Active science curriculum making: Teacher knowledge and expertise

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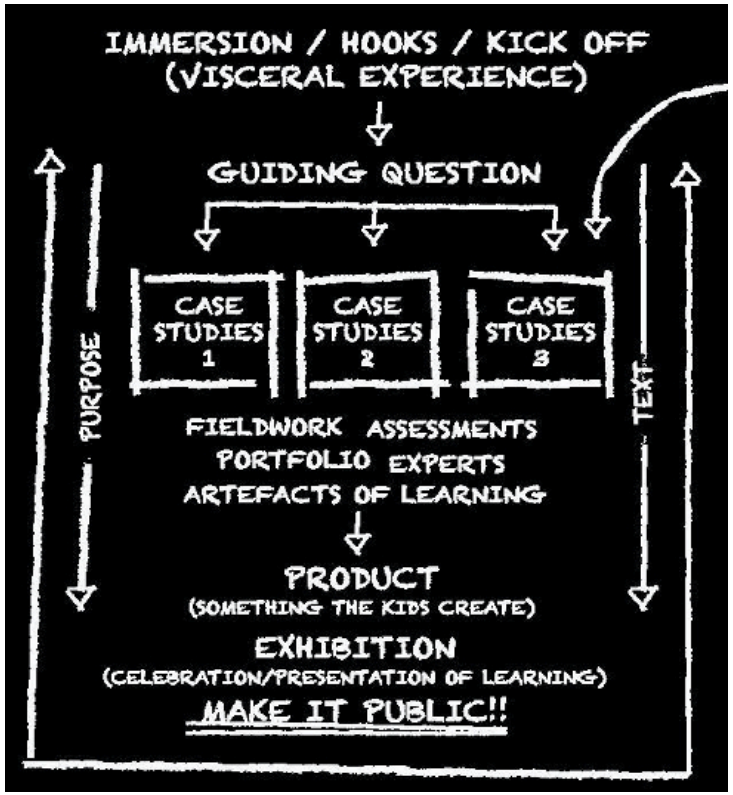
This presentation

- My Background
- The problem space
- Conceptual framework
- Research design

My work at XP School

- The curriculum at XP is based on ‘expeditions’, a problem-based learning, thematic and cross-curricular curriculum developed by EL Education in US
- XP teachers are curriculum makers
- XP teachers start from subject standards, then integrate subjects in a ‘principled’ way, finally they attend to subject boundaries to review
- The knowledge and expertise for this work was tacit and learnt through apprenticeship



