Experiencing the smart learning journey

A pedagogical inquiry

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Introduction: *defining the project*

The Research Questions

1. How can we measure the effectiveness of smart learning experiences considering both content of learning and process for learning?

2. Can we formulate a practical pedagogical guide for smart learning activities based on connectivist principles?

3. How does this pedagogical guide inform the design of smart learning?

Key quotes about Smart Learning

Learning to learn, learning to do and learning to self realisation (Liu et al., 2017, p. 209)

... a complex conversational process that can and usually does lead to much that is of value beyond what is planned (Dron, 2018, p. 3)

… a smart learning environment is one that is effective, efficient and engaging (Spector, 2014, p. 2)

Perhaps even our notion of design is worth rethinking - do we design learning? Or do we design environments in which motivated learners can acquire what they need? (Siemens, 2006, p. 119)

Introduction: *summary*

The phenomenon of investigation is ***a smart learning activity conceptualised as a real world journey.***

Learning is examined from the perspective of the learner, and the experiences of participants offer clues about what may constitute aspects of learning to them (e.g. in Roisko, 2007, p. 23).

The challenge of the study is to find pedagogical understanding of this kind of learning through ***researching learner experience guided by the methodology of phenomenography***.

Potential for ***measurement is shown as surface to deeper learning and cognitive domain equivalences*** using Bloom's Revised and SOLO taxonomies alongside the PECSL model.

Connectivist principles formed the basis for the smart learning journeys and subsequent PECSL model, emphasising factors of participatory, collaborative, autonomous and connected learning.

Pedagogical understanding derived from findings ***is applied to practical learning design, demonstrated as iterative stages of PECSL considerations*** in a design and development cycle.

Exploring the literature

Related discourses in pedagogy and smart learning

- Concepts of smart learning environment connectivist models
- Smart city learning as citizen centred, with ad-hoc ‘smarter’ mobile apps, not technological, urban, and data orientated
- Experiential and pedagogical factors of a connectivist-inspired smart learning activity

Related discourses for connectivist-inspired smart learning activities

- The connected learner and connected pedagogies
- Role of related theories and discourses -
  - Connectivism, (Social) Constructivism and Constructionism in learning design
  - Active, social learning as part of the participatory nature of connectivist learning
  - Activity Theory and Actor Network Theory
- The roles of community and technology mediations

Methodology

- **Phenomenography** examines learner experience variation, often using an emergent interview approach
- Is a ***non-dualist*** interpretivist paradigm - there is only one world, the relationship between inner and outer world for those being researched
- Takes ***a 'second order' perspective*** - the researcher attempts to assume the position of the researched, rather than analyse them as an 'object' of research
- ***Analyses data at collective level*** - across all interviews together - though individual context is retained
- ***Commonality and variation*** of experience form ***an 'outcome space'*** with ***'categories of description'*** for possible ways of experiencing a phenomenon
- Utilises a ***'structure of awareness' analytical framework*** - a structural internal and external horizon, and a central focus of referential, where 'meaning' is constituted

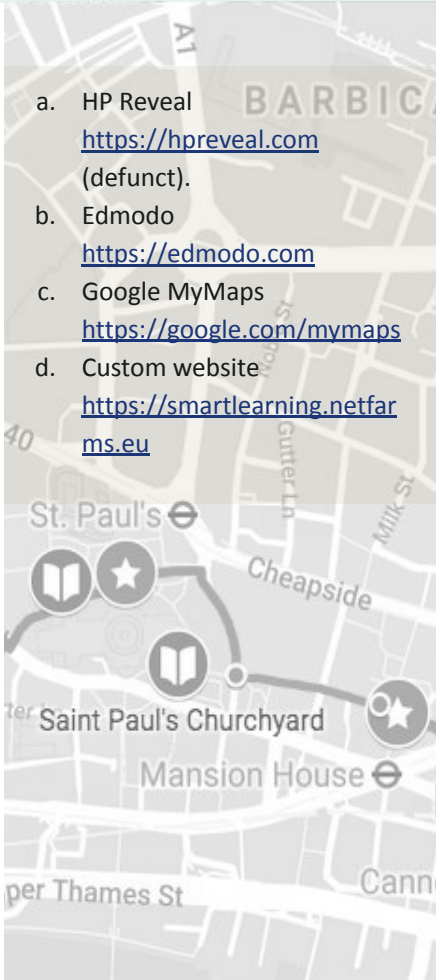
Figure 1: Diagram of a structure of awareness

