Using Technology-Enabled Learning Networks To Achieve Practical Improvement Outcomes In The UK Open University

Thesis

Using technology-enabled learning networks to achieve practical improvement outcomes in the UK Open University

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Abstract

Collaborative learning technology is becoming ubiquitous across the globe for academic learning or professional development. However it also affords dispersed practitioners the ability to grapple together with a problem area requiring improvement. This process requires mutual and reflective learning so that each participant can bring to bear their professional viewpoint, experience and insights to the problem at hand. However, there is insufficient conceptual and practical understanding about how this unfolding process might happen.

This thesis explores how technology-enabled learning networks can be used to achieve practical improvement outcomes amongst disparate and geographically separated practitioners. It is situated within a challenging learning design and delivery scenario in the UK Open University, a Higher Education (HE) distance learning context.

The research investigated what practical improvement outcomes could be achieved; how the mechanisms of using technology-enabled learning networks to achieve improvement outcomes can best be conceptualised in the practice environment; and what factors enable or constrain the achievement of these outcomes. By embracing an insider action research and theory-building combined approach, the research both enacted and conceptualised a collaborative and equitable Pragmatic Inquiry process, and successfully demonstrated measurable impact. The new conceptual framework is entitled ULTIMATE - Using Learning Technology in Making Action-based Transformative Enhancements.

ULTIMATE provides an enacting framework for a structured, flexible and recoverable collaborative action research process which can be used by practitioners and be systematically and rigorously extended to other contexts. A successful ULTIMATE learning network will consist of learning technology infrastructure integrated with this action research process, and with engaged individual participation based on problem-solving role or interest. Together, they provide a means for a profound and ethical shift in the way that

disparate and geographically separated practitioners and stakeholders can share their experiences, mutually transform, and address complex fragmented practical challenges in HE and beyond.

Dedications

This work is dedicated to three special people in my life who are no longer with us.

To my dear Mum: Mum ….. we have just come to visit you and Dad in Salisbury Cathedral. Three sisters together after 18 months of lockdown and restrictions. We lit your candles. You always said I would find my place in life; I think perhaps I might be getting there. How can it be that you and Dad have just helped me to go the final stretch in the marathon for this thesis. Thank you for everything, and all your sheer hard work for all of us.

To my dear Dad: I know this would make you a bit proud Dad if you saw it now. I have finally gotten to the end. Thank you for everything you gave and sacrificed to keep us going in the challenges of life. It was such a great achievement Dad, really. Thank you for typing out all those lovely, beautiful emails when we were in South Africa. They meant more than you knew. I am proud to have been your daughter.

To our dear family friend and fellow path-traveller Johnny: we all miss you so much. I will never forget our connection, our laughing times with everyone round the dinner table, your thank you cards and our lovely profound conversations. Your repeating clock numbers on the phone and iPad always tell us – just when we need it and with uncanny precision - that you are with us, not to worry and that things are going to be just fine.

Acknowledgements

There is such a wide network of people who have been instrumental in supporting me in this research over so many years. I would not be in this position now without the support, collegial way of working and encouragement of every single one of them.

My ever-loving, stalwart, jokey and completely optimistic husband John has kept me going through all our life's crazy challenges and ups and downs. John has an enviable capacity to produce fantastic food, do the washing and never to complain about anything.

I have lost count of the times that our beautiful son Peter has said 'Can I get you anything, Mum?' and always kept his wonderfully kind, considerate and level-headed good nature. Whilst being a full time young OU student himself in these most challenging times, Peter always listened patiently with his Dad to my latest piece of progress or latest frustration.

My dear and very close two elder sisters, Christine and Linda, have always been interested, encouraging and supportive of my progress, and in my numerous challenges.

Many years ago, I planted the seeds of this research in South Africa with my family friend, work colleague and publishing partner, Jill Fresen. We have continued to travel an interesting path together and always been close and supportive friends. Jill's late husband Johnny, a statistics Professor, was always a shining beacon of support and love, and used to say: "Knowledge is always primitive", which was such a help as I was setting out on this road.

Another very special John in my life is John Pettit. I first came into contact with John when picking up the strands of my professional development after a break of many years, in the OU H800 postgraduate certificate course, of which he was the Chair. I was based in Johannesburg at the time and John supported me through my return to postgraduate study, and in the very early days of this research at Masters level. He was such a friendly and enthusiastic cheer leader for my ideas, and articulate supporter when I had a 'wobble' at the journey's outset.

I am immensely grateful to my three supervisors – new lead Carina Bossu, Anne Adams and Julia Sargent for all their protracted moral support and reassurances about the end in sight. We have been down a very long and tricky road, with so many twists and turns, and with Carina and Julia joining part way along and having to pick up the threads. Together we have wrestled with so much, and we will emerge the other side to celebrate together.

My project benefitted immeasurably from the firm and eventually unshakeable foundations put down through so many enjoyable and animated conversations with my original lead supervisor Doug Clow. Doug has now left academia and his 'proud to be your supervisor, Lesley' oft-repeated affirmation, and his faith in me, changed my world at the time.

I would like to record my sincere thanks to OpenTEL at the Open University, and to the OU itself for funding this PhD and providing me with the opportunity for personal transformation and realisation of my research aspirations, keenly held for so many years. Once again it has been a tortuous, untravelled and transformative path and the infrastructure support has always been there during some very challenging times. I look forward to anywhere this might take us, as the uncertain and unpredictable future of the 2020's unfolds.

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My eSTEeM project co-leader was Rob Janes, at the time Chair of 'Module S'. Rob is a chemist and a chemistry teacher by profession. Crucially he's also committed, open and amenable to finding different approaches to help support Open University students and to enhancing their learning experience. He was interested and excited to come along on this path with me so that we could explore this fusion of practice and research approaches. Together we made a convivial and supportive working relationship, which was established for several months before we even met in person. It has been so enjoyable to go along this path with Rob. There have been countless occasions when his reassurance and good natured collaboration underpinned that what we were doing was worthwhile, and generating value and impact.

I would also like to thank Tom Olney, as it was our joint 'light bulb moment' that pulled everything together for Phase 2, as we experimented with sharing learning design analytics with tutors. Tom and I have done a few dissemination presentations together and we had several encouraging and animated discussions which were so enjoyable.

I have always been rewarded by sharing my research and working with the OU Learning Design unit. There are several people there who have helped and supported me personally, and the intersecting path with everyone has been stimulating and reciprocal. The Learning Design Twitter account issued several lovely affirming Tweets along the way which have been so encouraging, and galvanised me to take the next steps. Thank you LD.

I was a member of a very lively and diverse cohort of PhD students within the Institute of Educational Technology at the OU. I felt extremely fortunate to be habituated within the 'Codebreaker' research student office in the fantastic and inspiring Jennie Lee Building, for quite a part of my development. Jake, Jo, Steven, Jess, Helen, Ralph, Tina, Paco, Vicky, Natalie and Josmario, and the 'Chocolate' student office across the way, were all a part of this diverse and embracing community. A special thanks to Tina for her virtual hugs and encouragement, and her wonderful warm parents who congratulated me all the way from Greece! A most special thanks to Vasudha for her affirming support and lovely inspiring words from afar.

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I would also like extend my most grateful thanks to my Third Party Monitor who has been a source of support for the entirety of my MRes and PhD research journey. My TPM always took her role very seriously and helped and supported me with her insightful knowledge, extensive experience and practical guidance on several occasions along the way. She always provided affirmation and encouragement about my research which has proven indispensable.

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With respect and high esteem for the seminal thought leaders

in their fields on whose work this thesis is based.

Declaration of authorship

I declare that this thesis has been composed solely by myself and that it has not been submitted, either in whole or in part, in any previous application for a degree. The intrinsic nature of this work is collaborative action research, conducted *with* and not *for* or *on* the participants. The overall action research process was facilitated and conceptualised entirely by myself. All work undertaken by participating practitioners has been described and acknowledged.

Relevant publications are as follows:

Boyd, L. (2019) 'Using technology-enabled learning networks to drive module improvements in the UK open university', *Journal of Interactive Media in Education*, 1(16), pp. 1–7. doi: 10.5334/jime.529.

Boyd, L. (2017) *Using technology-enabled learning networks to achieve practical improvement outcomes : a pilot project to explore impact of student-made videos on student engagement in the IET MAODE programme at the OU*. Open University. doi: https://doi.org/10.21954/ou.ro.0000ef43.

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Glossary

Term	Description of term and reference
Abductive reasoning	a vital element or creative leap in the production of new knowledge and in the creation and development of innovative organisational interventions (Shani, Coghlan and Alexander, 2020)
Action research	a family of related approaches that integrate theory and action with a goal of addressing important organisational, community and social issues together with those who experience them, and to generate *actionable knowledge* (Coghlan, 2019)
Actionable knowledge	knowledge that is usable by practitioners and theoretically robust for scholars (Coghlan, 2019). 'Collaborative and generative possibility knowledge intertwined with transformative action' Sannino & Engeström (2017, p.80)
Basic social process	a process apparent in the categories and sub-categories constructed in a grounded theory, and the relationships between these (Birks and Mills, 2015)
Close-to-Practice (CtP) research	research that focusses on issues defined by practitioners as relevant to their practice, and involves collaboration between people whose main expertise is research, practice, or both (BERA, 2017)
Content	One of three forms of reflection used in *insider action research* (Coghlan and Brannick, 2014; Coghlan, 2019) originally identified by Mezirow (1991), who was responsible for transformative learning theory in the field of adult learning. These three forms are *content*, *process* and *premise.* In this research *content* does not refer to the understanding of educational subject content, but the practical aspect of the project or challenging situation, the issues surrounding it, and the practical actions being considered or implemented.

Content reflection	reflecting on what is done or discussed (Coghlan, 2019)
Category	a concept at a higher level of abstraction that represents a group of codes (Birks and Mills, 2015)
Coding	the act of attaching concepts to data. These concepts are called codes (Urquhart, 2013)
Collaborative	action research is collaborative in that it emphasises research *with* people rather than *on* or *for* them. This differentiates action research from 'traditional' research approaches (Bradbury, 2015; Coghlan, 2019)
Community of Inquiry (CoI)	the community that forms when undertaking a Pragmatist Inquiry, after Dewey. Inquiry starts when a particular situation is recognised to be problematic; when there is a feeling of doubt or that something is wrong, in a normal or habitual situation (Elkjaer and Simpson, 2011; Morgan, 2014; Lorino, 2018). Two types of Community of Inquiry may then arise: community of practice, and community of process (Lorino, 2018)
Community of practice (CoP)	CoPs are 'formed by people who engage in a process of collective learning in a shared domain of human endeavour', in which there is a 'shared competence that distinguishes members from other people' (Wenger-Trayner and Wenger-Trayner, 2015)
Community of process	a community of process is required when 'cross-professional groups of inquirers, whose different views and interests combine to bring a response to the disrupted situation' (Lorino, 2018, p.177). Communities of process are characterised by differing practices (Lorino, 2018, p.179)

Concept	an idea or notion that encapsulates a descriptive explanation of a phenomenon or characteristic of a phenomenon (Birks and Mills, 2015)
Conceptual framework	a way of representing concepts and the theoretical relationships between them within an integrated framework for a particular scope
Constant comparison	the act of comparing one piece of data you have attached a concept to with another piece of data you have attached the same concept to, in order to see if it represents the same concept (Urquhart, 2013)
Constructivism	a research process that recognises that reality is constructed by those who experience it and thus research is a process of reconstructing that reality (Birks and Mills, 2015)
Cognitive learning mechanism	provides the conceptual, linguistic or cognitive apparatus for individuals to learn in an organisational context. Cognitive OLMs relate to the cognitive processes happening at individual or *first-person* action research level (Coghlan, 2019)
Core category	a concept that encapsulates a phenomenon apparent in the categories and sub-categories constructed and the relationships between these (Birks and Mills, 2015)
Diagram	a visual representation that can assist in the process of data analysis (Birks and Mills, 2015)
Dimensions	variations of a property (Birks and Mills, 2015)
Doubt	a driving force of a Pragmatist Inquiry (Lorino, 2018)
Epistemology	a branch of philosophy concerned with the theory of knowledge, and how knowledge is constructed (Birks and Mills, 2015)