Problematising my research

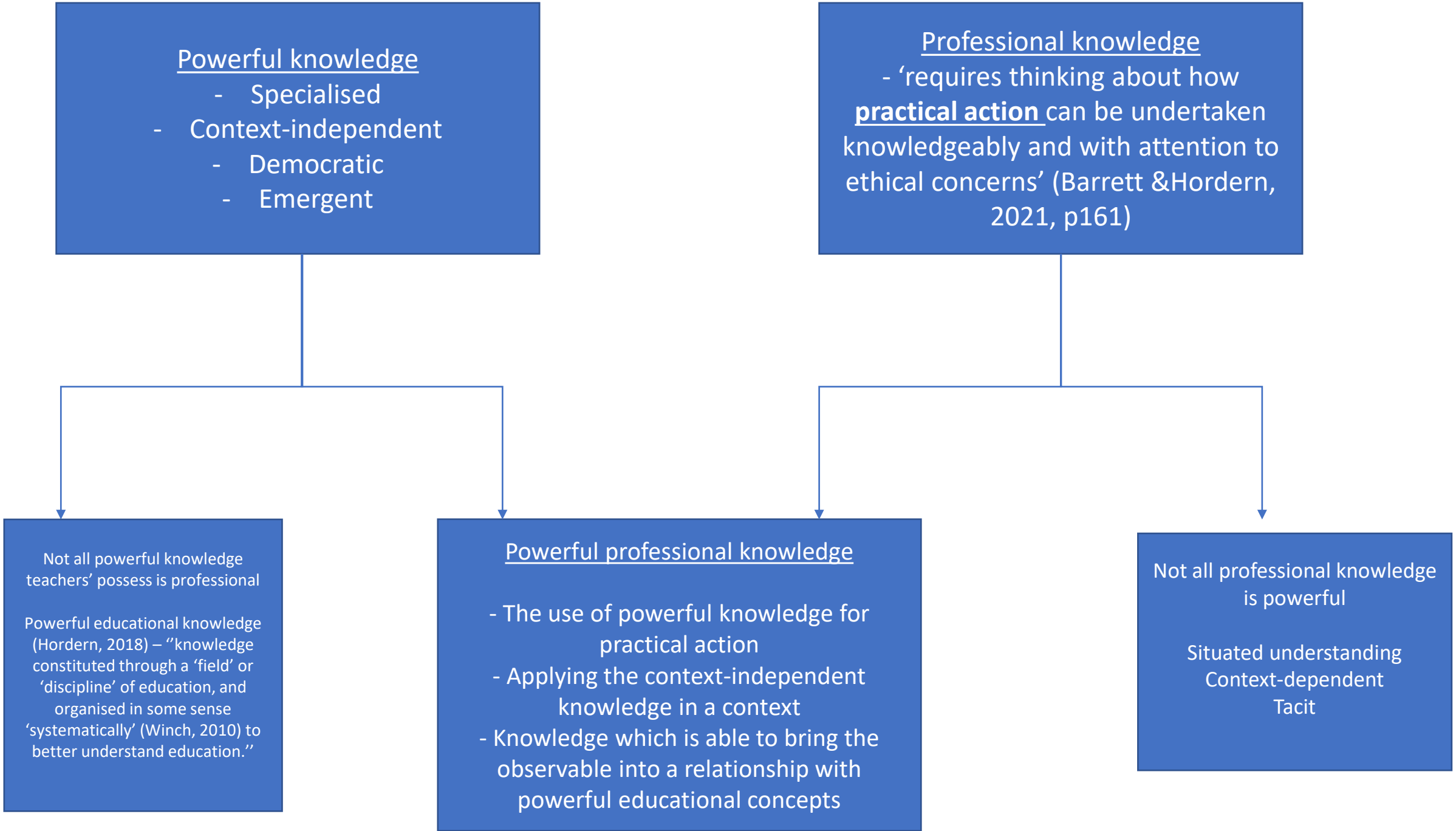
- Some teachers in England are being given more autonomy over the curriculum.
- Curriculum making is difficult, multifaceted and requires specialised knowledge.
- Teacher training and professional learning seems to have a blind spot when it comes to curriculum scholarship required for curriculum making.
- Science teachers appear to have to make a choice between a dichotomy of a