Sample & method

- **Research investigated two smart learning real-world journeys**,
- Points of interest were **augmented with digital interactions** to access to context aware content.
- Original knowledge content together with other digital knowledge commons content.
- Participants were requested to **create their own content** and upload to Edmodo group areas.
- **Participants took part voluntarily**, and did as much or as little of the journey as they chose. **Participants often took part in small groups**.

- ***London*** Metropolitan University, UK and the University of ***Malta***
- Sample was purposeful and convenience
  - 24 participant interviews ***were voluntary***
  - Students were studying BEd. & Masters education related programs, and BA English Literature & Creative Writing
- ***Interviews*** were responsive and emergent (35-60 mins duration)
  - Standardised questionnaire to icebreak and clarify 'what the interview was about'
- A wide ***international demographic*** was represented across cohorts in both countries
- Age range approximately ***20 to 35***
- A ***potential limit of the study was gender balance***, with 19 female and 6 males

a. HP Reveal https://hpreveal.com (defunct).
b. Edmodo https://edmodo.com
c. Google MyMaps https://google.com/mymaps
d. Custom website https://smartlearning.netfarms.eu



Analysis - two perspectives

A primary** and **secondary perspective of analysis were utilised to investigate possible ways of experiencing a smart learning journey.

The primary perspective was key to overall findings, with the secondary offering further understanding.

Two distinct analysis perspectives may assist in communicating and thereby increasing understanding of interpretive awareness

Looking for commonality and variation across all quotes, continually reflecting on the data, ***units of meaning emerge, in a context of structural awareness***.

The secondary perspective of analysis established four broad 'system elements' of a smart learning journey: **Place, Knowledge, Collaboration** and **Technology**.

These *system elements* helped scope the icebreaker questionnaire and what interviews were 'about'.

In simple terms - the primary perspective of analysis poses the question "experiencing a smart learning journey as …"

The system elements pose questions of "experiencing place (or knowledge, collaboration, technology) in a smart learning journey as…"

Experience complexity in a smart learning journey

The primary outcome space of '***experiencing a smart learning journey***' was formed, with four categories of description for experience variation, each with four layers of complexity (Table 1).

Descriptive guidelines were noted for the emergent categories and levels of experience complexity, to assist interpretation of interview quotes.

	Category A **Tasks & Obligations**	**Category B** **Discussing**	**Category C** **Being there**	**Category D** **Knowledge & place as value**
Level 4	Research tasks and topic beforehand, take time doing and reflecting on tasks	Share tasks and content, do additional learning, discuss related experience and knowledge	Live it, being in the picture, live the atmosphere, take more time, seeing the whole and related parts	Knowing and seeing knowledge and place as valuable, personal experience, deeper engagement and 'possibilities'
Level 3	Tasks indirectly related to coursework or assessment	Discuss tasks and topic in relation to time and place	Experience in the place relating to other people, aspects and memories. Make connections between places and knowledge	Engage further with knowledge in topics, create upload content for tasks and at locations
Level 2	Do the tasks of interest, directly related to coursework or assessment	Discuss the tasks, help each other with tasks and tech	Locations are of some interest, potential for learning, creativity or inspiration	Click a few content links, save links 'for later', make screenshots of augmentations or tasks
Level 1	Do the tasks, go home	Discuss who does the tasks, how technology works	Go to locations, do tasks, go home	No engagement with content or knowledge, don't create or upload content

Table 1: The experience complexity of a smart learning journey

Thesis chapter 5 and App. 3

Analysing learner generated content

To 'assess' learner generated content, the primary outcome space CoD and levels of experience complexity combine with:

- Descriptions of surface to deep learning (somewhat after Hounsell, 2005)
- Cognitive domain 'equivalences' of Bloom's Revised (Anderson & Krathwohl, 2001) and SOLO (Biggs & Collis, 1982) learning taxonomies

The idea experimented with the concept of measuring effective smart learning, and was developed by analysing content made by learners, but could potentially be developed further and flexibly adapted for different assessment and learning outcomes (Lister, thesis p. 172-175).