Epistemic fluency	combining diverse forms of knowledge and ways of knowing (Markauskaite and Goodyear, 2017)
Evaluation	the process of judging the quality and value of the products and processes of research using criteria designed for that purpose (Birks and Mills, 2015)
Evidence	research outcomes that lend support to the existence of a concept, phenomenon, or theory (Birks and Mills, 2015)
First-person practice	Attending to one's own thinking, valuing, way of learning and behaving (Coghlan, 2019)
Formal grounded theory	theory developed to a higher level of conceptual abstraction thereby encompassing concepts spanning a number of substantive areas (Birks and Mills, 2015)
Gerund	verb used as a noun that finishes with 'ing' (Birks and Mills, 2015)
Grounded theory	a 'qualitative research method that seeks to develop theory that is grounded in data systematically gathered and analysed' (Urquhart, Lehmann, & Myers, 2010, p.357)
Impact	the extent to which research findings have measurable utility in application (Birks and Mills, 2015)
Indeterminate situation	a situation characterised by a feeling, or emotion, of unease or doubt that something is wrong; 'a disordered and unintelligible aggregate of unrelated elements' (Lorino, 2018, p.103)
Inquiry	'a process that transforms an *indeterminate situation* into one that is sufficiently unified that a coherent course of action can be anticipated'. A Pragmatist Inquiry 'brings into being a new practice that did not exist before' (Lorino, 2018)

Insider action research	conducting action research in the organisation or community in which the researcher is employed or is a member (Coghlan, 2019)
Integrative diagram	a way of representing categories and relationships visually (and cumulatively) as a means of thinking about relationships (Urquhart, 2013)
Interpretivism	interpretivist research: studies based on a researcher's interpretation of non-quantifiable data (Birks and Mills, 2015)
Intervention	doing or saying something that alters the status quo (Coghlan, 2019)
Learning network	working definition for this research: 'a task or process driven technology-mediated intervention, connecting together individuals of disparate backgrounds to learn how to address a specified outcome or goal; the learning may be formal, informal, social, organisational or creative' (Boyd, 2019)
Meta-learning	learning about learning (Coghlan, 2019)
Methodological congruence	accordance between the researcher's personal philosophical position, the stated aims of the research and the methodological approach employed to achieve these aims (Birks and Mills, 2015)
Methodology	a set of principles and ideas that inform the design of a research study (Birks and Mills, 2015)
Methods	practical procedures, strategies and processes used to generate and analyse data (Birks and Mills, 2015)
Object	motivation for activity; sense of purpose or what is being aimed for. 'Object refers to the 'raw material' or 'problem space' at which the activity is directed' (Engeström and Sannino, 2010, p.6)

Ontology	the study of being, concerned with concepts of existence and reality (Birks and Mills, 2015)
Organisational capabilities	organisational capabilities enable an organisation or working group to learn and problem-solve (Coghlan and Shani, 2008)
Organisational learning	a 'process of individual and shared thought and action' (Rashman, Withers and Hartley, 2009, p.470)
Organisational learning mechanism (OLM)	planned organisational structures and processes that encourage dynamic learning, particularly to enhance or create new organisational capabilities (Coghlan, 2019)
Participatory action research	action research that addresses issues of power and powerlessness (Coghlan, 2019) – this is the most commonly understood definition of this term
Performative	having the effect of performing an action (Cambridge University Press, no date a)
Philosophical position	the personal beliefs about reality that guide thinking about how legitimate knowledge can be acquired (Birks and Mills, 2015)
Philosophy	a view of the world that informs and is informed by conceptualisations of existence and reality (Birks and Mills, 2015)
Positivism	philosophy of science that is based on being a detached researcher (Coghlan, 2019)
Practitioner	an individual whose main focus is to operate in a practice environment, in contrast with a specialised researcher
Pragmatism	a tradition of Inquiry founded in America in the late nineteenth century, born as a radical critique of the Cartesian theses of dualism, representationalism and abstraction from experience. Representationalism can be said to be 'freezing the temporality of experience' (Lorino, 2018, p.256)

Premise reflection	critiquing taken-for-granted assumptions and perspectives (Coghlan, 2019)
Preunderstanding	the knowledge that a researcher brings to a research project (Coghlan, 2019)
Procedure	an established or accepted way of doing something (Merriam-Webster, 2021a)
Procedural learning mechanism	the rules, routines, methods and tools that can be institutionalised in the organisation to promote and support learning (Coghlan, 2019)
Process	a series of actions that produce something or that lead to a particular result (Merriam-Webster, 2021b)
Process reflection	reflecting on how things are done (Coghlan, 2019)
Properties	characteristics of a category (Birks and Mills, 2015)
Qualitative data analysis	analytical processes that seek to describe and explore, rather than to explain, data (Birks and Mills, 2015)
Quality (in research)	refers to research outcomes of value through the application of rigour throughout all stages of a study (Birks and Mills, 2015)
Quality assurance (in Higher Education)	the processes for the monitoring and evaluation of learning and teaching to safeguard the academic standards of the University's awards and to ensure the ongoing quality of the student learning experience' (Open University, 2021c)
Quality enhancement (in Higher Education)	understood as the internal activity of 'using evidence to plan, implement and evaluate deliberate steps intended to improve the student learning experience' (Open University, 2021c)
Reflexivity	being attentive to and inquiring into the process as it unfolds (Coghlan, 2019)

Rigour	control of the processes employed in a research study in order to accommodate or explain all factors that can impact on, and thereby potentially erode, the value of research outcomes (Birks and Mills, 2015)
Roles	patterns of behaviour which individuals expect of others performing specific functions or tasks (Coghlan, 2019)
Second-person practice	face-to-face working with individuals and/or teams or groups (Coghlan, 2019). In a learning network context, 'face-to-face' is replaced by a group of individuals who may be geographically separated and disparate, but working together in a particular *indeterminate situation* connected together by learning technology infrastructure
Secondary data	data previously collected by another researcher for another research study (Birks and Mills, 2015)
Storyline	a strategy for facilitating integration, construction, formulation and presentation of research findings through the production of a coherent grounded theory (Birks and Mills, 2015)
Substantive grounded theory	theory that aims to address a studied phenomenon in a specific situation and makes no claims to generalise (Urquhart, 2013; Birks and Mills, 2015)
Structural learning mechanism	Organisational, physical, technical and work system infrastructures that encourage practice-based learning (Coghlan, 2019)
Systems thinking	Seeing the whole rather than parts and understanding how elements are interrelated and interdependent (Coghlan, 2019)
Theoretical coding	the use of advanced abstractions to provide a framework for enhancing the explanatory power of a grounded theory (Birks and Mills, 2015)

Theoretical integration	Two separate definitions exist: the task of relating the emergent theory to other theories in the same or similar field (Urquhart, 2013) the pulling together of the abstract theoretical scheme into a final grounded theory (Birks and Mills, 2015)
Theoretical sampling	deciding on analytic grounds where to sample from next (Urquhart, 2013)
Theoretical saturation	occurs when no new codes are identified pertaining to a particular category. Categories are clearly articulated with sharply defined and dimensionalised properties (Birks and Mills, 2015)
Theoretical sensitivity	the ability to recognise and extract from the data elements that have relevance for the emerging theory (Birks and Mills, 2015)
Theory	theory asserts a plausible relationship between concepts and sets of concepts (Urquhart, 2013, p.5)
Theory mechanism	building blocks of middle range theory, equivalent to grounded theory theoretical coding (Urquhart, 2019)
Third-person practice	extending *first-person* and *second-person* learning to an impersonal audience, those who were not directly involved in the project. This includes dissemination through reporting, publishing and being examined (Coghlan, 2019)
Transformative	causing or able to cause an important and lasting change in someone or something (Merriam-Webster, 2021c)
Utility	the usefulness and applicability of research findings (Birks and Mills, 2015)

Validation	an assessment of whether the knowledge contribution filled the specified research gap in knowledge, and the practice contribution represented an amelioration of the practical problem, that is whether the research fulfilled its requirements in use (Isaksson et al., 2020).
Verification	an assessment to confirm whether specified requirements have been fulfilled (Isaksson et al., 2020)

Prologue

Stranded – Van Morrison

I was grateful and heartened by the lyrics of this song, which seemed to me to encapsulate the challenges of interdisciplinary, theory building and action based research work.

Chapter 1: Introduction

1.1 Introduction

> **"Courage is not the absence of fear, but rather the assessment that something else is more important than fear."** ***Franklin D. Roosevelt***

This PhD has been carried out at the hitherto unexplored and uncharted intersection between several different methodological and interdisciplinary traditions. It arose from my personal professional experiences and developing practice over many years, both in permanent employment and as an independent consultant. Academically, it started from a disciplinary 'home' of networked learning, or technology-enhanced learning, within the Institute of Educational Technology (IET) at the UK Open University.

By taking a collaborative, equitable and rigorous action-oriented and theory-building approach, the research has both facilitated and conceptualised a process to generate new practical insights with participants, to implement solutions to challenging situations that they identified, and achieve a series of measurable impacts inside the Open University. It has synthesised a new conceptual framework, which makes the first steps in conceptualising a different type of networked organisational learning. This learning is associated with collaborative problem-solving and improvement amongst the disparate and geographically separated practitioners involved in distance learning design and delivery, in the context of the UK Open University. The conceptual framework can be used to flexibly apply, adapt or extend the approach to other contexts, using established theory building, verification and validation techniques. Further research contexts could include any distributed organisation model, or any fragmented situation where disparate or dispersed practitioners need to make sense of, and achieve improvements in, problematic or challenging situations which are spread across organisational, inter-organisational or geographical contexts and boundaries.

In this Introduction Chapter, the overall and aims themes of the research will be introduced. This will lead into an introduction to the research gap. The practical context of the UK Open University will be set out, followed by the practical problematic scenario in the university that the research aimed to address. The Research Questions will be introduced, followed by my personal and professional experience driving the research. Finally the structure and layout of the thesis will be described.

1.2 Overall aims and research themes

The overall aim of the research was to investigate the achievement of *practical improvement outcomes* arising from technology-enabled learning networks. The context was the UK Open University, an example of a not-for-profit or public service institution. The definition of 'public service' from the Cambridge Dictionary is: 'something that is done or provided for the public because it is needed, and not in order to make a profit' (Cambridge University Press, no date b). This can embrace examples such as health, state education and policing. Public service organisations possess distinctive characteristics for the study of organisational learning to achieve practical improvement outcomes. Rashman, Withers and Hartley (2009) undertook a systematic literature review of organizational learning and knowledge in public service organizations, and identified a gap in the review. Whilst confirming that 'learning within and between organisations has been identified as central to the processes of public service improvement' (Rashman, Withers and Hartley, 2009, p.465), they concluded that organisational learning in general is under-researched in relation to the (UK) public sector context, and that 'foundational and classic works in the field rarely consider the public organisational domain' (Rashman, Withers and Hartley, 2009, p.487). They identified a fragmented debate 'centred on theoretical conceptualisations and operational features, with less emphasis on managerial implications and the means to recognise, enact and measure organisational learning' (Rashman, Withers and Hartley, 2009, p.470). Additional research is therefore required on organisational learning in general in public service, *how* it actually

happens, and how it can be recognised, enacted and measured in order to achieve practical improvements.

In this research, 'practical improvement outcomes' are defined as shown in Box A:

practical: based in real life experience or activity, as opposed to in thought, theory or imagination

improvement: organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders

outcome: the way the collaborative activity by participants in the learning network turns out; the result

Box A. Definition of practical improvement outcomes

The primary aim was to produce a theory, or new conceptual framework, on the unfolding process of collaborative organisational learning required to achieve practical improvement outcomes. The secondary aim was to *seek* the achievement of those outcomes using *learning networks*, to provide a context for theory generation. An innovative technology-enabled collaborative action research approach was used, incorporating Grounded Theory Method.

1.3 Research gap

In the turbulent world of today, many profound challenges are facing humanity. Even before the dramatic and discontinuous global disruption brought about by the Covid-19 pandemic, awareness has been building of the need for a collective response to global challenges such as climate change, plastics in the ocean, access to education and universal healthcare for preventable diseases. Bradbury *et al.* (2019) made a call for a transformative approach to global challenges and to counter the unsustainability currently in evidence concerning such challenges. In a critical analysis of the predominant processes in today's knowledge creation, Bradbury *et al.*, (2019, p.6) assert that these have been driven by elite 'expert understanding', and that the time is now right to revisit our conventional research practices and embrace more collaborative and transformative approaches:

> *Conventional science excels in producing factual knowledge of, and insights into, the world. But it is not designed to lead to collaborative action of the kinds now urgently needed. Because collaborative action tends to be an afterthought of conventional knowledge creation, radical shifts are needed to encourage production of more inclusive knowledge forms capable also of supporting desired action and change.*

These authors, influential in the field of action research, go on to propose that action-oriented research can contribute towards transformative approaches in which those affected are empowered to contribute towards generating solutions:

> *Action-oriented research can, indeed should, help us effectively address our unsustainability crisis, bringing intelligent collaboration directly into knowledge creation processes. It does this not by starting with expert understanding of our problems, but by helping those with stake in an issue to see their own problems more clearly and to take intelligent action with others in response to their shared learning.*
>
> Bradbury *et al.* (2019, p.6)

In tandem with the current accumulation of global challenges and unsustainability issues, the world has witnessed a revolution in the availability of information and communications technology which has profoundly impacted many aspects of daily life for those who have access to it. In the workplace, education and society, there has never been more technological interconnectivity between individuals, groups and organisations. Networked learning technology, increasingly ubiquitous for academic learning or professional development, also affords Higher Education practitioners the ability to grapple together with a problem area requiring improvement. However, 'there is a need for theory-based frameworks to enhance technology-enhanced learning at work' (Tynjälä, Häkkinen and Hämäläinen, 2014, p.991).