knowledge-led curricula or a more active 21st century approaches to curriculum.

Research Aims

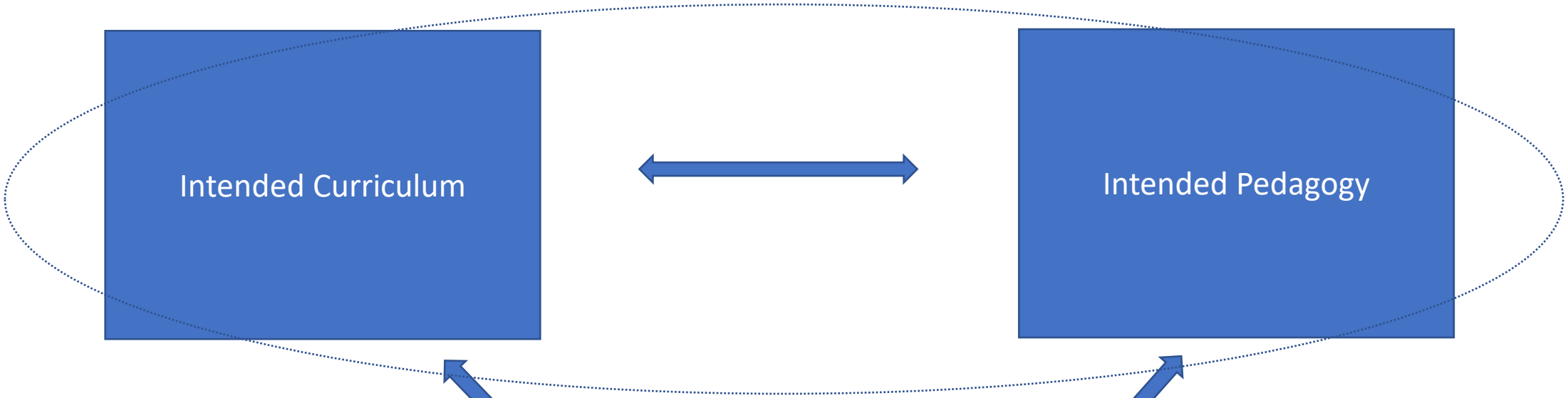
- To examine what is meant by active learning in the science curriculum
- To understand what constitutes teacher knowledge and skills in making the science curriculum active and how teachers acquire it.
- To understand how school and policy conditions relate to teachers' active science curriculum making practices.