	Cat A	Cat B	Cat C	Cat D	Surface to deep learning relationships	Bloom's Rev.	SOLO
Level 4	4A	4B	4C	4D	DEEP APPROACH shows intentionality for tasks, topic, knowledge and locations to contribute to ***argument***; to understand further potential interpretation (inter/intra); ideas, application	5/6	4/5
Level 3	3A	3B	3C	3D	SURFACE TO DEEP #2 ***moving towards 'argument'*** concepts; tasks and journey begin to be seen as indirectly relevant to wider settings; more reliant on imagination, creativity, inventiveness, inspiration	4	3/4
Level 2	2A	2B	2C	2D	SURFACE TO DEEP #1 some engagement with ***'viewpoint'***, building elements of meaning and connection resulting from the journey participation	3	3
Level 1	1A	1B	1C	1D	SURFACE APPROACH shows intentionality of doing tasks as fact, ***'arrangement'*** only. The bare minimum required.	1/2	1/2

Table 2: Description of surface to deep learning with Bloom's & SOLO taxonomies in relation to CoD levels of complexity using code representations (RQ1 solution)

Thesis chapter 6 - (also refer to 3.4.6, and App 3 & 5)

The Pedagogy of Experience Complexity for Smart Learning

The '**PECSL**' four-tier model of considerations

Tier 1 - Experience relevance structure(s)

The primary outcome space categories of description - types and levels of experience complexity indicate experience as relevance for engagement and value in participation.

Tier 3 - Pedagogical relevance structures

Further pedagogical relevance structures of motivation, autonomy, demand structures (Marton & Booth, 1997, p. 169) and complex learning environments.

Tier 2 - Related Pedagogies

Related pedagogies are derived from the CoD of the primary outcome space, and from direct quotes to indicate closely related 'good fit' pedagogy for each category of experience.

Tier 4 - Epistemological context

Relevant epistemological positions, individual and social factors, CHAT and ANT.

Ontological 'dualism' that may be present in these theories, contrasting with the 'constitutionalist perspective' non dualist position of phenomenography.

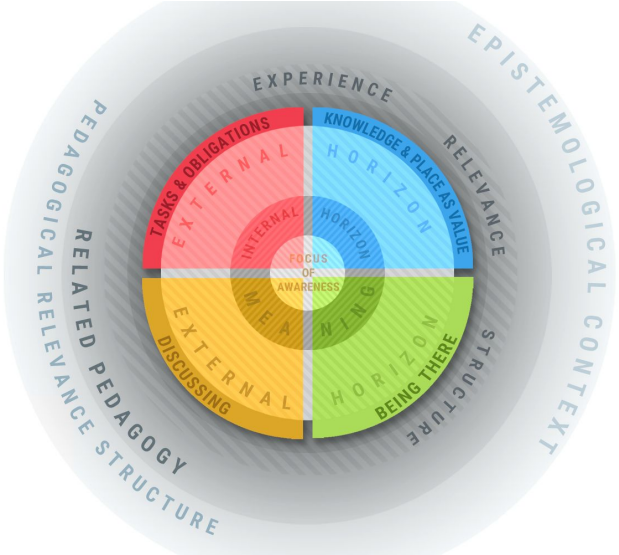


Diagram conceptualisation of the pedagogy of experience complexity for smart learning [click for larger image]

Thesis chapter 7

Tier 1 - Experience relevance structures

The primary outcome space of "Experiencing the smart learning journey", visualising the four categories of description as a quadrant of experience relevance structures: ***Tasks & Obligations, Discussing, Being There and Knowledge & Place as Value.***

- A central integrated focus and internal horizon (where meaning emerges and reconstitutes)
- Extending out towards the perceptual boundary of external horizon
- Each category is briefly described to illustrate scope of complexity and show potential integration with the whole

