Ways of Experiencing Technology in a Smart Learning Environment

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Abstract. This paper discusses ways of experiencing digital technology and digital interactions in 'smart learning journey' activities. Smart learning journeys can be considered as ad-hoc smart learning environments outside in the real world, offering a wide range of opportunity for empowering local populace engagement in issues relevant to a neighbourhood area. Activities may often be associated with urban citizen communities, enhancing quality of life and lifelong learning in urban digitally connected 'hyperlocal' spaces. Activities discussed in this paper used freely available smartphone apps and consisted of a series of digitally augmented real-world local features that together formed a journey of points of interest related by topic.

Research discussed in this paper investigated how people experienced 'Technology' as one of four conceptualised system elements of a smart learning journey activity, the others being Place, Knowledge and Collaboration. Utilising the methodology of phenomenography and analysing participant semi-structured responsive interviews with a structure of awareness analytical framework approach, four categories of Technology experience variation emerged. These were Easy, Helper, Novel and Problematic. These categories were formed by noting the commonality and variation across all interviews at collective level, while retaining the individual participant context. This paper reflects on these categories of experience variation, positioning discussion in further context of the socio-cultural technological, 'post digital' world that smart learners may find themselves in future urban smart learning environments.

Keywords: Human-computer interaction, user experience, augmented reality, presence, post digital, smart learning environments

1 Introduction

This paper discusses aspects of research carried out during 2018-2020 investigating experiences of participation in 'smart learning journey' activities, here reflecting specifically on how participants in these activities expressed their experiences of Technology. This follows on from previous publications discussing this work from pedagogical aspects of interest and formation of pedagogical guidelines for smart learning design in these activity contexts [30, 31, 33]. Smart learning journeys are considered as ad-hoc smart learning environments located outside in the real world, offering a wide range of opportunity for empowering local population engagement with issues

relevant to their neighbourhood area. Activities may often be associated with urban citizen communities, enhancing quality of life and life-long learning in urban digitally connected 'hyperlocal' spaces, e.g. [28, 31]. Hyperlocal is a useful term to define a small local area of closely related places or specific communities, arising from a term originally describing 'hyperlocal media' such as blogs and local news websites [60]. Carroll et al. [8] and others, e.g. [36], have used this term in relation to learning situated in a closely localised area. Participants in these activities often take part voluntarily, and choose what they might find of interest, using their own mobile devices to digitally interact with aspects of an activity. Smart learning journey activities discussed in this paper used freely available smartphone apps and consisted of a series of digitally augmented real-world local features that together formed a journey of points of interest related by topic.

To determine the variation in how participants experience taking part in an activity, the smart learning journeys discussed in this paper were researched using the methodology of phenomenography, and research participants were drawn from groups of undergraduate and postgraduate students who took part voluntarily in smart learning journeys in their own time. Participants were interviewed according to the phenomenographic method of eliciting deep emergent reflections of their experiences during open responsive interviewing [1]. Interview transcripts were analysed using a phenomenographic structure of awareness framework [12]. This facilitates deeper understanding of the focal awareness of participants and what may form the figure and ground in the continuously reconstituting range of a participant's experience that constructs meaning and context for an activity [37, 39]. Zerubavel elaborates: "(a)lthough originally conceptualized specifically within the context of sensory perception, the figure-and-ground model is nevertheless applicable to non-sensory modes of cognition … (to) capture the essence of the process of mental focusing" [63, p. 11]. Additionally, Lister [34] discusses figure and ground in relation to understanding of focal awareness for learning through self-reflection.