The identified gap of *how* – or whether – organisational learning using the affordances of networked learning technology can be recognised, enacted and measured is still in its infancy.

Conceptual frameworks in the field of learning networks and networked learning are still developing, and there is insufficient conceptual and practical understanding about the mechanisms by which technology-enabled organisational learning might happen.

1.4 Research context and practical problem

The practical context for this research work is the UK Open University (OU). The OU was founded by a Royal Charter in 1969. It is one of the largest universities in Europe with approximately 175,000 students (Open University, 2021a). However the events of the Covid-19 pandemic have resulted in a recent increase in student numbers. It is a dedicated distance learning institution with a mission to be 'open to people, places, methods and ideas'. This means that it promotes 'educational opportunity and social justice by providing high-quality university education to all who wish to realise their ambitions and fulfil their potential' (Open University, 2021b). It therefore has an open admissions policy, is committed to providing equal opportunities, widening access to education and embracing students with disabilities. The OU believes that 'the qualifications our students have when they leave are the only ones that matter' (Open University, 2021b). As such it plays a unique role in society, and has well developed support mechanisms available to support students practically, financially and emotionally as appropriate. The key strategic priority for the OU is student success. This includes 'supporting our students to successfully progress through and complete their chosen module(s) or qualification', and 'investing in technology that enables success' (Open University, 2021e). A graphic illustration of the four current OU strategic objectives to support student success is shown in Figure 1. The OU has a global presence and in addition to serving international students, works in partnership with international bodies such as governments, NGOs and funding institutions in global development areas such as frontline health, teacher education and English language teaching (Open University, 2021b). It also has

an internationally recognised research programme including over 900 research students and a long standing TV broadcasting partnership with the BBC (Open University, 2021d).

A general principle underpinning quality management systems at the OU is that 'continuous improvement of the student learning experience should be at the core of all the University's quality assurance and enhancement activities' (Open University, 2021c).

Definitions of quality are adopted from the UK Quality Assurance Agency. *Quality assurance* is understood as 'the processes for the monitoring and evaluation of learning and teaching to safeguard the academic standards of the University's awards and to ensure the ongoing quality of the student learning experience' (Open University, 2021c). This refers to both internal and external activities to assure and be accountable for quality. *Quality enhancement* is understood as the internal activity of 'using evidence to plan, implement and evaluate deliberate steps intended to improve the student learning experience' (Open University, 2021c). Thus quality enhancement and continuous improvement of the distance learning experience to support student success is at the core of OU principles and strategic objectives.

Figure 1. The four strategic objectives underpinning student success at the OU

Source: (Open University, 2021e)

The OU has a presence across all four nations of the UK (England, Scotland, Wales and Northern Ireland). The headquarters and campus is based at Walton Hall, in Milton Keynes. The dedicated distance learning model is that of 'supported open learning', in which course modules are developed by 'multi-disciplinary course teams comprising of:

- *Academics, educational technologists and media specialists contributing pedagogic and technical expertise*
- *Respected academics from other universities working alongside OU colleagues*
- *External examiners.*

(Open University, 2021f)

As a pioneer and world leader in distance education. this model has helped to establish and build the OU's reputation for innovation, rigour and quality. Once course modules are developed and quality assured, they are released into "presentation" – meaning live delivery to students – for a number of years. Modules are delivered via a Study Planner on a dedicated module website, which organises the module learning materials and assessments into weekly tasks. Each student is assigned a tutor for each module that they are studying. Tutors are sometimes full time members of staff, but most frequently are "Associate Lecturers" (or "AL*s*"). Tutors run online tutorials, mark assignments, provided detailed written feedback, and offer support to students by telephone and email. They are experts in the taught subject, who often combine their work as OU tutors with other academic or industry positions. This means that they are most frequently based at home, and not on the central campus. There is a network of more than 5,000 tutors – the largest in the UK (Open University, 2021f).

This arrangement means that there is a perennial organisational need to close a feedback loop between multiple remote module tutors, students and campus based teams, and to develop and maintain a joint understanding of teaching and learning design challenges.

1.5 Research questions

The research questions addressed by this thesis are therefore as follows:

1. *What practical improvement outcomes can be achieved from the collaborative technology-enabled learning networks under investigation?*
2. *How can the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment?*
3. *What factors enable or constrain the achievement of practical improvement outcomes using collaborative technology-enabled learning networks?*

The research questions were formulated by addressing the research gap and overall aims, within the research context of the UK Open University, and the practical perennial problem of needing to close a feedback loop between multiple remote module tutors, students and campus based teams. Can increasingly ubiquitous collaborative learning technology be used as *learning networks* to develop a joint and inclusive understanding of teaching and learning design challenges, and help put remote tutors as close as possible to the development of solutions? If so, how? What enables or constrains this?

1.6 Personal and professional experience driving the research

The overall research aim was to investigate and actively seek the achievement of practical improvement outcomes arising from technology-enabled learning networks, and to produce a conceptual framework on the collaborative organisational learning required to do this. My point of departure was the organisational learning involved in my previous active management consultancy experience. This was focussed on helping organisations in different sectors to implement strategic process-based quality management systems, sometimes to international standards. My earlier consultancy work involved working for companies who required certification to international quality systems standards for accountability or marketing purposes, and in order to tender for UK government business. Later, I began to facilitate quality management systems for groups concentrating on *improvement* and not just *accountability* motivations. The work for both types of motivations involved taking a *process approach* which means that practitioners become aware of the organisational processes they contribute to, and that these are documented in some fashion so that they can become shared, agreed on and improved – all for the benefit of those for whom the process serves.

Many disparate practitioners might be involved in a process (for example, to build an e-learning module at a university, or to follow a complex purchasing process for outsourcing an IT solution at a major airline). Practitioners have to work together across the contexts and boundaries of the organisation, to strive to achieve the process aim. During the course of my consultancy work it became apparent if they were going to improve it, practitioners had to *learn* about the entirety of the process, and the part played in it by themselves and others. Only then could they collaboratively embrace and understand together about possible issues and solutions. This was a learning activity just like any other informal learning activity but it was vital to be recognised as such. Participants also reported much individual interest and reward in gaining more insight about the activities of their colleagues elsewhere in the organisation, when working on a particular process.

Initially I facilitated several quality management systems in which practitioners learned about the contributions of others via face-to-face workshops that I designed, or from written "quality manual" documentation produced as part of the project. At the University of Pretoria (UP) in South Africa, I consulted on and facilitated an *online* quality management system (QMS) for the e-learning unit. At the time there was a mandated strategy to embrace e-learning (as it was then known) within a blended learning model throughout this well-resourced South African institution. However academics were unaware of the process required to produce good quality e-learning materials, or the time that was required to do so. The e-learning unit was swamped with urgent requests with little awareness of the process or how the academic units needed to interact with it. Also the production of any e-learning or technology-enhanced learning is characterised by a complex "web" of interrelationships between role players, each of whom have their own professional practice area, professional language and experience, and who need to co-operate together (Fresen and Boyd, 2005).

Therefore the unit commissioned myself, and a member of their staff as internal project manager, to implement a quality management system. We decided that this system should be online, so that the university could use their own learning technology to produce, store and share up to date versions of the documented procedures and operating guidelines.

Improvement outcomes from the system were that e-learning practitioners, academic units and other interested stakeholders could easily share and learn about the e-learning production process, and understand the associated institutional guidelines and practices. They could do this from their own geographic location and in their own time. The process was collaboratively reviewed and streamlined. Also qualified new members of staff in the e-learning unit could become independent and self-sufficient much faster, cutting induction time and understanding more efficiently how things were done at UP. All of this contributed to a series of practical improvement outcomes and impacts that were achieved.

The PhD research aims are thus borne from a personal aim to :

- underpin my management consultancy experience with academic rigour
- make a unique contribution to practice and research
- harness the power of technology for collaborative learning amongst practitioners about how to make improvements which they recognise are changes for the better, and which bring positive impacts to their working lives or those they serve.

1.7 Structure of the thesis

The thesis will now proceed with the following structure. A Glossary is provided at the beginning of the thesis to provide definitions of terms as they are understood in this research, and the source of this understanding. Key terms in the glossary are shown in text, in *italics*.

Chapter 2: Interdisciplinary multi-faceted research approach will set the scene and introduce the interdisciplinary context and the disciplinary and methodological domains that were ultimately embraced in this research. These were networked learning, organisational learning, process and practice theory, grounded theory and collaborative action research. The knowledge and practice contributions of this thesis are located at the intersection of these domains.

Chapter 3: Literature review will provide a literature review. The concept of technology-enabled learning networks will be introduced and after considering existing definitions in the literature, a working definition for this research will be provided. Illustrative examples of learning networks will be discussed, and the notion of organisational learning as a form of shared thought and action introduced. Three conceptual frameworks in the literature will be described and systematically compared, in order to justify the exploration of a new conceptual framework. Finally the research questions will be derived.

Chapter 4: Research methodology will present the methodology and research design. The researcher's underlying Pragmatic philosophical viewpoint will be explored, which became deeper and richer as the research progressed. The chosen methodology of insider action research will be presented, underpinned by Grounded Theory Method (GTM) in order to search for a new conceptual framework. The research context, being a particular project in the researcher's own institution will be described, along with an account of the research design, emerging ethical considerations, and implementation of the two phases of the project. The chapter will conclude with a summary of the methodological implications, ethical considerations addressed throughout the project, and its emerging, evolving nature.

Chapter 5: Findings Phase 1 and Chapter 6: Findings Phase 2 will present the findings of the project. The findings will be structured to mirror the research design, embracing both the practical action research tasks and the conceptual analysis of the unfolding process, in each of the two project phases. The ULTIMATE conceptual framework will be presented, the practical impact of the project, and the evaluation of the project by participants.

Chapter 7: Discussion will present a discussion of the findings, and present the research claims for each of the research questions. These claims embrace both contributions to knowledge and theory, contribution to practice, and enabling and constraining factors.

Chapter 8: Conclusions, limitations and future research will conclude the thesis, presenting final conclusions, limitations of the current research and possible directions for further work.

Finally, in order to provide a visual roadmap of the unfolding theoretical and practical components of the research journey, a framework published by Isaksson *et al.* (2020) has been adapted and used throughout the thesis. The first research journey roadmap is used as a

summary of the introductory aspects discussed thus far, in Figure 3 at the end of Chapter 2: Interdisciplinary multi-faceted research approach.

1.8 Conclusion

This Introduction chapter has set out the overall aim of the research to investigate the achievement of *practical improvement outcomes* arising from technology-enabled learning networks in public service. Organisational learning, as a 'process of shared thought and action' (Rashman, Withers and Hartley, 2009, p.470) in public service in the UK is under researched. In tandem with a current accumulation of global challenges and unsustainability issues, the world has witnessed a revolution in the availability of information and communications technology, which has the potential to support learning in the workplace and organisational learning. There is a need to research *how* – or whether – organisational learning using the affordances of networked learning technology can be recognised, enacted and measured. If feasible, this could help to address challenging situations which may be fragmented across geographical or functional boundaries within or between organisations, or amongst many different kinds of disparate practitioners. Each practitioner may have a particular role to play in the identification and resolution of challenging scenarios. Indeed Bradbury *et al.* (2019) made a repeated call for action-oriented research which can contribute towards transformative approaches in which those affected are empowered to contribute towards generating solutions. Such approaches contrast with traditional knowledge creation processes which have historically been driven by 'elite' or expert understanding.

Thus the theme of technology-enabled learning networks applied to the subject area of organisational learning is in its infancy.

The research context of the Open University has been described, as a dedicated distance learning institution in the UK. The practical problem being investigated is the perennial organisational need to close a feedback loop between multiple remote module tutors, students and campus based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions.