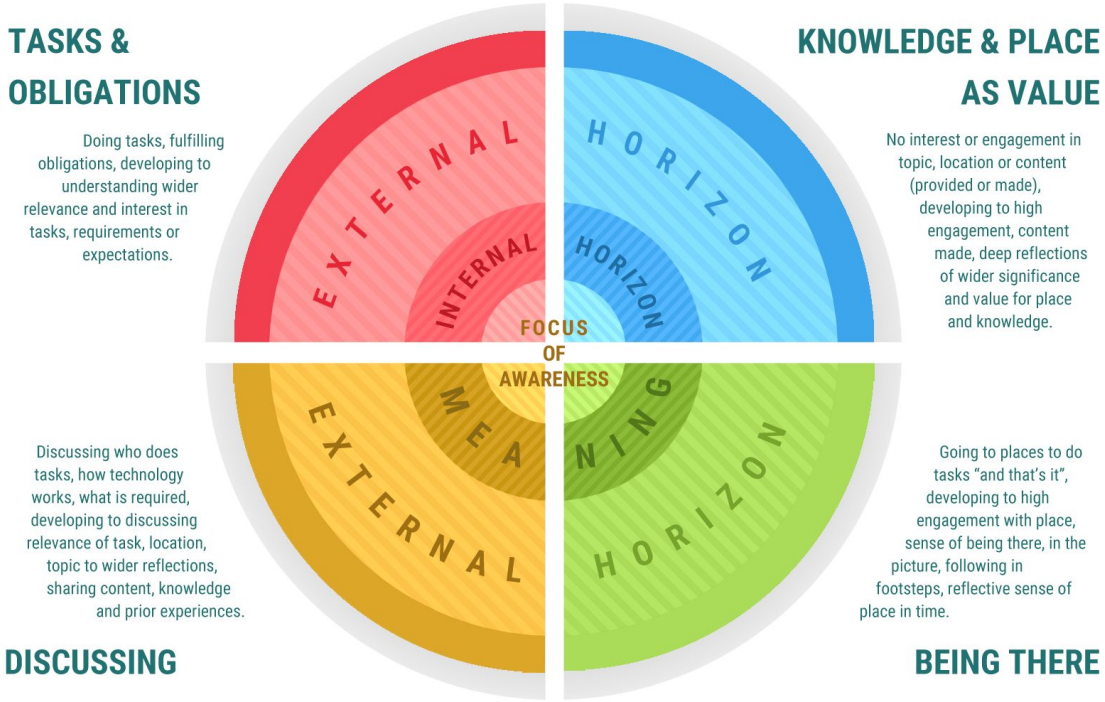


Diagram conceptualisation of the pedagogy of experience complexity for smart learning
[click for larger image]

Tier 2 - Related Pedagogies

- Using direct quotes and the analysis 'descriptive guidelines' I introduce pedagogy to the thinking and propose ***related pedagogies*** for each category of description.
- This attempts to form a relationship between experience variation and pedagogical approach and could ***facilitate planning for experience relevance through related pedagogical approaches.***
- The ***experience variation 'relevance' of each category*** indicated 'good fit' pedagogies:
    - Inquiry-based learning
    - Dialogic-learning
    - Place-based learning
    - Creative-learning
- Diagram visualisations show brief experience complexity descriptor, related pedagogies and 'activity plan' to plan for experience relevance.

Diagrams with experience relevance structure in related pedagogical context [click for larger images]

Tier 3 - Pedagogical relevance structures

Participants form ***relevance structures*** related to learning activities, and **decide how much of an activity to take part in**

- **Explicit relevance** - e.g. decisions about value and relevance of task for their grades
- **Implicit relevance** - e.g. decisions about whether they are interested in a task or topic (intrinsic interest)

'Metacognitive consciousness' of ***what participants interpret as significant may highlight areas of learning that could be supported*** either implicitly or explicitly

- *The relevance structure* - the immediate context of a task or action required
- *The demand structure* - a way of describing how the learning instructions and requirements might be designed
- *The global aspects of learning* - the wider context surrounding the learning activity

(Marton & Booth, 1997)