Focus in this paper is on examining participant experiences from the perspective of thinking about a smart learning journey activity as a system, conceptualising broad system elements that may assist in delimiting aspects of participant experience. This thereby further enables analysis and discussion of relationships between system element experiences as well as variations within them. These relationships might in some ways be considered as the functions, purposes and interconnections of system elements according to the systems thinking terminology of Meadows [42]. Four broad smart learning journey 'system elements' of Place, Knowledge, Collaboration and Technology were utilised, both to provide focus in interviews, and additionally to act as alternate lens perspectives of analysis for the focal awareness of structure and meaning in participant interview experience reflections. This offered a mechanism for delimiting analysis interpretations related to each system element (SE), yet retained potential analogous contexts. Four system element phenomenographic outcome spaces [40, 25] of experience variation were therefore formed, each including several relational categories of experience variation. This paper focuses on the Technology

outcome space experience variations discovered in the analysis, and seeks to highlight possible ways that people experience aspects of interacting with the technological mediations of their participation in a smart learning activity and environment. Discussion explores reflections on the nature of experiencing real-world and digital realities in co-existing socio-temporal spaces [57, 4, p. 141], and potential relationships of digitally mediated reflective and affective intra-active [4, p. 168] perceptions in smart learning environments.

2 Summary of research

Two smart learning journeys were investigated, located in the City of London, UK (a route of 2km), and central Valletta, Malta (a route of 650m), with themes of heritage, history and literature. Real-world points of interest (PoI) features such as statues, monuments or building plaques were digitally augmented with augmented reality (AR) interfaces offering a choice of context-aware digital knowledge content to click on via a series of icon triggers. This was achieved using the HP Reveal[1] web-based 'Studio' app, high-resolution photographs and image based recognition to recognise and trigger the AR augmentations. Early in the study experiments with geo-fenced image recognition proved technically successful, however during the period of research HP Reveal withdrew their AR geo-fencing functionality, leaving the research to use the simpler image based recognition as the AR method. This was sufficient to create a 'future-present' [18, 24] version of a digitally augmented real-world environment for users at each of the PoI locations. A custom map was created using Google MyMaps[2] which showed each augmented feature location (PoI), additionally providing basic instructions in the information panel at each PoI for what to focus on and how to trigger the AR. The Edmodo[3] app was used to provide participants with a group online area for uploading content they had created either during or after the journey (photographs, written notes or web links related in some way, with some group commenting). Digital knowledge content provided for each PoI in the AR triggers consisted of video, image galleries or custom webpages authored by the tutors of classes participating in the journeys, plus third party content sourced from WikiMedia[4] or other open knowledge content. Original knowledge content webpages were hosted on a WordPress custom website[5], where webpages were only accessible via the AR triggers, otherwise hidden from website menus. All mobile apps used were free to use, available in the Apple App Store or Google Play store.

1 HP Reveal, formerly Aurasma, defunct link and app as of 2020 [https://www.hpreveal.com]

2 Google MyMaps [https://google.com/mymaps]

3 Edmodo app [https://edmodo.com]

4 WikiMedia [https://commons.wikimedia.org/wiki/Main_Page]

5 Smart Learning Journey website [https://smartlearning.netfarms.eu]

2.1 Methodology

Phenomenography [37, 39] was selected as the methodology most suited to this investigation, as other relevant qualitative research studies had benefited from its utilisation. Studies involving learning with technology and studies in user experience have increasingly looked to phenomenography to understand more about what users and learners do and why they do it. For example, Souleles, Savva, Watters, Annesley & Bull [53] examined art and design student experiences of using iPads in their studies, describing the phenomenographic approach as allowing for a "bottom-up investigation, ie, from the perspective of learners". Kaapu & Tiainen [23] investigated experiences of consumers and their understanding of virtual product prototypes, "to get an idea of users' subjective experience", aiming to "support customers' participation in product design process". The aims of these studies were somewhat reflected in my research, therefore phenomenography was considered a 'good fit' for investigating participant experiences of smart learning activities, and to "observe the phenomenon of 'learning' from their perspective" [3].

Phenomenography is 'non-dualist' [38] in nature, making an epistemological assumption that there is only one world as experienced by the learner, "where there is an internal relation between the inner world and the outer world" [19]. Here we are interested in the reality concerning phenomena of interest to the research as experienced by individuals being researched. Phenomenography analyses learner experience at collective level, looking at the experience variation itself rather than the individual context, though context is retained. Drawing on Gurwitsch's [17] ideas about theme, thematic field and margin, experience is analysed using a 'structure of awareness' analytical framework [12]. Significantly, phenomenography takes a 'second order' perspective to analysis [37, p. 2; 38, p. 183; 52, p. 340]. This means that the researcher accepts the participant self reported experience without attaching latent interpretation, that is, the analysis does not seek to explain why a participant may state something, simply that they do. Therefore, the outcome space and categories of description are developed by the researcher, yet are emergent and consist of the experience variation as noted in the manifest content only, described by Bowden as "if it is not in the transcript, then it is not evidence" [6, p. 15].