Conceptual Frameworks

- Curriculum and curriculum making – Priestley & Philippou (2018)
- ‘Ecological [teacher] agency’– Priestley et al (2015)
- Knowledge and expertise – Winch , Young & Muller (2016), Barrett & Hordern (2021)
- Active learning in science – explored in phase one of methodology


Powerful knowledge
- Specialised
- Context-independent
- Democratic
- Emergent
Professional knowledge
- 'requires thinking about how practical action can be undertaken knowledgeably and with attention to ethical concerns' (Barrett &Hordern, 2021, p161)
Not all powerful knowledge teachers' possess is professional
Powerful educational knowledge (Hordern, 2018) – ''knowledge constituted through a 'field' or 'discipline' of education, and organised in some sense 'systematically' (Winch, 2010) to better understand education.''
Powerful professional knowledge
- The use of powerful knowledge for practical action
- Applying the context-independent knowledge in a context
- Knowledge which is able to bring the observable into a relationship with powerful educational concepts
Not all professional knowledge is powerful
Situated understanding
Context-dependent
Tacit

My object of study



Focus is on curriculum intent and how teachers plan for this…

Not on the actual classroom events

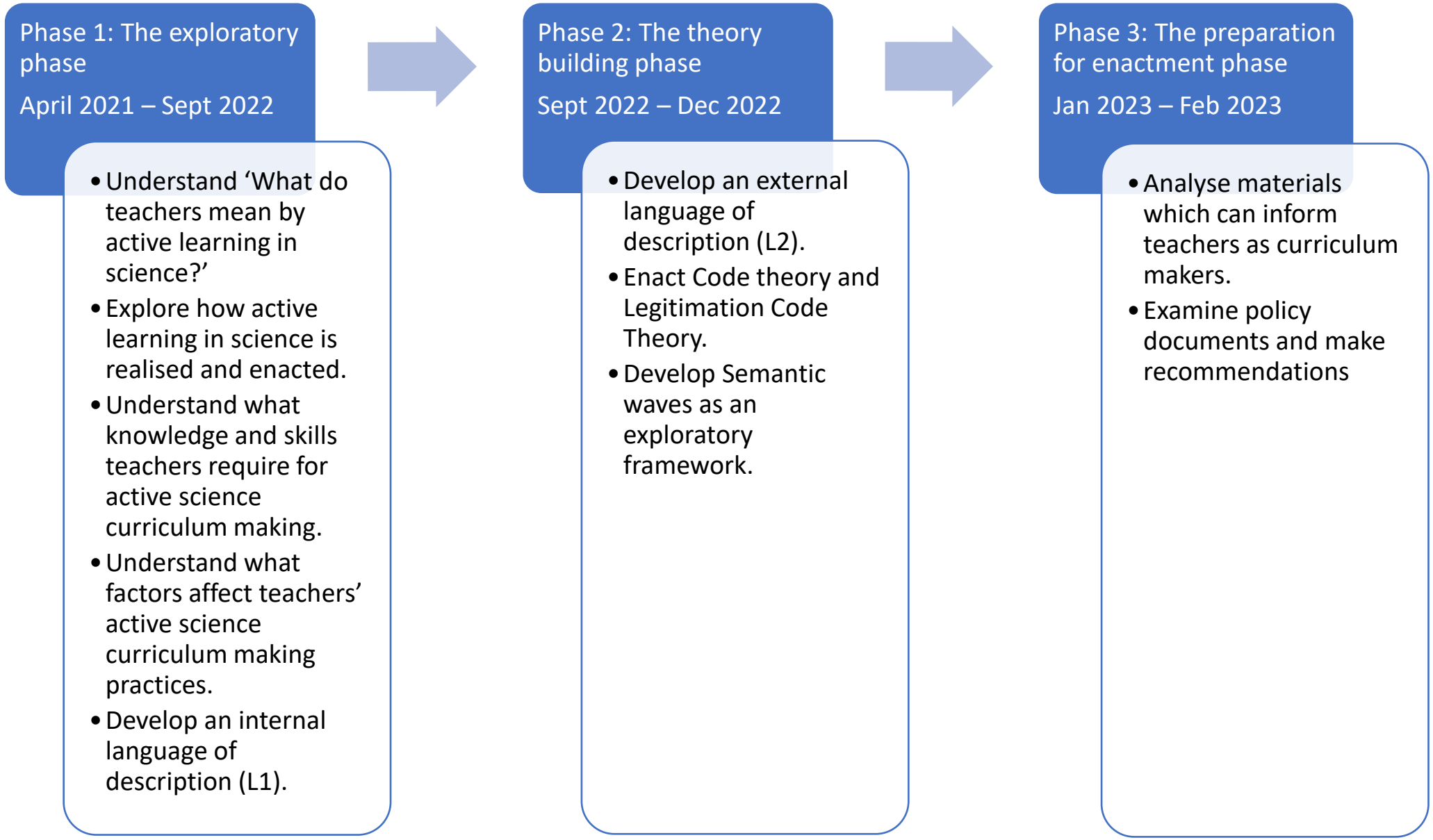
Enacted curriculum

Classroom ‘events’

Teachers’ curriculum making knowledge practices and expertise cannot be ‘seen’ by observing the classroom

Methodology: Social realist approach

- Critical realism is the ‘underlabourer’ to social realism
- Depth ontology
- Move beyond surface description to get at the basis of practice
- Instrumental Case study approach
- Three phases consistent with a SR approach


Phase 1: The exploratory phase
April 2021 – Sept 2022
• Understand 'What do teachers mean by active learning in science?'
• Explore how active learning in science is realised and enacted.
• Understand what knowledge and skills teachers require for active science curriculum making.
• Understand what factors affect teachers' active science curriculum making practices.
• Develop an internal language of description (L1).
Phase 2: The theory building phase
Sept 2022 – Dec 2022
• Develop an external language of description (L2).
• Enact Code theory and Legitimation Code Theory.
• Develop Semantic waves as an exploratory framework.
Phase 3: The preparation for enactment phase
Jan 2023 – Feb 2023
• Analyse materials which can inform teachers as curriculum makers.
• Examine policy documents and make recommendations

Phase 1: Exploratory phase

Intended curriculum

- Curriculum documents at macro level
- School subject statements

What knowledge practices enable teachers to move from Intended curriculum → active learning pedagogy