Context can impact experience awareness in multiple ways

→ ***Physical and virtual presence*** *(Traxler, 2015, p. 197)*

→ ***Socio-cultural contexts*** *of place (Buell, 2005) can influence interpretations of learning in real-world environments*

→ ***Complex learning environments*** *- A three architecture terrain of material, social and epistemic factors, with interactions involving fast and slow thinking (Goodyear & Carvalho, 2012, p. 55)*

Tier 4 - Epistemological context

'***Cultural Historical' Activity Theory*** (CHAT), the 3rd generation of AT (Engestrom, 1987, p. 6) emphasises culture to "show the rules, roles and expectations that can shape activities", (Edwards, 2011).

"… a double temporal component, the local temporality as well as the historical and the cultural embeddedness…" (Roth, Radford & LaCroix 2012, p. 6 7).

Accounting for non human agents of an activity impacting on the nature and possibility of meaning making - Goodyear & Carvalho cite Fenwick et al. (2011), who capture 'some of this complexity' though they remain sceptical about attributing agency to artefacts (2012, p. 51).

Gourlay & Oliver describe "***knowledge and meaning making practices not only residing in […] cognition, but also relying on interaction and entanglement with the internet*** […] in which the human 'contracts out' the responsibility to entanglement with the internet […] in which the human 'contracts out' the responsibility to store and organise information" (2018, p. 85), describing a ***connectivist style*** relationship.

Learning "may reside in non human appliances", *learning is "a process of connecting specialized nodes or information sources" […]* ***off loading "many cognitive capabilities onto the network*** *… our focus as learners shifts from processing to pattern recognition.*

(Siemens, 2005)

Thesis chapter 7

Discussion

- The ***process for*** and ***content of*** learning as act and object of learning
- Content (object) and apprehended content (intentionality)
- Phenomenography considers learning as a qualitative change in the relationship between person and world, based on the notion of ***intentionality***

The intended object is depicted as a monopoly of the instructor, but **learners also have intentions**...- the "***learners object of vital interest***" (Greeno & Engeström, 2014, pp. 133-134)

Marton (1981, p. 184): ***figure-ground learning relationships*** as "content as being figure, and process as being ground in a figure ground relation"...

- If a learner reflects on their experience of learning, may come to know their process for learning
- This might be considered as ***figure ground reversal***

Reflection: *Aspects of experience and reflection relevant to the process and content of a smart learning journey*:

- Action learning places emphasis on reflection (Lin, Galloway & Lee, 2011, p. 55)...

Dewey + Buell's conceptions of place *as 'gestures' in three directions - "environmental materiality, toward social perception or construction, and toward individual affect or bond", (**Jayanandhan**, 2009, pp. 106-107 & Buell, 2005, p. 62).*

Validity, transferability, applicability

- ***Content-related validity*** requires that research is grounded on a sound understanding of the subject content, that "the researcher must understand and identify with the topic
- ***Methodological validity*** is determined by suitability of research design, participant sampling and data gathering
- ***Communicative validity*** requires that conclusions are presented to the community they relate to in terms it can understand

- The "***transferability***" of the research findings to apply in other situations, either the experience complexity CoD or the PECSL itself
- The "***applicability***" of research outcomes - the original enquirer cannot know to what their findings might be transferred and applied to, but that the appliers can and do

The phenomenographic findings of the investigation contribute to a wider set of conclusions - the pedagogical considerations of the PECSL, informed directly by participant experience data, and are absorbed into a wider real-world interpretation.

Q1 - Measuring effective smart learning with the PECSL

Q1 - How can we measure the effectiveness of smart learning experiences considering both content of learning and process for learning?

- Attempt to ***define learning effectiveness as reflecting principles of transversal skills such as participation, empowerment, self realisation and efficient, engaged learning*** (Dron, 2018; Liu et al., 2017; Spector, 2014).
- How ***learning might be experienced in a range of complexity, with categories of description indicating process for learning and content of learning as an intertwined relationship***.
- Articulated ***surface to deep learning descriptions*** (also after Hounsell, 2005).
- ***Broad equivalences of Bloom's Revised and SOLO*** taxonomy related values.
- Possible mechanisms of measurement for ranges of surface to deep experience complexity and equivalent learning.