2.2 Sampling

The sample of research participants was purposive and convenience [49, p. 6, 53, p.4], recruiting undergraduate and postgraduate students on a voluntary basis between 2017-2019. Student cohorts were drawn from Education and the International Master in Adult Education for Social Change degree programmes based at University of Malta, plus an additional cohort from London Metropolitan University studying English Literature and Creative Writing. Phenomenography does not require large amounts of data, only sufficient to permit the widest possible (or likely) variation of experience to be found [62, p. 8]. Taking into account practical limitations as well as iterative estimation for different variations to emerge, twenty-four participants were considered

sufficient, giving a snapshot of variation [58, 2] that included different demographics and subject disciplines. A possible limitation was gender representation, with nineteen females and six males. This might be because of a paucity of males in the degree programmes or simply the voluntary nature of recruiting participants for interviews. However, Reed considers gendered distinction of experience as a potentially artificial construct within the terrain of phenomenographic inquiry and 'individuals most likely to provide ... variation in ways of experiencing' [49, p. 6].

2.3 Analysis

A brief description follows of the overall smart learning journey system element analysis, with subsequent discussion specifically focusing on the Technology system element, the topic of this paper.

Adopting a phenomenographic analysis approach, categories of experience variation emerged to form outcome spaces [40, 25] for each of the conceptualised system elements. Through reflecting on analysis in each system element of a smart learning journey it was possible to broadly delimit aspects of experience as separate yet related parts of a system. Experience was analysed using a phenomenographic structure of awareness framework, discovering units of meaning [40, 49], noting commonalities and difference variations across the utterances at collective level in the interview transcripts. The phenomenographic structure of awareness (SoA) analysis framework conceptualises awareness based on Gurwitsch's theme, thematic field and margin [17, 12]. The 'referential' aspect of the SoA is the theme, the central focal awareness, where meaning is formulated from the closest focus of attention in relation to the immediate or most relevant context of surroundings. This referential meaning is seated within the thematic field of a structural 'internal horizon' of the focus, formed through interpretation of it. The internal horizon surroundings extend outward until they reach the margin, the structural 'external horizon' which is articulated as the perceptual boundary [62] of what may still be relevant to the referential and internal horizon. In other words, as the focal awareness extends outwards it becomes less related to meaning and close focus, steadily fading from perceptive awareness into the background. Analysis findings are reviewed by a co-judge [5, p. 68] to confirm or challenge analysis interpretations, and to enhance communicability and interpretive awareness [12, 50]. The system element outcome spaces of a smart learning journey that arose from this analysis are described in more detail in following sections.

3 The system elements of a smart learning journey

The purpose of the system element analysis was to help define the delimited nature of the experience perspective positions, as this enabled an articulation of those differences. By analysing from the perspective of each SE it was possible to look at how participants viewed and thought about their experience of particular broad aspects of the smart learning journey (SLJ) without having prompted them directly in the inter-

views, which may have risked influencing their responses. Noting that the phenomenographic method is to adopt a second order position, the researcher/analyst always attempting to bracket their own assumptions about *why* participants might be saying things, simply to take it 'at face value'. Therefore, phenomenographic outcome spaces were discovered in the commonality and variation of how participants expressed their experiences of each of the broad SE's of the SLJ, namely Place, Knowledge, Collaboration and Technology. These SE outcome spaces formed categories with delimited structure of awareness (SoA) perceptual boundaries, being delimited by the element itself, defined by (analytically) asking the question, "experiencing place in a smart learning journey as…", "experiencing knowledge … as …", and so forth.