Chapter 2: Interdisciplinary multi-faceted research approach

2.1 Introduction

This chapter sets out interdisciplinary context and the disciplinary and methodological domains that were ultimately embraced in this research. The chapter will introduce these traditions, and set out a brief overview and indication of the state of the art in each one. This forms an important backdrop before proceeding to the Literature Review in Chapter 3: Literature review.

The top three petals in the interdisciplinary 'flower' in Figure 2 illustrate the disciplinary areas that were gradually embraced in the research, starting from a disciplinary 'home' of networked learning which is predominantly based in the education discipline. Both organisational learning and development, and process and practice theory, are part of management and organisation studies. The philosophical and methodological traditions of Pragmatism, grounded theory, collaborative action research, and quality enhancement and improvement, can be all be applied across academic disciplines. Thus Figure 2 illustrates diagrammatically the components of the composite multi-faceted approach.

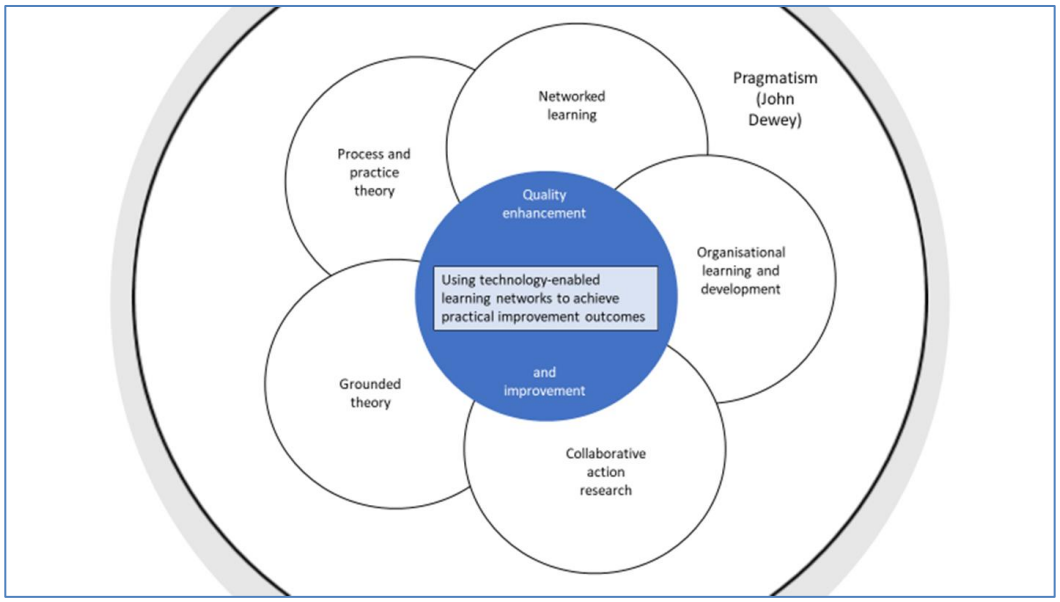


Figure 2. Interdisciplinary multi-faceted research approach

As a novice researcher but experienced consultant in the practical implementation of organisational quality management systems, I adopted an initial pragmatist viewpoint. My pre-disposition and professional experience is to facilitate and empower project participants to achieve active and practical improvements, which are recognised as such both by themselves and other relevant stakeholders. My philosophical engagement with the American Pragmatist tradition, especially that of John Dewey's Inquiry, deepened and became much richer as the research progressed. There have been several recent calls for a return to the principles of Pragmatism (Elkjaer, 2004; Elkjaer and Simpson, 2011; Morgan, 2014, 2020; Lorino, 2018; Buchan and Simpson, 2020; Simpson and den Hond, 2021) both in organisation studies and in the use of grounded theory, as it has much to offer contemporary problem-solving across the disciplines. This important topic forms a thread throughout the thesis.

The chapter will now introduce each of the interdisciplinary domains in turn, referring to Figure 2. The current developmental position or reference point for each domain will be introduced. This will lead into the Literature Review, followed by the description of the methodological considerations and the methodological path taken.

2.2 Networked learning

Carvalho & Goodyear (2014) provide a helpful overview to historical developments, and a range of definition of terms, in the field of networked learning and learning networks. They highlight that 'networks are one of the three major forms of social and economic organisation, along with markets and hierarchies' (Carvalho and Goodyear, 2014, p.14). They explain that hierarchies involve enduring relationships with clearly recognised and established legitimate authority, whereas markets involve episodic relationships formed for the purpose of exchange of goods and services. In contrast:

> *A distinguishing feature of networks as organisational forms in business is an orientation to reciprocity, building and maintaining trust, resolving differences through dialogue and consensus-building (rather than shifting to another supplier), and to constructing shared understandings of business needs and opportunities.*
>
> Carvalho and Goodyear (2014, p.25)

Thus a collaborative and equitable property of networks is highlighted in the mutual construction of shared understandings, in contrast to the use of authority or power in a hierarchy. A network involves greater communication than the episodic relationships of a market, and the boundaries or composition of a network can be more fluid and easier to evolve according to needs than a hierarchy (Carvalho and Goodyear, 2014, p.26).

These network properties of greater communication than a market, and more fluid boundaries than a hierarchy, then extend to the notion of geographical separation. Carvalho and Goodyear (2014, p.27) describe that there are historical examples of trade networks 'overcoming geography' even 20,000 years ago, and other networks spreading religious innovations for example. Indeed the exchange of knowledge through networking could be seen as a 'central driving factor propelling the Industrial Revolution in 18th century Britain' (Carvalho and Goodyear, 2014, p.28). Citing David Hancock, a business historian, these authors use another 18th century example – that of the Atlantic trade in Madeira wine – to illustrate the trade benefits of increased communication across geographical boundaries. Whilst the merchants' primary goal was to sell their Madeira wine across the Atlantic, it was profitable for them build up networks and establish long term relationships with "repeat customers" and those who would recommend them to others.

Developing on from these interesting historical insights is the recognition that 'the special value of information passing between linked people (or organisations) in a network is a core

characteristic of sociological research on networks' (Carvalho and Goodyear, 2014, p.26). Indeed understanding how information or knowledge flows around a network that is considered as a form of "pipe" or conduit is one of the key principles in much contemporary network research. It is the purpose of many analysis techniques, such as Social Network Analysis, which aims to understand how information flows can enable individual and organisational learning (Carvalho and Goodyear, 2014, p.26). The notion of "weak ties" and "strong ties" was developed by Granovetter (1973). This insight illustrated that connections or flows between those who have less regular, less routine, or "weaker" contact can be more beneficial in passing new information through a network than connections that are tight knit, shared, routine or stable. Connections or flows occur between network "nodes", which are points that can receive, create, store or send data along distributed network routes.

Carvalho and Goodyear (2014) continue their historical account by distinguishing two different types of learning that may occur in business or organisational networks, citing Podolny and Page (1998). The first type characterises the flow of information between nodes. The second type characterises something more than just flow down a conduit:

> *One [type of learning] involves the rapid transfer of self-contained pieces of information – network ties are thereby seen as conduits through which useful knowledge can pass. The second form of learning is more transformative, and occurs when new syntheses of information occur – creating something qualitatively different from the knowledge previously residing in any specific node.*
>
> *Whether one is using nodes to represent individual people or organisations, network forms can be understood as promoting both additive knowledge accumulation and transformative change. They have been functioning in this way for a very long time.*
>
> Carvalho and Goodyear (2014, p.27)

Thus the notion of transformative change is introduced – a change in which a new synthesis has occurred, in contrast to movement or flow of information or knowledge. One apparent example of major transformational change brought about by forms of networked learning is the socio-economic development in the Industrial Revolution, as described earlier. Using learning networks to achieve practical improvement outcomes and organisational change for the better, as sought after in this PhD research, would be another example.

Carvalho and Goodyear (2014) identify that the modern term *networked learning* has been existence for almost as long as the advent of computer networks and digitally mediated human interaction. They believe that eventually the extensive history of networked learning activity will come to be understood, and that *networked learning* will take on a particular character between approximately 1980 – 2020, after which it will become normal and invisible. This assessment may present itself as rather ambitious. Indisputably however, the term has been applied to the use of computers, computer networks and information technology to support educational activity.

The most widely adopted definition of networked learning was crafted in 1998:

> *We define 'networked learning' as learning in which C & IT [computer and information technology] is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources. Some of the richest examples of networked learning involve interaction with on-line materials and with other people. But use of on-line materials is not a sufficient characteristic to define networked learning.*
>
> Goodyear, Hodgson and Steeples (1998, p.2, original emphasis)

This definition emphasised connections, transfer through a conduit of information and knowledge, and interactions between the nodes or participants in the network and particular learning resources. It did not however imply any transformational change.

Carvalho and Goodyear (2014, p.17) have a particular interest in the design of networked learning initiatives, and in the notion of an architectural influence on design. They particularly highlight the multidisciplinary practice of architecture that engages what they refer to as *epistemic fluency*, which is combining diverse forms of knowledge and ways of knowing. They assert that *epistemic fluency* can be rare or even shunned in the educational world and can impede progress.

The next disciplinary tradition to consider is process and practice theory.

2.3 Process and practice theory

Becoming aware of process is becoming aware of the vitality of life itself.

Langley and Tsoukas, (2016, p.17)

As a project manager and latterly a management consultant whose work has embraced the implementation of strategic process-based quality management systems, I have been profoundly aware of *process* since the earliest years of my career.

A "process approach" forms a key backbone of the ISO9000 family of international quality management systems standards, which I have implemented and facilitated in several organisations in different sectors. My professional experience is that understanding organisational processes, and the sequence and nature of the steps within them, is a key challenge in implementing quality management systems. This challenge extends across functional boundaries. Thus participants in an improvement initiative need to acquire visibility and understanding of the entirety of an organisational process, and the part they play within it, to be able to achieve considered and sustainable improvements.

My experience is also that process awareness appears to be much less prevalent (or more contested) in educational contexts than in corporate environments such as airlines or IT organisations. Hence the notion of *process* to educationalists may be rejected or downplayed as "jargonistic" or "managerialist". In the academic study of management and organisations, there has been a "process turn" in the last couple of decades, but an interesting reflection for this research is the extent to which those working as practitioners in the provision of Higher Education perceive and relate to notions of process, especially within prevailing discourses of accountability and managerialism. This section deals with the current position of process and practice thinking within the academic field of organisation and management studies.

Langley and Tsoukas (2016) provide an overview to the development of process thinking, process theorizing and process researching within organisation and management studies. They observe the "process turn" in which the foundational notion of *organisation* is shifted to *organizing*, especially through the work of Weick (Weick, 1995). This shift redirects attention from the study of organisations as static entities to the study of organisations as dynamically *emergent* phenomena. Organisations continuously *emerge* through a multiplicity of 'coherent and constrained' interactions between individuals (Langley and Tsoukas, 2016, p.3).

A first wave of process research took place from about the late 1960s to late 1990s, and a second from the late 1990s onwards. Before the beginning of this century, understanding organisations and the human interactions within them from process oriented perspectives had been 'relatively sidelined' (Langley and Tsoukas, 2016, p.2). It has now become established and gained significant momentum. Given that the aim of this PhD research is to investigate how a dynamic and emergent organisational learning process might unfold using technology-enabled learning networks, it is important to intersect with the current state-of-the-art in process thinking in organisation and management studies.

Langley and Tsoukas (2016) identify two perspectives associated with the two waves of process research. They identify a *weak-process* perspective, largely associated with the first wave, which aims to understand the temporal evolution of relatively stable entities. Change is something that *happens to* organisations. The alternative, taken up in the second wave, is a *performative* or *strong-process* perspective. Change is not something that *happens to* entities or organisations, but is 'the way in which reality is brought into being in every instant' (Langley and Tsoukas, 2016, p.4). A performative or strong-process perspective derives from an ontological commitment that sees the world as constantly evolving and *becoming*, in contrast to a static world viewed as *being*. Strong-process thinking foregrounds the ever-changing nature of reality, and highlights the continuous flow of human experience.

This distinction between a predominantly *being,* and a *becoming* ontology in organisation studies was also identified by Elkjaer and Simpson in 2011:

> '*Philosophically speaking, there is a fundamental cleavage in the contemporary scholarship of this field that separates entitative and processual orientations towards scholarship and inquiry*'.
>
> Elkjaer and Simpson (2011, p.75)

The term *entitative* is used to denote thinking about relatively static or stable entities (such as knowledge), in contrast to the continuous flow of unfolding processes.