Categories of description	TASKS & OBLIGATIONS	DISCUSSING	BEING THERE	KNOWLEDGE & PLACE AS VALUE	BLOOM'S	SOLO
RELATED PEDAGOGY	INQUIRY BASED	DISCUSSING	PLACE BASED	CREATIVE		
LEVEL 4 COMPLEXITY	*DEEP APPROACH shows intentionality for tasks, topic, knowledge and locations to contribute to argument; to understand further potential interpretation (inter/intra);*				5/6	4/5
LEVEL 3 COMPLEXITY	*SURFACE TO DEEP #2 moving towards 'argument' concepts; tasks and journeybegin to be seen as indirectly relevant to wider settings; more reliant on imagination, creativity, inventiveness, inspiration(inter/intra); ideas, application*				4	3/4
LEVEL 2 COMPLEXITY	*SURFACE TO DEEP #1 some engagement with 'viewpoint', building elements of meaning and connection resulting from the journey participation*				3	3
LEVEL 1 COMPLEXITY	*SURFACE APPROACH shows intentionality of doing tasks as fact, 'arrangement' only. The bare minimum required.*				1/2	1/2
Pedagogical relevance summary description	About tasks and assessment. Relevance of activity to coursework or purposes, assessment, further usefulness.	About discussion and collaboration. Considerations concern how to expand participation to include the 'dialogic space', collaborating, discussing, sharing.	About being in the place, support by showing learner how to engage in the place, with specific indicators and clues or prompts.	About value of knowledge in the place, specified by location, time and relevance to other categories. Applying, creating knowledge bound by place with value.		

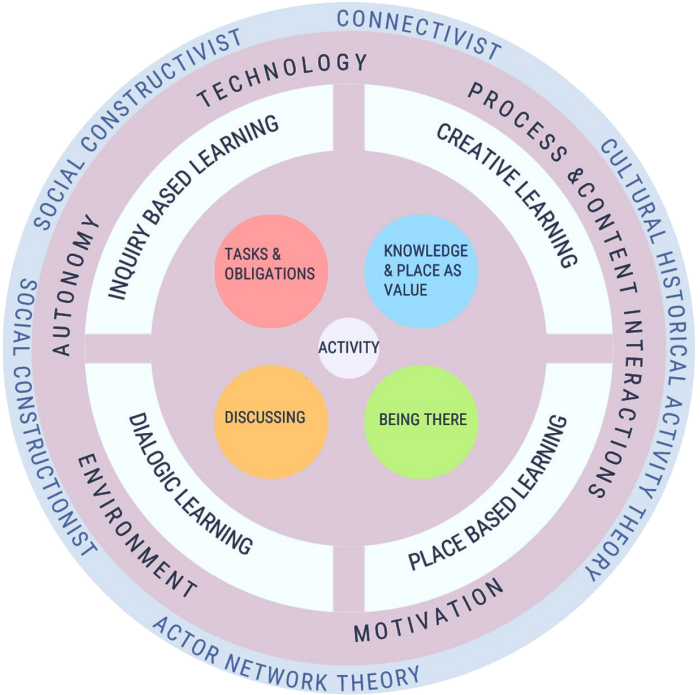
Pedagogical alignment for experience CoD and surface to deep learning experience complexity of a smart learning journey, with Bloom's and SOLO equivalences
[click for larger image]

Thesis chapter 9 - (also refer to 3.4.6, and App 3 & 5)

Q2 - Forming a pedagogical guide for smart learning

Q2 - Can we formulate a practical guide for smart learning activities based on connectivist principles?

- The Pedagogy of Experience Complexity for Smart Learning (PECSL) model of considerations is ***based in experience of smart learning activities using connectivist-inspired approaches***, emphasising factors of participatory, collaborative, autonomous and connected learning.
- Connectivist principles are at the heart of the PECSL, *but may not adequately account for the learning that is going on from an epistemological perspective.*
- The diagram visualisation illustrates the relationships of the considerations, acknowledging intertwined epistemological contexts underpinning the pedagogical model.