2. Explore realisation rules:

Analysis of curriculum documents

Semi-structured interviews

Pedagogy

Active learning in science

1. Explore recognition rules:

- Literature
- Survey

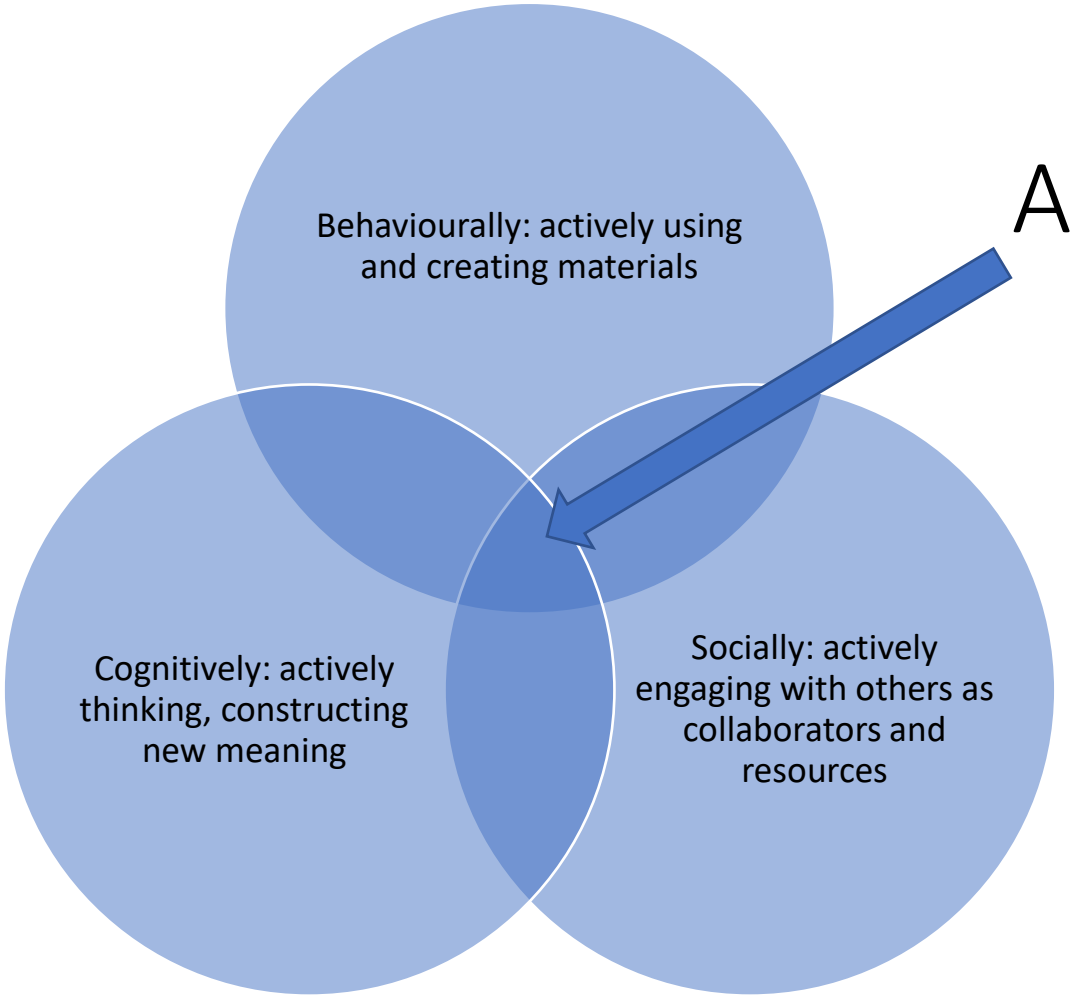
RQ1: What do teachers understand by the term active learning in science?

The model:
Adapted from Watkins et al (2007)

- Active learning has three overlapping dimensions: behavioural, cognitively, and socially

Also used by:

Drew & Mackie (2011)



Active learning

Aligns with a large number of definitions of active learning literature:
Bonwell & Eison (1991)
Kane (2004)
Skinner (2010)
Synder (2003)
Freeman (2014)

Dimensions of active learning in science: Framework from SALiS (Eilks & Kapanadze, 2012)

Dimensions of active science	Indicative survey questions
Activating students' prior knowledge	Active learning requires consideration of students' prior knowledge
Activating students' minds	Active learning re enged Active learning re
Activating hands	Active learning re r than listening
Activating cooperation	Active learning inv r teacher)
Activating communication	Active learning requires students to discuss ideas with others (students or teacher)