As part of the ongoing debate in organisation studies, these authors argued that this a dualistic separation which requires transcending. They proposed American Pragmatism as the approach which can achieve this:

> *The Pragmatist alternative seeks to transcend this entitative/processual dualism by understanding organizational practice as the continuous and emergent weaving together of social selves and social situations. Its focus is very much upon the social nature of real-time actions that constitute living and lived experience. This perspective, then, offers a way of approaching 'how' and 'why' questions that remain difficult to address by more conventional means.*
>
> Elkjaer and Simpson (2011, p.79)

Hence, as highlighted earlier in this section, Pragmatism has been put forward in the literature as having much to offer in the contemporary field of organisation studies, not least as a contribution to the understanding of continuously unfolding process and practice. Understanding and capturing both participants and the researcher's experience 'is a major challenge for any empirical study of process' (Langley and Tsoukas, 2016, p.5).

Pragmatism can therefore help in the understanding of reality as a continuously unfolding flow rather than an arrangement of relatively stable entities, to which change might happen. Pragmatism can be set apart from those philosophies 'that account for meanings solely in terms of retrospective interpretations of past experiences' (Elkjaer and Simpson, 2011, p.80). This means that it is fundamentally distinct from *interpretivism*.

Developing on these themes of process and flow, Langley and Tsoukas (2016, p.8) argued for four different types of process research, distinguished along two axes. On the vertical axis, processes may be researched *from within*, or alternatively *from the outside.* Researching a process from within entails eliciting first-person feedback from individuals, and possibly being a part of the experience oneself. Researching from the outside means being a separate and detached observer.

On the horizontal axis, process research may be distinguished by whether it is undertaken *after-the-fact*, or *in-the-flow. After-the-fact* research is retrospective and could include identifying a particular outcome and investigating how it was produced.

Using an insider action research approach, this research project is positioned both *from within* and *in-the-flow* of teaching and management activity in a Level 2 (Year 2) distance learning module at the UK Open University. This combination is identified as *prehensive* in the Langley and Tsoukas (2016) typology. Acting as an action researcher and internal consultant, I aimed to facilitate a *prehensive* organisational learning process using technology-enabled learning networks in my own organisation.

Langley and Tsoukas (2016) offered a helpful confirmation (identified long after this research had begun) that this approach was likely to offer significant promise in embracing both academic and practice concerns, and indeed in aligning with a new understanding of doing research:

> *Combining process research with process consultation (Schein, 1999) and process-sensitive practice (Shotter, 2011) can creatively span the world of academia with the world of organisational practice, and is likely to be useful as well as revealing.*
>
> *At the end of the day, a shift towards a process approach to organisations, and social life more generally, is aligned with a new understanding of doing social science – one that is not so much obsessed with establishing statistical generalisations as concerned with elucidating the complexities of agency through which much in social and organisational life is accomplished.*
>
> Langley and Tsoukas (2016, p.17)

In their conclusion, Langley and Tsoukas (2016) provide a list of challenges for process organisational research. These influential authors highlight that more ways need to be found to engage in research which has an explicitly *strong-process* perspective, most especially *prehensive* research. They highlight that this type of research – as embraced in this PhD – is more difficult to conduct, but potentially very rewarding.

Buchan & Simpson (2020) made an alternative call for a Pragmatist approach within the management of projects, in the context of Scottish mental health service provision. They contrast *projects-as-practices*, articulated as a noun, with *projects-as-practice*, articulated as a verb. The former relates to the *being* ontology, and the latter to the *becoming* ontology. They underscore that in modern Western cultures, we are 'deeply conditioned to see the world in terms of fixed elements (nouns)' (Buchan and Simpson, 2020, p.40). Research methods that investigate projects-as-practices seek to accurately *represent* these practices, either from within or from the outside. See the Glossary entry on Pragmatism and representationalism.

In contrast, projects-as-practice are theorised as *emergent* processes of Pragmatic Inquiry, that flow, seek active interventions and also seek a *transformational* outcome (Buchan & Simpson, 2020). Although this additional call for a Pragmatist approach within organisation studies was made towards the end of this PhD, it strongly resonated with and substantiated the principles under which the research was undertaken.

Buchan & Simpson (2020) do highlight that a Pragmatist approach is one of many types of process and practice theory that are current in contemporary organisational literature. There are others that also engage with *performative* dimensions and a *becoming* ontology, such as Karen Barad's agential realism (Barad, 2003). However Buchan and Simpson (2020, p.45) argue that Pragmatism, which as an approach is always asking: 'if this is the situation, how should we now proceed?', is uniquely suited to bring theory and practice together.

This PhD research was thus positioned at the intersection of the networked learning domain, and the recent developments of process and practice theory in organisational research. It sought to both facilitate and conceptualise an unfolding process of technology-enabled organisational learning. In doing so, it took a *strong-process*, *performative,* and *prehensive* perspective (Langley and Tsoukas, 2016).

Whilst this might be rather unusual or ambitious in a PhD study, it illustrated both an informed and passionate determination to develop the threads of my previous professional process improvement practice and experience, and underpin it with academic rigour. It aimed to facilitate an innovative approach to implementing an organisational learning process in the pursuit of collaborative and equitable improvements, using networked learning technology in a highly complex and fragmented distance learning HE institution.

The next disciplinary tradition to consider is organisational learning.

2.4 Organisational learning

Organisational learning is most frequently identified as another domain of management and organisation studies. The term is used in this research to denote a 'process of individual and shared thought and action', as described by Rashman et al., (2009, p.470). This means to embrace the notion of *learning together* about some form of shared problem area or challenge, and then taking collaborative action aimed at achieving an organisational improvement or change for the better. Indeed the 'guiding thought' that I have always shared in dissemination presentations is that people (practitioners) need to *learn* how to improve in challenging and complex practical situations. This notion was introduced in 1.6 Personal and professional experience driving the research, and is reflected in the working definition of learning networks that was presented in Box B.

Thus by taking shared action, organisational learning can *involve the achievement of practical improvement outcomes,* defined in Box A. Organisational learning can also be contrasted to organisational knowledge, which is a resource or asset that can be aggregated, codified, stored and shared, in contrast to an unfolding learning *process.*

Rashman et al. (2009) produced a systematic review of organisational learning and knowledge in public service organizations. This review forms a credible point of departure for the assertion that 'public organizations constitute an important, distinctive context for the study of organizational learning and knowledge' (Rashman et al., 2009, p.463).

Organisational learning may also be contrasted with individual or group-based academic learning, or professional development carried out by individuals. The most prevalent use of networked learning technology to date has been for academic learning and professional development. This type of networked learning generally takes place and is recognised as taking in the minds of individuals, albeit exploiting the collaborative affordances of the technology to assist and augment the individual developmental process. However the affordances of the technology for collaborative problem-solving are apparent.

The intersection between the networked learning and organisational learning domains has thus been illustrated. This research addressed the gap about *whether* and *how* learning networks of geographically separated disparate practitioners, connected by networked learning technology across an organisation, could use collaborative learning affordances to grapple with a problem area requiring improvement, within an organisational learning process in which *practical improvement outcomes* might be achieved.

The notion of organisational learning within management and organisation studies has, although enthusiastically received and taken up by academics, had somewhat of a chequered history. Prominent authors have asked whether organisational learning has "lost its way", or whether the learning organisation is "still alive" (Pedler and Burgoyne, 2017). A well-cited critical review in the dedicated journal *The Learning Organisation* observes that the term *organisational learning* is frequently conflated with any type of organisational change, and that 'the influx of literature provides overwhelming, but unclear information to both researchers and practitioners' (Wang and Ahmed (2003, p.8). The critical review set out 'five focuses' of the organisational learning concept and its practices that the authors identified in the extant literature. The authors also highlighted the important connection between organisational learning, and quality management or continuous improvement techniques, such as Deming's Plan-Do-Study-Act cycle (The Deming Institute, 2022):

1. **collectivity of individual learning**, facilitated by staff training and development
2. **process or system**, facilitated by enhancement of problem-solving capability
3. **culture or metaphor**, facilitated by creation and maintenance of a learning culture
4. **knowledge management**, facilitated by acquiring and sharing diverse information
5. **continuous improvement**, facilitated by incremental improvement techniques

Wang and Ahmed (2003, p.10)

The authors highlight that these aspects do overlap and are not mutually exclusive. They conclude by offering a suggested sixth focus of 'creativity and radical innovation' (Wang and Ahmed (2003, p.13), that should be incorporated in addition to the other five. Although this review refers to the business world and to sustaining competitive advantage, the six 'focuses' present as universally applicable across all contexts, including public service. However, they do not provide an inkling as to the mechanism for practically *how* organisational learning actually happens, and how it can be recognised, enacted and measured, as subsequently identified by Rashman, Withers and Hartley (2009) and introduced in 1.2 Overall aims and research themes.

One key aspect in the organisational learning literature identified in the first focus of Wang and Ahmed (2003) above, is the interaction between learning at the "individual level" and learning at the "organisational level". Is organisational learning the collective sum of learning in individuals, and can organisations be anthropomorphised, i.e. assigned human learning or behaviour qualities? The seminal works of Chris Argyris and Donald Schön conceptualise that individuals are 'agents' for organisational learning (Argyris and Schön, 1978, p.19). They assert that organisational learning occurs when individuals detect an error or discrepancy between 'espoused theory' that an individual might explain to someone else, and the 'theory-in-use' that actually governs their actions or behaviour (Argyris and Schön, 1978, p.11). The inventions and evaluations of 'learning agents' must then somehow be transferred or 'embedded in organisational memory' (Argyris and Schön, 1978, p.19). "Single-loop" learning occurs when error correction occurs within existing norms. "Double-loop" learning occurs when those organisational norms are challenged and changed.

However in their call for a return to the principles of Pragmatism in the field of organisation studies, that was described in the previous section, Elkjaer and Simpson (2011) assert that the work of Argyris and Schön is dualistic. The identification of an individual level and an

organisational level is regarded as a dualism, which can be unhelpful. It is contrasted with the mutually constitutive, transactional and transformational nature of the interaction between individual and organisation in a Pragmatic approach. 'If these levels are treated separately, then we are left with the intractable problem of having to glue them together again' (Elkjaer and Simpson, 2011, p.72). Similarly the separation of knowledge and action by Argyris and Schön is identified as a dualism, and compared with the mutual constitution of knowledge and action within the flow of a continously unfolding and anticipatory process in the Pragmatic approach. Thus although Argyris and Schön claimed a Pragmatic approach in their work, Elkjaer and Simpson (2011, p.81) counter that 'that they have not fully embraced the potential of Pragmatism as their work continues to reflect dualistic distinctions between knowledge and action, and individuals and organization'.

The knowledge management aspect in the organisational learning literature, identified as one of the 'five focuses' by Wang and Ahmed (2003), also speaks to the knowledge/action and entitative/processual dualisms that Pragmatism seeks to transcend. Knowledge is identified as a resource or entity which can be aggregated, codified, stored and shared, as observed earlier. 'Knowledge management', knowledge transfer' and 'knowledge exchange' are three key terms in the literature, and evident in practice, that reflect this dualism. The dualism is evident in a review of the past, present and future of organisational learning research published in the leading *Management Learning* journal by Linda Argote, who is another influential contributor in the organisational learning field. Argote (2011, p.440) maintains that 'organizational learning can be conceived as having three sub-processes: creating, retaining and transferring knowledge'. The notion of 'individual' and 'organisational' knowledge levels is also explicit: 'although individual members are the mechanisms through which organizational learning generally occurs, the knowledge that individuals acquire would have to be embedded in a supra-individual repository for organizational learning to occur'

(Argote 2011, p.440). This is the same understanding as Argyris and Schön, explained earlier in this section, and can therefore also be contrasted with a Pragmatic approach.

Easterby-Smith and Lyles (2011) set out a review of the 'the evolving field of organizational learning and knowledge management' in a prominent compilation Handbook. They identify 'classic', 'foundational' and 'popularizing' works in their appraisal of the field (Easterby-Smith and Lyles, 2011, p.9). They highlight John Dewey as a 'classic' author who had a significant influence and was active long before terms such as organisational learning had appeared. They highlight the entitative/processual dualism:

> *Dewey's view that learning takes place through social interaction and yet cannot be passed from person to person as if it were a physical object is also seen to underlie the social learning perspective.*
>
> Easterby-Smith and Lyles (2011, p.9)

Their diagrammatic mapping of key topics in their Handbook sets out their understanding of the dualisms of 'process' and 'content', plotted against 'theory' and 'practice' (Easterby-Smith and Lyles, 2011, pp. 3-4). In this mapping of the field, they allocate *organisational learning* as the predominantly academic and theoretical study of process, although they do not refer explicitly to the emerging ideas of process thinking in organisation and management studies, or the ideas of *weak-process* and *strong-process* introduced in the previous 2.3 Process and practice theory. They allocate 'organisational knowledge' and 'knowledge management' as the corresponding theoretical and practice-based studies of "content", or knowledge. They identify the *learning organisation* (Garratt, 1987) as an 'entity that has the capacity to learn effectively' and is written about in more practical process terms (Easterby-Smith and Lyles, 2011, pp. 3).