The categories in each SE outcome space derived from the most obvious commonalities of experience variation, so aspects that show variety of experiences within those commonalities across multiple transcripts that are given prominence or emphasis in the context of individual transcripts. Analysis was kept to an overview of possible experience variations, not seeking to define these beyond a first level of complexity for a possible SE structure of awareness. This was because in a smaller scale study of this size there is risk of duplication, and additionally, the main focus of the questions in the study were on relationships of learning and development for pedagogical understanding in the experience of a smart learning journey, not to analyse deeply the experience of place, knowledge, collaboration or technology within it. In this paper however, it is of interest to attempt to highlight the Technology SE outcome space to potentially uncover useful understanding that may be of relevance to others who develop SLJ or similar activities in urban connected spaces. To provide context for the Technology outcome space discussion, here I give brief outlines of all the SE outcome spaces, to describe the other SE categories in relation to the Technology SE. Subsequent sections will then describe the Technology structure of awareness analysis process and categories in more depth.

3.1 Place

The Place SE enables thinking about aspects of being at locations, points of interest on the SLJ, or the journey as a whole. Here the analysis statement is "experiencing place in a smart learning journey as….". It is therefore more possible to delimit the variations of the position place occupies in the awareness of the learner. The categories in 'Place' were Being at the place; Being outside; A tour, a trip, a game.

3.2 Knowledge

The Knowledge SE looked for how information was experienced in terms of content provided in the SLJ activities. Here the analysis statement is "experiencing knowledge in a smart learning journey as….". Commonality with related variation in perceptions of information were observed as either interesting, or not interesting, or that there was just too much content (even though this can be interesting or not interesting). Analysis of how information was experienced by participants is especially

useful when considering learning activities, as may have bearing on how technology mediates knowledge content provision and consumption. The categories in 'Knowledge' were Of interest; Not of interest; Too much.

3.3 Collaboration

The 'Collaboration' SE was a way to acknowledge the direct or indirect impact between people in a SLJ activity. Here the analysis statement is "experiencing collaboration in a smart learning journey as….". It could be argued that people form part of all aspects of a smart learning journey system, that is, elements, functions, purposes and perhaps especially interconnections [42, pp. 11, 13]. However, 'Collaboration' created a sufficiently broad category with focus on narrowing down the experiencing of 'people' in these activities. The categories in 'Collaboration' were Distracting; Sharing; Social, engaged (sociable).

3.4 Technology

The Technology system element permitted a drilling down of the structure of awareness for 'Technology' in a SLJ activity. Here the analysis statement is "experiencing technology in a smart learning journey as….". Technology topics nearly always emerged completely naturally in conversations but appeared to not be at the forefront of most participants' minds. Comments relating to the experience of technology were about how augmented reality (AR) worked, and this caused both a sense of 'wow factor' as well as frustration when things didn't work. Other comments were about the potential of AR for interacting with the environment for both civic and learning experiences in future professional work scenarios, so seeing the possibilities in wider context. Remembering again that participant comments emerge naturally (not specifically prompted for), it was notable that not everyone remarked on technology in any way, it merely seemed to form an unacknowledged aspect of background or assumed context. There were four categories in the 'Technology' SE, these were Easy; Helper; Novel; Problematic.

4 The technology system element 'outcome space'

The focus of this paper is to unpack the findings of the Technology system element (SE) phenomenographic outcome space, and reflect on possible areas of understanding that might be derived from what was discovered. The categories of 'Easy', 'Helper,' 'Novel' and 'Problematic' are described here, illustrating each category with key quotes drawn from interview transcripts, with brief contextual reflections. These categories offer clues about the range of variation in experiencing technology in smart learning environments, acknowledging that this range of experience variation can be concurrently present in a single individual, as well as between individuals. Experience variation will fluctuate according to the interests and motivation of each individual

and additionally be impacted by multiple other factors such as peers, other persons, the sociocultural context or other issues.