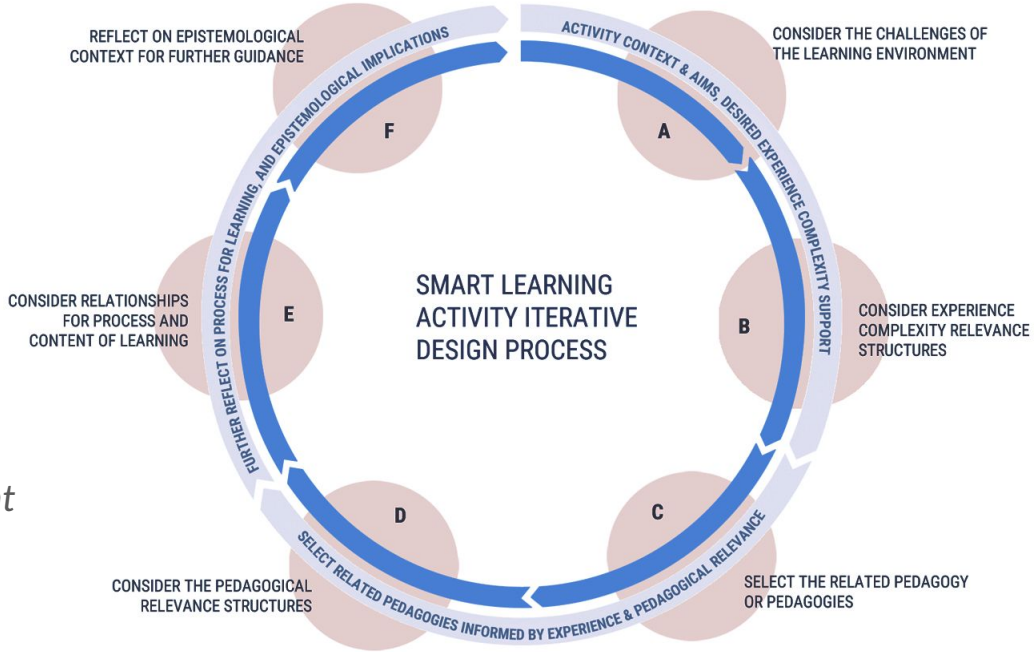
Visualisation of the four-tier model of the Pedagogy of Experience Complexity for Smart Learning: CoD experience relevance; related pedagogy; pedagogical relevance; epistemological context (RQ2 solution)
[click for larger image]

Thesis chapter 9

Q3 - Designing with the PECSL

Q3 - How does this pedagogical guide inform the design of smart learning?

A process of design iteration describing the four tier pedagogical PECSL model ***to inform thinking and planning for smart learning activities*** set in real world locations.



Iterative design process for a smart learning journey, using the four-tier model of the pedagogy of experience complexity for smart learning [click for larger image]

A. *Consider the complexity of the environment*
B. *Plan for experience complexity*
C. *Consider the choice of related pedagogy*
D. *Plan for the pedagogical relevance of motivation*
E. *Plan for process and content integration*
F. *Reflect on epistemology*

Thesis chapter 9

Concluding remarks / Summary

- Responsive, empathetic interviews in a context of phenomenography describe the ***experience complexity of a smart learning journey***.
- Experience relevance structures based on analysis of data leads to related pedagogies, further pedagogical relevance structures and epistemological underpinning.
- This became known as the ***Pedagogy of Experience Complexity for Smart Learning*** (PECSL).

- ***Connectivist principles*** of participatory, collaborative, autonomous and connected learning can be said to form the foundation of the PECSL model.
- The model is intended as an iterative cycle of pedagogical considerations for **design and development of smart learning activities**.
- Adding ***further surface to deep learning descriptors with cognitive domain equivalences*** to PECSL learning design offer potential mechanisms to measure implicit learning.

Selection of HP Reveal AR interfaces, from top left: Ludgate Hill, London; Ye Olde Watling pub, London; St Olave's Church, London; Valletta City Gate Unesco sign; Grand Palace red pillar box; Malta Parliament pillar; Malta Republic day; Leadenhall, London.