In addition, they do not explicitly refer to the work of Rashman, Withers and Hartley (2009), or the definition of organisational learning as a form of shared thought and action, as

introduced in Chapter 1: Introduction and at the beginning of this section. Their appraisal also appears to omit the consideration of organisational learning in the public service domain, as Rashman, Withers and Hartley (2009) observed.

In a more recent publication introducing a virtual special issue in the leading *Organisation Studies* journal, Simpson and den Hond (2021, p.1) point to an 'explosion of interest in process philosophies', and they 'reread Pragmatism as a process philosophy that can profoundly inform process views of organization and organizing'. Referring to the traditional entitative and theoretical stance in management and organisation studies, these authors assert that an approach that 'attends to the practical actions of organizing that arise in emergent situations [.....] is lamentably absent in contemporary organizational research' (Simpson and den Hond, 2021, p.2). They explicitly build on this by referring to the notions of *weak-process* and *strong-process* introduced in the previous 2.3 Process and practice theory

> *Whereas there is no shortage of methodological advice on doing entity-based ('weak') process studies of organization, there is little guidance for empirical researchers who wish to step out on a 'strong' process pathway.*
>
> Simpson and den Hond (2021, p.6)

They believe that American Pragmatism could re-invigorate the current traditional practices of organisational research, although the 'potential remains largely unrealised' (Simpson and den Hond, 2021, p.16). They also point out that Pragmatism is an inherently ethical approach. This ethical aspect will be discussed in more detail in Chapter 4: Research methodology.

Earlier writing of Bente Elkjaer, before Elkjaer and Simpson (2011), suggested a 'Third Way' of organisational learning (Elkjaer, 2004), and organisational learning 'with a pragmatic slant' (Elkjaer, 2003). Elkjaer built on the 'two metaphors of learning' proposed in the

seminal paper by Anna Sfard (Sfard, 1998). Elkjaer suggested that beyond the first 'knowledge acquisition' metaphor that concerned the knowledge management aspect identified in this section, and the second 'participation' in communities of practice metaphor identified by Sfard, was a third metaphor, synthesised from the other two, that could be identified as Pragmatic Inquiry. This third metaphor could cast organisational learning in a new light. In the 'Third Way', the relationship is transactional – in Pragmatic terms – the unfolding mutual formation of both individuals and organisation together, as they carry out collaborative Inquiry. This can be contrasted with the directional flows of knowledge between separated "levels" in the knowledge acquisition metaphor, and with becoming a competent practitioner and member of a community of practice in the participation metaphor. Thought and action, and individual and organisational levels, are mutually constitutive:

> *This way of developing a learning organization includes cognition and emotion, individuality and sociality, thinking and acting.*
>
> (Elkjaer, 2003, p.492)

Thus Pragmatism does appear to have been an 'largely unrealised' avenue in the field of organisational research and organisational learning, which is again heralded in by the special issue in the *Organisation Studies* journal just described (Simpson and den Hond, 2021, p.16). Now complete, this research offers a Pragmatic contribution to both this call, and that from Langley and Tsoukas (2016) described in the previous 2.3 Process and practice theory, for resaerch which has been enacted from a *strong-process* and *prehensive* perspective.

Garad & Gold (2019) recently built on arguments in the management and organisation studies literature that ideas about the learning organisation and organisational learning have 'not achieved what was hoped for', and that 'their influence on business organisations has been limited' (Garad & Gold, 2019, p.338). In a similar vein, Elkjaer (2021) recently carried

out an investigation of the publication patterns on organisational learning, prompted by 'a sense that the field of OL is vanishing as a field of research' (Elkjaer, 2021, p.18). Findings showed that this sense was not justified, but there was however a general plea from interview respondents for more practically relevant work, which might also encompass contemporary societal challenges. It is telling that this plea is made 20 years after another seminal paper by Brown and Duguid (1991) argued that working, organisational learning and innovating had to be more closely linked in theory and practice, than was currently the case.

As explained previously, the term *organisational learning* is used in this research to denote shared or collaborative reflection and action about some form of shared problem or challenge which is spread over functional and geographical boundaries, involving disparate participants.

The next interdisciplinary tradition to consider is collaborative action research.

2.5 Collaborative action research

The collaborative action research strategy followed in this research is described in detail in the forthcoming Methodology The role of mechanisms. The focus of this research was on the active use of learning networks to both facilitate and conceptualise an unfolding process of technology-enabled organisational learning. In addressing this focus, as previously described in 2.3 Process and practice theory, the research took a *strong-process*, *performative,* and *prehensive* perspective (Langley and Tsoukas, 2016). The research work was carried as an emergent unfolding process, located *within* as opposed to *outside* the flow of the daily practice of distance learning module presentation and delivery at the OU. The research was carried out *with* the participants, rather than *on* them (Bradbury, 2015). For all these positive reasons a collaborative action research strategy was chosen, which is described in detail in 4.3 Insider action research.

Action research is a complex and multi-faceted tradition with a rich heritage spanning formally over the last hundred years, and embracing many different variants all of which are united by a desire for practical improvement (Cohen, Manion and Morrison, 2011; McNiff, 2014). The knowledge, practice traditions and values of collaborative action research formed a critical part of the composite interdisciplinary approach.

2.6 Grounded theory

Since the aim of this research was to produce a new conceptual framework on the unfolding process of technology-enabled organisational learning, a theory-building approach was required. The Literature Review in Chapter 3: Literature review will describe the conceptual frameworks that were available in the literature, and illustrate why none of these were assessed as being sufficient. Based on a critical comparison of existing frameworks, the Literature Review will also identify the characteristics of the proposed conceptual framework that was being sought.

As a theory-building approach was required, within the practicable limits of a PhD project, grounded theory method (GTM) was followed. This is described in detail in the Methodology **4.4** Grounded Theory Method. The simultaneous facilitation and conceptualisation of an unfolding and emergent process, *from within* and *in-the-flow,* was a defining characteristic of this research. My aim was to drive this unfolding process in collaborative partnership with the project participants. The complex knowledge and practice traditions of grounded theory method therefore also formed a critical part of the intersecting interdisciplinary domains in which the research took place, underpinning the action research approach.

2.7 Conclusion

Thus, the research gap occurs at the intersection of current developments in five significant knowledge and practice domains. This was illustrated in Figure 2 and illuminated in the

preceding sections. The research aimed to claim both a contribution to knowledge in the form of a new conceptual framework, and a contribution to practice in the active seeking of practical improvement outcomes using learning networks, as a context for theory generation. The new conceptual framework might then form the vehicle for applying the research and the nature of the unfolding technology-enabled organisational learning process to other practical contexts. Further contexts might be within or external to that of the Open University. These could be additional distance learning modules within the OU as a UK Higher Education institution; in other distance learning or HE contexts, or further afield in other fragmented practical problems where practitioners may be disparate and separated across geographical organisational or inter-organisational boundaries.

In order to provide a roadmap, and track the research journey and claims of both the theoretical contribution to knowledge and the contribution to practice, a framework developed by Isaksson *et al.*, (2020) was adapted and used throughout this thesis. This framework was designed by its authors specifically to integrate knowledge and practice claims across a research journey, and to assist with their *verification* and *validation.* The first stage of this roadmap is shown in Figure 3.

Adapted for this specific research, this roadmap provides an unfolding illustration at key points in the thesis of the research path, progression, and the journey to verifying and validating the research claims. *Verification* is an assessment of whether specified requirements have been fulfilled (Isaksson *et al.*, 2020). As explained earlier, the literature review will identify the characteristics or 'requirements' of the proposed conceptual framework that was being sought, based on a critical comparison of existing frameworks.

Validation is an assessment of whether the knowledge contribution filled the specified research gap in knowledge, and whether the practice contribution represented an

amelioration of the practical problem, that is whether the research fulfilled its requirements *in use* (Isaksson *et al.*, 2020). These *verification* and *validation* assessments are shown as feedback loops in Figure 3 overleaf. V*erification* and *validation* will be carried out in the Discussion Chapter 7: Discussion.

At the conclusion of this chapter, Figure 3 summarises the introductory knowledge and practice aspects of the thesis that have been discussed thus far, using this framework adapted from Isaksson *et al*. (2020). The diagrammatic illustration is useful to juxtapose the described research gap with the specified practical problem, within the specified context, i.e. to integrate the theory and practice research journey and claims.

The next chapter is the Literature Review, which critically appraises current conceptual frameworks in the literature, derives the focus of the research and from this appraisal concludes by specifying the research questions. Figure 3 also shows this onward journey.

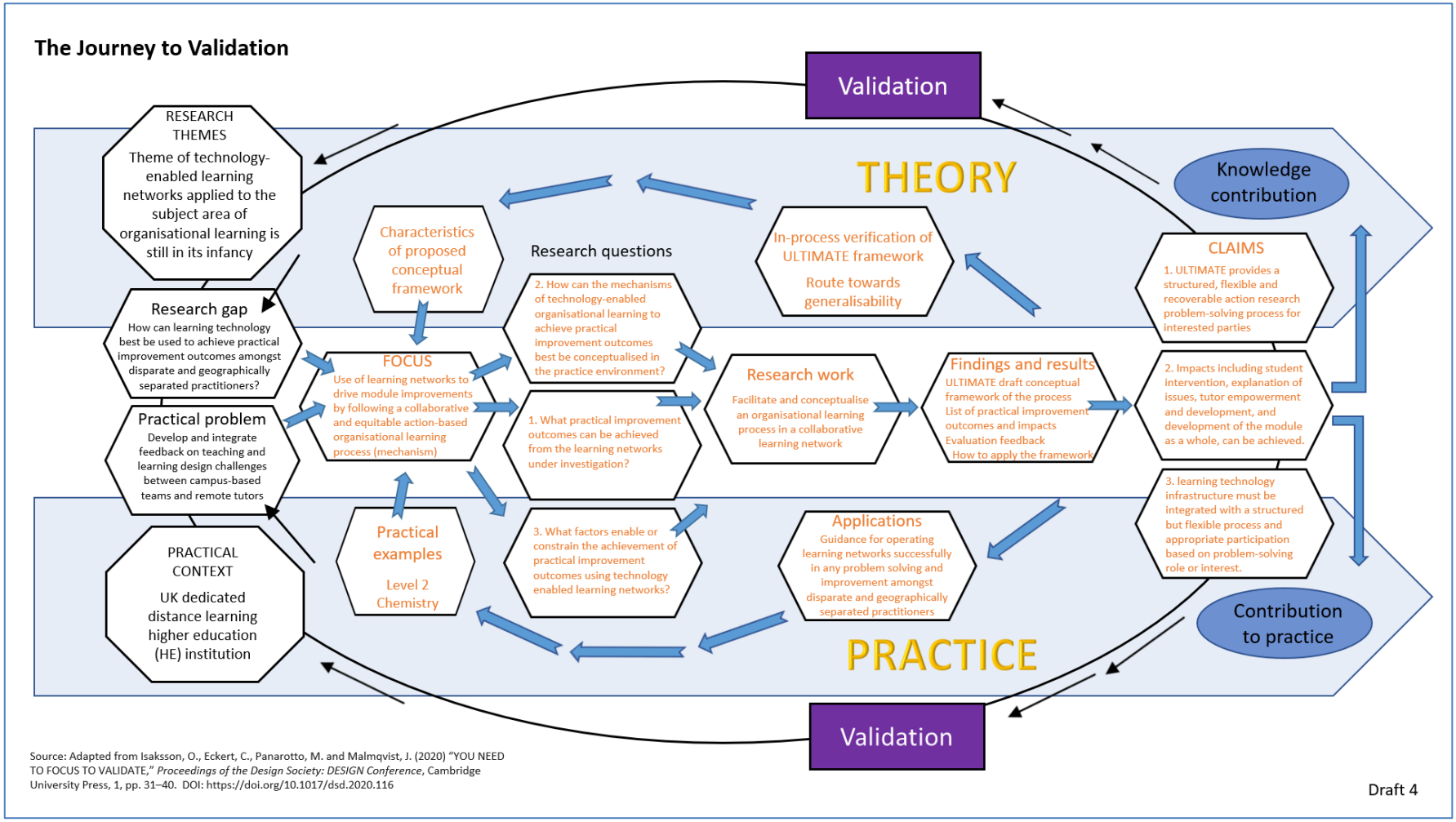


Figure 3. Research gap and practical problem in the research journey

Chapter 3: Literature review

3.1 Definition and discussion of terminology

The first section of this literature review introduces the concept of technology-enabled learning networks, and compares them to other arrangements of learning in groups such as *Communities of Practice*. It then describes an illustrative example of a learning network, and discusses the types and features of the learning that can take place. The notion of organisational learning as a form of shared thought and action to collaboratively achieve practical improvement outcomes is introduced. The section then introduces the work of some key authors and indicates that in the domain of networked learning and learning networks, the process of theory and concept formation is still in an immature state. Three conceptual frameworks in the literature are described, which have been applied to collaborative organisational learning environments and were identified in earlier research by the author (Boyd, 2017). A comparison of the frameworks was also carried out and is briefly described, as it helps to support the formulation of research questions for the PhD. The research questions and objectives are included at the end of the section, as they are derived from this literature review.