Pearson's scale correlation coefficient – correlations between categories

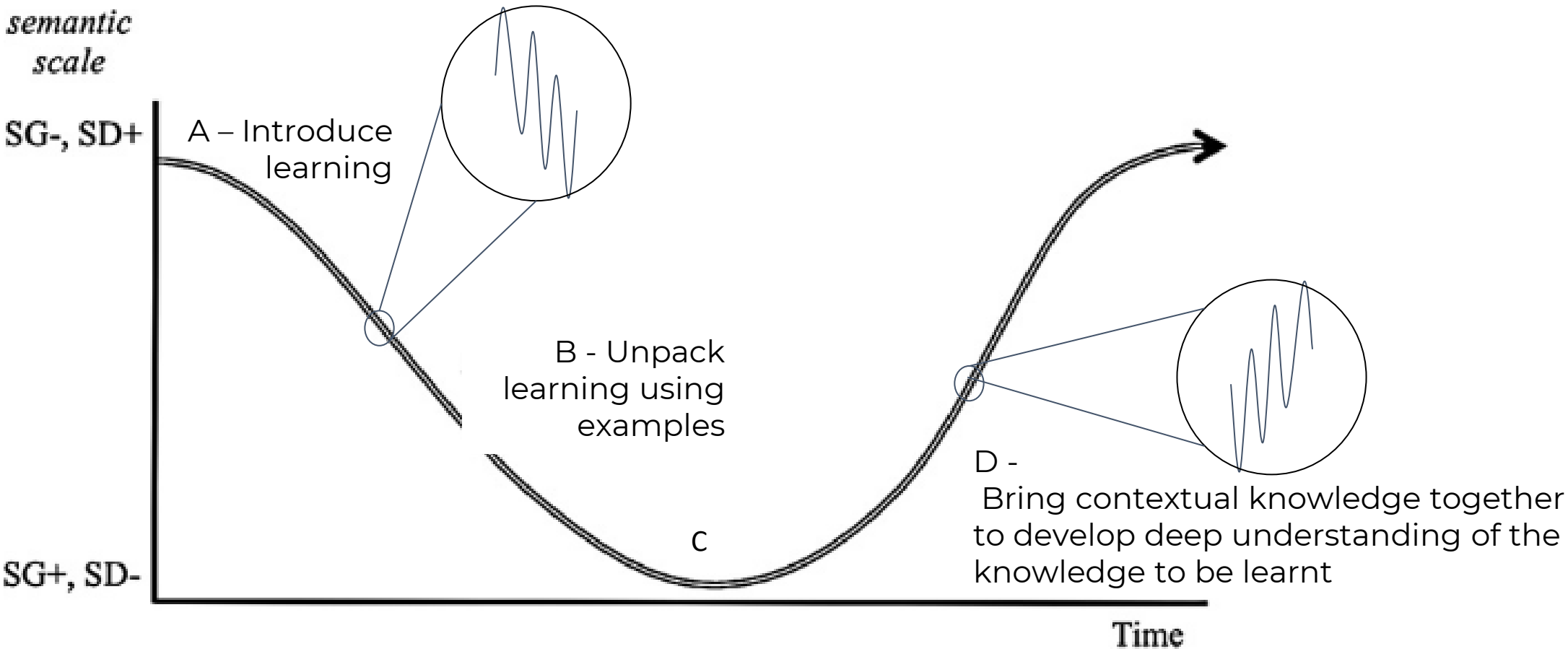
RQ2: How do teachers make the science curriculum active, what teacher knowledge and skill do teachers require to do this, and how do they acquire it?

Documentary analysis	Purpose: • Supports the rich description of context and can indicate conditions which affect teachers' knowledge practices within the case. • Generate interview questions
Semi-structured interview	Purpose: • To explore the knowledge practices teachers' use and require. • Allows teachers to share the language they use in the process of active science curriculum making • Allow teachers to discuss how they acquired their knowledge

Phase 2: Theory Building phase

Level one Thematic analysis	Level two Organisational coding	Level three Analytical coding
Inductive coding	Selection Sequencing Pacing Coherence Relevance	Classification Framing Semantic gravity Semantic density

Possible model: Active learning using semantics



Phase 3: Preparation for enactment phase

- Analyse active science curriculum making materials
- Make recommendations for teachers, schools and policy

Thank you

- Any questions and / or feedback greatly appreciated