The Technology SE analysis looked at all participant expressions that related in some way to technology, and analysed them for meaning by using an approach of first establishing individual context for emphasis, significance and position in transcript discussions, then looking for commonality and variation across all participant expressions concerning technology (somewhat after descriptions in [51, 52]). 'Technology' was interpreted as any app or technical service that might have been mentioned by a participant relating to their participation on a SLJ. Technologies were not limited to only those that might have been used 'on the day' but any other that a participant felt relevant to mention, for example discussion using WhatsApp[6] or Facebook Messenger[7] before or afterwards, using Edmodo to upload content to group areas, or using wifi and phones generally in relation to the activity. However, the majority of mentions concerned the AR app, HP Reveal.

To reiterate, the structure of awareness analysis framework [12] considers the structural (context and boundary) and referential (meaning) aspects of perceptual awareness. Meaning is formed of the 'internal horizon' of the structural, those aspects that hold the most significance from the closest focal awareness. The surrounding context extends out finally to the perceptual boundary or 'external horizon' of awareness. The four categories of variation are now described:

4.1 Category: Easy

- Referential (Meaning): Simple, easy to use, fun
- Structural/Internal Horizon: Fast, normal, straightforward, works
- Structural/External Horizon: The (assumed) normality of it, ease of using, 'it was great'

Quotes

1. "If you have to check about it before you would get it, it's a simple technology but on the day on the task they couldn't set it up or whatever… because *they haven't paid attention"; (P8) *(*referring to classmates)*
2. "… I was quite scared of it at first but like now it makes more fun, You know it's fun going into different things and just pressing a button and, and saying oh my like wow a video popped up"; (P11)
3. "I think its much easier with technology (…) I said this, that you are immersed in the technology, you are not just there. You are immersed in the visual sphere"; (P13)

6 WhatsApp [https://www.whatsapp.com/]

7 Facebook Messenger [https://www.messenger.com/]

4. "… it was very easy to tap on individual things, erm, and my data was working well, so I had a really quick internet response, so when I clicked on the links, I was able to load pretty quickly, erm, so, I, er, yeah, thought it was great."; (P23)

The 'Easy' category consisted of what participants said about their ease of use, or learning to operate the technology, particularly the AR. Though quotes may hint at other interrelated relationship aspects such as being immersed, not just 'there', or the 'wow' of things popping up, the meaning in the experience of technology is attempted to be analysed separately, delimiting it from further meaning or structural categorisations - such as novel, or helper, or other system elements such as place or knowledge. Quotes show a selection of how participants appeared to think of the technology as easy, fun or simple, sometimes compared to others not finding it easy.

4.2 Category: Helper

- Referential (Meaning): Guide, helping, convenient
- Structural/Internal Horizon: Convenient, right there, personal assistant
- Structural/External Horizon: Providing content you would not know about, sparking ideas and interest

Quotes

1. "what it does is in putting you in the place it almost gives you another level of access to something that really we don't have anymore, get a deeper understanding of what that part would've been like at a certain time and what was going on around that time. I think, I think it did help."; (P3)
2. "It's more alive, It's like you're a tourist and seeing the sights of Malta and at the same time learning about them it's like you have a person but a personal digital assistant telling you about the place, the historical background about the things you are seeing…"; (P7)
3. "the most significant part was using our smartphones in this learning experience like you could access the content that's very important just by taking a photo of that monument for example "; (P15)
4. "… without your phone, you're looking at a building, which is pretty, and there's a couple of statues, and a small plaque, but that's all you get. Whereas with the phone there are like all these other facts and figures and videos and pictures and stuff and impulses for questions to ask and answer"; (P21)

The 'Helper' category was how I categorised meaning for a range of comments that referred to convenience, guidance, digital tour guides. The sense that a participant had when they accessed content about the location they were at which perhaps then prompted discussion or further awareness and reflections about the historic significance of the place. Comments in Helper covered a range of variation demonstrating

interrelated relationships between this category and others, notably the 'Problematic' category in the Technology system element.