3.1.1. What is a technology-enabled learning network?

Since the advent of the internet and web-based communications technologies, research on technology-enabled learning networks has been a growing inter-disciplinary endeavour (Carvalho and Goodyear, 2014). Today, online networks and communities are used extensively across the globe for academic and professional learning, and to share knowledge and resources. Web portals, discussion forums, blogs, wikis and social networking tools are being combined to enable communication, interaction and learning on an unprecedented scale. A 2011 United Nations publication *Networks for Prosperity: Achieving Development Goals Through Knowledge Sharing* observes that 'networks, formal and informal, local and global, are increasingly important channels for pursuing policy goals in a globalizing world' (UNIDO, 2011).

Learning networks connect individuals together in order to achieve some goal, or address a specified challenge or problem area. They can be contrasted to *Communities of Practice* (CoPs), which are 'formed by people who engage in a process of collective learning in a shared domain of human endeavour', in which there is a 'shared competence that distinguishes members from other people' (Wenger-Trayner and Wenger-Trayner, 2015). In a CoP, it is the existence of the shared practice – 'a common set of situations, problems and perspectives' that allows members to share knowledge (Wenger, McDermott, & Snyder, 2002, p.25). Members help each other, share resources and make relationships to further their practice. A member of a CoP blends their 'personal experience and accountability to the regime of competence of a respected community', to assure and develop their professional standing as a practitioner within that community (Wenger-Trayner, Fenton-O'Creevy, Hutchinson, Kubiak, & Wenger-Trayner, 2015, p.14).

CoPs may be *networked,* into *networked communities* or *distributed communities*, as they seek to extend their reach and build bridges with each other, within the shared competence of the particular domain of endeavour. An example of this are school improvement networks, connecting teachers in professional communities based at individual schools together, for the purpose of improving educational practice and student outcomes (Brown and Poortman, 2018). Brown & Duguid (2017, p.152) describe these networked communities, linked across different organisations through common practices, as '*networks of practice'.* An interesting example of a Networked Learning Communities (NLCs) initiative, in the locality of the headquarters of the OU in Milton Keynes, is described by Day and Hadfield (2004). This initiative, although primarily for face-to-face interactions, is notable as it specifically embraced a collaborative action research methodology. It aimed 'to give ownership for development back to teachers' within 'the pressures of managing the dynamic and diverse institution which is their school within an imposed, centralized, standards-driven change agenda' (Day and Hadfield, 2004, p.575).

More recently, Fox and Poultney (2020, pp. 23-24) have analysed that the NLCs of this early 2000s time period were established with a strong resonance to the principles of collaborative action research, including distributed leadership, freedom to act, and involving a wide range of both practitioner and student voices. Since this time, the policy predisposition of the UK Department for Education has shifted to evidence-based practice, 'evidence-at-scale', and randomised control trials (RCTs). However the notion of Professional Learning Communities (PLCs) has also been implemented since this time, embracing reflective and collaborative inquiry, group as well as individual learning, and collective responsibility to improve student outcomes through improving teaching practice (Fox and Poultney, 2020).

In contrast to the notion of 'community' where members can identify with one another via a shared practice, there may be no such shared competence or identity in a technology-enabled learning network, which may bring together geographically separated individuals of very disparate practice backgrounds to address a particular challenge or solve a problem. Carvalho & Goodyear (2014, p.9) provide a discussion and attempt the distinction between the two terms by observing that '"network" implies a degree of openness and flux that "community" may not capture'. If everyone who interacts knows one another, or can identify with one another by shared competence or value, Carvalho & Goodyear (2014, p.10) propose that '"community" or "group" is better as a distinctive descriptor.'

Most definitions in academia and organisational life are subject to different interpretations, contention and debate. "Community", "network" and the closely connected "networked learning" are of course no exception. Some definitions of a learning network do include the word "community", such as 'a technology supported community of people who are helping each other to better understand and handle certain events and concepts in work or life' (Koper, 2009, p.6).

Given that CoPs can be networked together, Wenger, Trayner, & de Laat (2011, p.9) prefer to think of network and community as two aspects of a social learning structure. Their interpretation is that both aspects are often present, in a dynamic interplay with each other, but one may dominate:

- *'The **network** aspect refers to the set of relationships, personal interactions, and connections among participants who have personal reasons to connect. It is viewed as a set of nodes and links with affordances for learning, such as information flows, helpful linkages, joint problem solving, and knowledge creation.*

- *The **community** aspect refers to the development of a shared identity around a topic or set of challenges. It represents a collective intention – however tacit and distributed – to steward a domain of knowledge and to sustain learning about it.'*

In describing the gradual evolution of relationships in a CoP, Wenger et al. (2002, p.111) comment that members may initially form a loose network which then progresses to a community with a common sense of identity. Wenger et al. (2011, p.16) also assert that 'in a network individual participants are unlikely to have a very clear awareness of the collective narrative. Their positioning is that a network on the whole does not necessarily have to "learn" even if network members use its contacts for learning.'

There are thus several aspects of different interpretation in the definitions. Wenger-Trayner et al. (2015, p.97) also refer to communities of practice in a simple sense of having the same practice (shared competence or identity), versus a complex sense of 'forming heterogeneous learning partnerships to transform existing practices or create new practices'.

Carvalho and Goodyear (2014, p.10) cite several writers in support of an argument that some may be 'enamored' of the 'communities of practice' label.

An example of this preference appears to be a quite recent systematic review of the literature on innovative capabilities of CoPs in a leading management learning journal, in which the search term 'learning network' was completely absent, and 'networks of practice' were excluded as the authors did not consider these to be CoPs (Pattinson, Preece and Dawson, 2016, p.4). These writers appear to consider the terms "network" and "community" to be exclusive.

In another account with a specific analysis of definitions, Sloep (2016, p.41) concludes that networks are 'essentially different than communities, although the former will contain the latter'. This notion appears to tie up with Brown and Duguid's idea of networks of practice, as networked CoPs. Anderson (2014) provides another insightful and entertaining comparison: 'a network is emergent, bursty, and defined more by connections and activities than by rules, memberships, or authority'.

Whilst acknowledging some of the criticism of existing definitions, Sloep (2016, p.42) also suggests that a learning network can be considered an instance of networked learning, but notably refused to be drawn on a further definition, as 'in my view, the process of concept formation in the field of networked learning has not matured sufficiently yet to do so'.

This research did consider a learning network as an instance of networked learning, where the unit of analysis was the network itself, as 'not everything consequential about a network can be inferred from the experiences of the people who participate in it' and 'not all its qualities can be defined as aggregates of the actions or preferences of individuals' (Carvalho and Goodyear, 2014, p.14). The approach taken embraced the distinction made by Podolny and Page (1998) and cited by Carvalho and Goodyear (2014, p.27) in 2.2 Networked learning. There could be a transformative or organisational learning element in learning networks; a change in which a new synthesis has occurred, in contrast to only the movement or flow of information or knowledge. The network can exhibit a learning quality in itself – contrasting with the positioning of Wenger, Trayner and de Laat (2011) and the more recent Wenger-Trayner and

Wenger-Trayner (2020, p.35), which is that a network is a set of connections which act as a "pipe" or conduit to spread information.

Some of the elements of distinction between community and network that have been discussed thus far in this section can be summarised, as shown in Table 1.

	Community of practice	Network
1.	generalised aim to improve practice and share knowledge in a particular domain, which evolves and becomes more sophisticated over time	task driven (as suggestions of things to do); aims towards an outcome or goal
2.	tends to be more tightly bound; homogeneous; individuals have shared competency, problems or values	tends to be less tightly bound; heterogeneous; individuals may have disparate backgrounds or not know each other
3.	joint sense of identity emphasised; may start out as a network of loosely bound connections	joint sense of identity not necessary; may evolve over time
4.	invitation or membership based on shared practice, from periphery to core	invitation or membership based on problem-solving role or interest
5.	may be networked, or in a 'landscape'	may contain communities

Table 1. Comparison of 'community of practice' with 'network'

In an additional distinction to those discussed above, Lorino (2018) describes the notion of *Community of Inquiry* (CoI) in his consideration of the potential of the Pragmatic approach applied to organisation studies. This is the community that forms when undertaking a Pragmatist Inquiry, after Dewey. Inquiry starts when a particular situation is recognised to be problematic; when there is a feeling of *doubt* or that something is wrong, in a normal or *habitual* situation (Elkjaer and Simpson, 2011; Morgan, 2014; Lorino, 2018).

Two types of Community of Inquiry may then arise, which Lorino (2018) significantly characterises as Community of Practice, and *Community of Process.* A Community of Process is required when 'cross-professional groups of inquirers, whose different views and interests combine to bring a response to the disrupted situation' (Lorino, 2018, pp. 177), in contrast to the more homogeneous Community of Practice.

The distinction is further developed in terms of the homogeneity or heterogeneity of the group:

> *While the learning challenge in communities of practice is about differing (styles of practice) on the basis of sharing (a practice), the learning challenge in communities of process is about sharing (a motive, an existential concern, an explanation, an action plan) in spite of differing (practices). Inquiring participants bring distinct visions of a conjoint collective activity, derived from their diverse professional cultures and functional positions. The non-commonality of practice is not incidental, it characterises the community of process.*
>
> (Lorino, 2018, pp. 178-179)

One example of this within my professional experience is the purchasing process for outsourced IT products in a national airline. Attempting to raise awareness of, and improve the process involved the participation of IT purchasing professionals, technical IT staff, business analysts and the 'customer' department or function in the airline.

Although the term *Community of Process* is not currently visible in the education or networked learning literature, and would likely promote some confusion, the concept is the same as the understanding of learning networks for organisational learning in this research approach, consisting of a *process-driven* intervention as an interconnected grouping of disparate and potentially geographically separated practitioners, united towards a particular outcome or goal.

The working definition of a technology-enabled learning network in this study is therefore as shown in Box B:

a task or process driven technology-mediated intervention, connecting together individuals of disparate backgrounds to learn how to address a specified outcome or goal; the learning may be formal, informal, social, organisational or creative.

Box B. Working definition of technology-enabled learning network

This research is focused on the use of technology-enabled learning networks for *organisational learning, to achieve practical improvement outcomes,* as defined in Box A. An example and discussion of this is provided in the next two sections.

3.1.2 What type of learning happens in technology-enabled learning networks?

In the South African case described in 1.6 Personal and professional experience driving the research, the collaborative learning unfolded over time and was facilitated by the learning network. The learning would not have happened without the technology intervention, and hence was 'technology-enabled' in contrast to 'technology-enhanced'. The learning was emergent, or not predictable beforehand, but was required to achieve the result. The learning was a consequence of collaborative practical action, and the resulting outcomes were evaluated by the participants and stakeholders as improvements to working practice. Hence practical improvement outcomes were achieved, as in the definition in Box A. This type of learning can be characterised as *technology-enabled organisational learning.*

Little is known about how to enact technology-enabled organisational learning to achieve practical improvement outcomes. Current research and the body of expertise being established on learning networks and networked learning tends to be dominated by academic or professional learning, the primary objective being the improvement of knowledge or practice residing in individuals. As previously observed in the case in South Africa, the technology intervention enables disparate participants to share thoughts and actions, and to work together towards some outcome or goal, in ways that were not available previously. The technology can help to evidence the trail of organisational learning and associated artefacts such that it is made visible and explicit. Participants located across different contexts and boundaries within or between organisations can then contribute to the learning process, engage with it as it unfolds, to share and benefit from the results. Further research is required on how this actually happens, in contrast to academic or professional learning which, although often stimulated by networked connections, occurs primarily in the minds of individuals.