4.3 Category: Novel

- Referential (Meaning): Novel, new, futuristic
- Structural/Internal Horizon: Sci-fi, modern, new, different
- Structural/External Horizon: Expectations of new technologies, potentials

Quotes

1. "I really liked the idea because I've never done a kind of augmented tour before. I liked the idea of going to a place and even though it's mediated and you have to do it on your phone it's as close as you're maybe get to going to a place like, which isn't going to provide you with kind of a document of its history."; (P4)
2. "I guess to *capture their emotions like how they looked when they were revealing the content like it was something unusual so they were like wooaaa oh my god"; (P16) *(*refers to taking photos of classmates)*
3. "the interactions that the app provides with the environment, that to me was very interesting. Feels a little … sci-fi?"; (P17)
4. "… when it worked we were like oh that's actually quite cool, like, I don't know because it's a bit like magic, you know, like tschoo *(makes sparkly noise)* and suddenly it's there. That's kind of cool."; (P18)

Aspects of novelty that formed the 'Novel' category were recognised quite early in the analysis process, appearing in slightly different ways in participant transcripts, with remarks on the 'sci-fi' or 'new' nature of the AR. Though it might have been a likely presupposition by the researcher (and therefore potential bias) to assume that participants would think of the AR as significant to discuss, especially as novel or futuristic, only some participants articulated this, sometimes interrelated with the 'easy' category. Perhaps for others it was seen as a kind of assumed given, a normal expectation by them that there would be AR and it was simply 'there'. It didn't seem that special to them, so often participants didn't even remark on it at all. This in itself was surprising and of interest to the research as it indicated that some people were not attentive to the technology *of itself*, but only to any resulting mediation outcome or possibility, whether positive or negative.

4.4 Category: Problematic

- Referential (Meaning): Not working, not good
- Structural/Internal Horizon: Not working, no wifi, no data, no battery
- Structural/External Horizon: Overwhelming, too complicated, difficult, tiring, obstructive, self conscious, tech zombies

Quotes

1. "… on the app I think I remember that things were quite layered they was kind of quite a lot of information on the screen at once so it was a little bit overwhelming"; (P1)
2. "… but like I hate that because it's like people walking around and looking just like zombies and not paying attention to anything or anyone you know like they're in this beautiful park and all they're doing is like looking at their phones"; (P22)
3. "… we did run into a couple of issues at the very end being we, I wanted to continue doing the walking tour but all of our phones were dying. And I didn't have a power bank or anything"; (P23)
4. "I was trying to make it happen, and, like, it did pop up at the beginning and then when I er, clicked on one of the icons, that's where it started hanging, started crashing and went crazy."; (P24)

Comments in the 'Problematic' category spanned a wide range of issues relating to using technology. Many quotes concerned access and use of AR triggers or issues regarding availability and access to WiFi. Other quotes refer to either technology in general, to using Edmodo or Google Maps, or to suitability of phones, including battery power. However, the vast majority of quotes are about AR and related issues of WiFi access. This may be because what is uppermost in participants minds is how they interacted on the journey itself, not the activity as a whole, which might have included Edmodo or creating digital content. It is clear that some participants thought access to the AR triggers (using HP Reveal) depended on quality of phones, while others said it was not about 'brand', and others said they thought it was about up-to-date mobile operating systems. P22 makes an interesting comment about 'zombies' and clearly indicates that the more phones are used to interact with reality, the less reality itself is being interacted with.

5 Interpreting technically mediated interactions

The combination of apps and services that provided the technically mediated interactions and functionality of the smart learning journey activities were in general found to be fairly easy and understandable to use. The AR triggers offered an 'AR interface' of choices, not the more common approach of triggering one piece of content only, such as opening a video or single webpage. This was to accommodate the choices of content desired by the tutors, and created an impression of being *smarter*. The aim was to create the future in the present moment, and though this may not have been an accurate representation of a future digitally interactive experience, it was a potential way to conjure an assimilation of a smart digitally augmented and interactive integrated city. Therefore the technology used was a 'future-present' representation [34, 18, 24] of what may happen more seamlessly in the future but as such was still somewhat primitive. However, participants either realised this and accepted it, or did not particularly notice it and accepted it. For example, it was noticeable that participants

did not talk about the icons and the AR interface used in the AR triggers, as seemed to know how to use them, and what the icons represented. Even though participants had never used augmented reality and context-aware content triggers, there appeared to be an implicit understanding of what it was or could be.

This implicit understanding may be part of what Thompson describes when she states “technologies and people fold into each other. Human and non-human actants are in a co-constitutive relationship […] co-constituted in webs of relations with other actants” [56, p. 160]. It is in this context that Latour [26, pp. 133, 134] declares “from now on, everything is data”, and whether something is ‘digital’ or not “no longer matters”. Jones describes “knowledge and capacities as being emergent from the webs of interconnections between heterogeneous entities, both human and non-human ... sociomaterialist approaches offer the prospect ...that encompasses people and machines in a symmetrical way” [20, p. 47]. In more simple terms (though no less technological) Morville [45] contends that “we are what we find”, indicating the influence of the technical networked system on the individual's perception and 'wayfinding' in knowledge and understanding. Though it was noticeable that technology was not at the forefront of a majority of participants minds in terms of the emphasis and context of what they talked about, many reported some experience focus where the AR technology provided a structural aspect of experience variation that contrasted with another referential theme of meaning. For example, it may have been that an AR content trigger (structural) created an opportunity for (referential) meaning to occur regarding personal reflections or memories about a place. However, technology also appears to have provided (referential) meaning *of itself* for some, for example the feeling of ‘wow factor’ to be in a place and trigger an AR content experience. It was up to participants how they may have chosen to talk about technology, some emphasising its role, others hardly mentioning it at all.

Contextualising the experience variations of Technology with the other three system element outcome spaces of Place, Collaboration and Knowledge can support reflections on potential relationships between digital interactions in related contexts. For example in relatedness of knowledge and place, by ‘hypersituating’ access to knowledge and a user’s location [44, p. 68]. Access to digital augmentation and interaction with context-aware knowledge content (as described in [27]), may impact perceptions in relation to real-time presence in place, memory or personal reflective value, e.g. [21]. Likewise, experiencing technology in relation to synchronous, asynchronous, face-to-face or virtual dialogic contexts of activities may alter how dialogic experiences form, and how the value of them is perceived, e.g. [10].

Technology mediates participant experience between these terrains, in cognitive, social and affective intra-active, co-constitutive relationships of awareness, communication, learning or value, mingling with externalised physicality of weather, light and heat, buildings, peers and the real-world and (potential) virtual conversations going on [48, 4]. These relationships may further inform perceptual interpretations within individual and social socio-cultural experience of place and the nature of the activity, or

be influenced by presuppositions and expectations about the technologies themselves, e.g. [47, 14, 46, 29].

6 Technology in a post digital world

Considering the post digital world of Latour [26] where "whether something is 'digital' or not "no longer matters", what can human experience variation of technology tell us? Jordan defines two key conditions of post digitality as "the pervasiveness and consequent normalisation of computationalism; in other words a complex enmeshment of digital technology with everyday life, to the point where to describe something as 'digital' becomes almost meaningless" [22, p. 176]. This is Morville's 'intertwingled' daily life of pervasive knowledge networks and activities [45, p. 75], the 'multidimensionalities' of smart cities described by McKenna, where, referring to the work of Streitz [55], "the computer disappears into the background and environments are more generally infused with technologies" [41, p. 6]. Yet, participants experience this variously, both within internal and externalised contexts.

Post digital debate has been going on for some time [9, 11], perhaps with renewed resonance in the hybridity of real world augmented reality and its various connotations of location-aware or vision-based digital interactivity as described by Dede in 2005, and then later [13, 15]. This scope of AR has developed over the past decade to potentially involve embedded sensors or smarter content delivery in some instances, though essentially remains as Dede indicated. The impact of new 3D virtual network worlds such as Metaverse[8] or AltspaceVR[9] may yet create new kinds of AR, though some might consider these as more 'sociotechnical imaginaries' better suited to venture capital investment than any useful or purposeful technical innovation [61]. These fluctuating mixtures of human face-to-face and virtual presence and glocality, e.g. [43, 59], mediate the participant experience of their real-time world through the interplay of technological interface, digital augmentation and multiple socio-material, spatio-temporal [57] and cultural intersections [7]. Sense of being in place in smart learning digital augmented environments is reconfigured as intertwined layers of physical real-time presence, virtual telepresence [54, 16] toward hypersituationism [44]. Further, socio-cultural glocalities of multiple time zones, languages and personal cultural connotations may impact senses of place [43].

Traxler describes an 'erosion of physical place' by multiple mobile virtual spaces as 'absent presence', that "(p)hysical space in fact is emptied of significance, becomes less dense as thickness, as the dimension of virtual space is grafted on to it" [57, p. 198]. Further reflecting on temporal and spatial contexts as "spatio-temporal capital, … or space-time as a commodity" [57, p. 199], which may be a way of considering how participants in smart learning activities focus engagement directed at differing

8 Metaverse (Facebook) on Wikipedia [https://en.wikipedia.org/wiki/Metaverse]

9 AltspaceVR (Microsoft) on Wikipedia [https://en.wikipedia.org/wiki/AltspaceVR]

digital and real-world domains as interest or motivation occurs. Clearly, participants gave voice to uncertainty regarding the impact of AR interactions in relation to how their 'real world' was perceived. Notably, P22 remarked passionately on her observations that no one was 'present' in the moment at the location their group was at, that "all they're doing is … looking at their phones". Others remarked on the phone interactions being an obstacle to engaging with place (P1, P5) or that amounts of knowledge content provided were 'overwhelming' or 'boring' (P1, P17), though others enjoyed the contrast and potentially enhanced understanding that both digital and real offered (e.g. P3, P7, P12, P14, P23). Yet, many participants did not remark in any significant or emphasised way about any of the technology being utilised to mediate the smart learning journey activity they had taken part in. It simply did not seem remarkable or unusual, and if probed further was greeted with a shrug of the shoulders, a kind of 'yeah, it was fine'. Only some participants offered reflections of their own volition on the impact of using apps or about using the AR in real world places, however if the AR app did not work then participant reflections were more readily expressed. This appears to suggest that if technology just 'works', there is an implicit general understanding and expectation of what it does and how it is used, even if it isn't that efficient, at least within this study and these kinds of activities. It becomes somewhat transparent in its affect, it is merely part of 'doing', like getting on a bus with contactless payment, or sending a text. This appears to describe the commonplace intertwingled, multidimensional [45, 41] post digitality that forms a smart learning environment.

7 Conclusions

This paper has discussed the ways participants experienced technology in smart learning activities positioned as journeys in ad hoc smart learning environments. Considering the categories of 'Easy', 'Helper', 'Novel' and 'Problematic' as the four categories of experience variation most commonly appearing in participant interview reflections, a further aspect of note was the absence of technology as a significant topic of reflection for many participants. Discussion further considered the possibility of a tacit assumption of post digital normality amongst participants implied in this absence.

In the near future, real world AR interactivity will likely become a much more streamlined set of technical interactions [41], and this evidently increasing ordinariness of technological experiences may well lead to activities such as those discussed in this paper becoming a regular feature of learning or in citizen led urban initiatives, supporting numerous ideas and purposes. For example, apps such as Google Lens[10], What3Words[11] and others may seamlessly integrate with a Virtual Learning Environ-

10 Google Lens [https://lens.google/]

11 What3Words [https://what3words.com/]

ment (VLE) through related Application Programming Interface (API) connectivity[12]. Though AR or other digital interactivity with the real world may still be somewhat of an unusual experience, in the post digital city many participants already appear to greet it with an urbane nonchalance. Yet while they may not be explicitly acknowledging their interpretations of technical mediations, citizen learners experience technology in multilayered ways, continuously reconstituting their interpretative awareness of the world around them in socio-spatio-temporal meaning and context. Acknowledging this spectrum of variations both within and between individuals and non-human actants can perhaps contribute towards improving design for more effective and useful activities, creating a more level playing field for a wider and more diverse range of users and communities.

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12 For example, Vision API [https://cloud.google.com/vision] or What3Words API [https://developer.what3words.com/public-api]

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