It is important to recognise the temporal elements involved in realising practical improvement outcomes, and how long these can take to become apparent. Projects need to pass along an evolution process in which individual and organisational learning gradually unfolds, and improvements or benefits may only be recognised by stakeholders after a period of years.

General examples of practical improvement outcomes which could be contemplated include:

- changes or improvements to working practice
- acquiring shared visibility and understanding of organisational processes and associated guidelines and operating standards
- achieving more efficient / rapid project co-ordination, especially when using temporary consultants or other staff
- problem solving and learning lessons from previous problematic scenarios
- designing and implementing completely new forms of work practice.

Referring to the search for practical improvement outcomes in organisational learning in general, Sannino & Engeström (2017, p.80) identify a current demand for *actionable knowledge* in organisational research. Understood as 'collaborative and generative possibility knowledge intertwined with transformative action', they describe how actionable knowledge is typically sought after in a collaborative fashion with practitioners and other stakeholders. They observe how often 'the methodologically more radical stance of intervention research is omitted or marginalised in calls for engaged scholarship', and describe 'looking in vain' for recent discussions of 'theoretically and methodologically ambitious approaches' in major journals.

Wenger-Trayner *et al.* (2015) refer to 'landscapes of practice'. They call for the 'systems' view necessary to analyse the learning and problem-solving capability of an entire system, using approaches which are yet to be invented. The system may consist of multiple interconnected communities or networks within a complex landscape.

Such a metaphor would appear to apply readily to most public service organisations such as health, policing, education and the OU itself, in which improvements must be considered across many different boundaries in the landscape.

The ability to facilitate organisational learning in Communities of Practice was critiqued by Elkjaer and Simpson (2011). Although the organisational learning concept was transferred as a scholarly response in the literature from the individual "level" to processes of participation in organisational CoPs, this move tended to 'overlook the conservativism, protectionism, and the tendency to recycle knowledge in organizations, rather than critically challenging and extending it' (Elkjaer and Simpson, 2011, p.71), citing Fenwick (2001).

It may have been in response to this type of critique that the thinking behind *Learning in Landscapes of Practice* (Wenger-Trayner *et al.*, 2015) was developed. As explained in the comparison of the notion of "community" and "network" in Table 1 and the following commentary, CoPs have traditionally been conceived of as homogeneous, with a shared sense of identify arising through 'a common set of situations, problems and perspectives' that allows members to share knowledge (Wenger, McDermott and Snyder, 2002, p.25).

Wenger-Trayner *et al.* (2015, p.99) do identify the role of *systems convener* 'for people who forge new learning partnerships in complex landscapes'. A systems convener aims to create lasting change across the boundaries of disparate institutional systems, and to encourage individuals that working together across boundaries is worth their while. The political considerations alluded to by Elkjaer and Simpson (2011) are considered in a discussion of 'leveraging and resisting power to include a diversity of voices' (Wenger-Trayner *et al.*, 2015, p.103) and a recognition of the power dynamics of practice. Boundaries between different practice communities (in this context between students, remote tutors, module teams and learning designers for example) are recognised as sites of potential learning. Power can also be reflected in the different communities and hierarchies of each academic discipline.

Echoing the concerns of Rashman *et al*. (2009) regarding theoretical conceptualisations, it is also worth highlighting some of the issues and tensions surrounding the use of theory by practitioners, and their relationship to it. Theory can sometimes be perceived as something alien, irrelevant or academic by practitioners. In an article on demystifying theory and its use practical improvement programmes in the American healthcare sector, Davidoff *et al.* (2015, p.229) take up this discussion:

> *We also acknowledge that the term 'theory' itself can make people's eyes glaze over, because 'theory' is seen as something abstract, intimidating and irrelevant, especially when their immediate and true concern is the hard work at the sharp end of providing care, rather than theory itself.*

This concern could certainly be reflected amongst educational practitioners, whose true daily concern is to provide good education to their students. As possible 'users' of theory, Davidoff *et al.* (2015) highlight that practitioners are looking for something which directly helps them achieve an improvement, either for themselves, their students, or for a wider group:

> *Put simplistically, improvers—practitioners, managers and others at the sharp end— are interested in theory to the extent that it can help them do their work better. If they want theory at all, it is for its potential in helping them design and implement interventions with the greatest possible impact in their particular context, which is often small and local.*
>
> Davidoff *et al.* (2015, p.228)

Therefore it is the job of researchers to formulate a theory for a specific bounded context, and then to extend that *scope* via successive levels of abstraction so that it can be successfully applied by practitioners to multiple contexts (Urquhart, 2019), in a way that they can readily understand and relate to. In the following section, the 'nuts and bolts' of theory and conceptual frameworks are unpicked, in order to frame the theory-building approach that was required to support practical improvement by practitioners.

3.1.3 What is theory?

In setting out the primary aim and purpose of this research as theory generation, it is worthwhile to consider the nature of theory, its components, and what is practicable to achieve in a PhD study.

Urquhart (2013) provides an informative practical guide and cites the work of Creswell (1998) and Dey (1999) to provide the following starting point:

> *Theory asserts a plausible relationship between concepts and sets of concepts.*
>
> Urquhart (2013, p.5)

The consideration of concepts and how they are related together is fundamental to theory building and assertion. This is the case in both qualitative and quantitative social science research traditions. Urquhart (2013, 2019) cites Gregor (2006) in identifying four components of theory:

1. means of representation
2. constructs or concepts
3. statements of relationship
4. scope

All theories must have some way of being represented, whether in 'words, mathematical terms, symbolic logic, diagrams, tables or graphically' (Urquhart, 2013, p.6). Constructs or concepts define the phenomena of interest in the theory. Statements of relationship indicate the relationship between constructs, which may be of many different types, such as associative or causal. Finally, scope specifies the degree of generality of the theory and the limits of that generality. Grounded theory method aims firstly to produce theory within a specific bounded context or empirical area, and then employs specific techniques to extend the scope and generalisability of the theory into a substantive area and from there into multiple contexts (Urquhart, 2019). Once the theory extends across multiple contexts, it can be considered to be

composed of formal concepts, to assert formal theory. At each level of generalisation, the relationships between concepts become more abstract and less context dependent. Therefore, it is important to realise that formal theory concepts 'are not underpinned by high empirical content', (Urquhart, 2013, p.5) although their origin arises from empirical data.

At this introductory stage it has been sufficient to introduce the basic "building blocks" or components of theory, in order to set a backdrop for a literature review of the current theoretical landscape in the specified research context of collaborative problem-solving activity within Higher Education distance learning.

In the specific field of technology-enabled learning networks and networked learning, as previously observed, the process of theory and concept formation is still in an immature state, with an acknowledgement that there is much more work to be done (Sloep, 2016).

Thus this research makes a response to the identified concerns and observations (Rashman, Withers and Hartley, 2009; Davidoff *et al.*, 2015; Wenger-Trayner *et al.*, 2015; Sloep, 2016; Sannino and Engeström, 2017) by theorising the organisational learning involved in seeking practical improvement outcomes in public service, using technology-enabled learning networks.

More research is required on *how* learning technology can support practitioners in the unfolding or emergent process of organisational learning required to achieve practical improvement outcomes. This gap applies especially when those practitioners are disparate, such as the complex web (Fresen and Boyd, 2005) of practitioners involved in the design and delivery of distance learning. Practitioners could be spread across the different contexts and boundaries of an organisation, and geographically separated as in the case of a complex distance learning institution. Each practitioner may therefore have a restricted view of the entirety of a complex problem area, and it may be challenging for practitioners to identify and articulate the nature of complex challenging issues. The challenge has become magnified since the changes in working patterns induced by the Covid-19 pandemic, which forced the geographical separation of teams, and severely restricted travel capabilities for face-to-face meetings.

The research sought a new conceptual framework that needed to be usable by practitioners whilst being sufficiently theoretically robust for scholars (Coghlan, 2019). In this way the research aimed to make an original contribution to the call for *actionable knowledge* (Sannino and Engeström, 2017) in organisational research. This meant using a collaborative, equitable and rigorous action-oriented and theory-building process approach, which aimed to achieve measurable impact and could be implemented or adapted elsewhere.

The next section will review three existing relevant conceptual frameworks in the literature that were considered, to guide an unfolding process of organisational learning. It will show how these were compared to justify a new framework and to identify its characteristics.

3.2 Existing relevant conceptual frameworks in the literature

Since the process of concept formation is still in an immature state in the field of networked learning (Sloep, 2016), this means that concepts, conceptual frameworks and definitions are developing all the time. At the outset, it was recognised that current frameworks in the literature should be explored to assess their suitability for investigating the unfolding process of organisational learning required to achieve practical improvement outcomes. The required framework also needed to support the collaborative seeking (in the present tense) of improvement outcomes in an active and practical way, during the research.

3.2.1 Identifying existing relevant conceptual frameworks in previous research

In previous research work to this PhD project, a learning network was established to seek a defined goal, of investigating the impact of student-made videos on student engagement in a Masters programme at the OU (Boyd, 2017). The technical platform for the learning network was a normal VLE course website. This was chosen because it is very familiar to OU staff, available at no additional cost, and secure and confidential for discussing matters relating to OU internal practice and improvement.

A standard VLE discussion forum was used to facilitate an action research cycle (see 3.2 Existing relevant conceptual frameworks in the literature below) of constructing issues, planning, taking action and evaluating. Supporting resources were provided to support the discussion as appropriate.

In this previously completed research, Boyd (2017) identified three existing conceptual frameworks currently being used in networked learning research and the literature. These were:

- a conceptual framework for 'promoting and assessing the value of learning enabled by community involvement and networks' deriving from Communities of Practice literature (Wenger, Trayner and de Laat, 2011)
- the Cultural Historical Activity Theory (CHAT) framework, as described in Yrjo Engeström's theory of expansive learning (Engeström, 2001)
- an activity-centred analysis and design framework (ACAD), which has been formulated specifically for learning networks (Carvalho and Goodyear, 2014).

The frameworks were compared pluralistically with each other via a series of categories that were identified as common across the frameworks. This initial comparison table is shown in Appendix A. Initial comparison of the three frameworks.

The frameworks were identified because they have all been previously applied to the research of technology-enabled learning networks, and explicitly depict the collaborative activity of individuals coming together to work towards some purpose, to produce some outcome. Collaborative activity is a key aim in this research. The chosen frameworks could be contrasted with other psychological, socialisation or organisational learning theories concerning conceptual systems, structures, politics and institutional forms of memory (Illeris, 2009), which are not relevant to exploring and supporting collaborative activity.

Boyd (2017) analysed learning network interactions deductively using the common categories identified in Appendix A. The data analysis concluded that they are indeed descriptive tools which could help to analyse component parts and critical success factors necessary in a learning network environment, such as social relationships and the role of artefacts or tools. There was, however, an alternative way of interpreting discussion forum data, which was then analysed in a second inductive phase. It appeared that the frameworks were still not adequate in identifying the social mechanism of interactions by which the learning happens. The data analysis, albeit limited to an individual learning network, suggested some justification for a new conceptual framework, potentially embracing a narrative based series of events which represent the collaborative social mechanisms by which technology-enabled organisational learning may occur. Understanding social mechanisms is a key aspect of the comparison and justification for a new framework.

The understanding of social mechanisms will be developed later in this Literature Review, and discussed after the existing conceptual frameworks have been further discussed and compared.

Both Communities of Practice (Wenger, 1998) and the CHAT framework and theory of expansive learning (Engeström, 2001) were previously existing theories that have been highly influential in the networked learning domain. The ACAD framework was formulated specifically for networked learning. Therefore all have a very close historical association.

The diagrammatic representations of the frameworks are reproduced in Figures 4 - 7, in the following sections. Each framework will be described and critically assessed, in order to develop and build up the picture and justification for searching for a new conceptual framework, within an interdisciplinary study.

3.2.2 Communities of Practice: Value creation in communities and networks

The first framework that was critically assessed was derived from the literature on Communities of Practice (CoP). Wenger et al. (2011) built a framework identifying cycles of value creation. A key criteria for success for a CoP is that it should provide value for its participants (Wenger, McDermott and Snyder, 2002). This practice-based framework was developed to chart the stages involved in the generation of that value over time, and to provide participants and stakeholders with a way of evaluating and assessing that value. This framework is the closest in the CoP literature to support an unfolding process of learning in pursuit of an outcome or goal, as a result of collaborative activity.

Wenger et al. (2011) identified five cycles of value creation, depicted in Figure 4 and Figure 5 below. The framework was based on creating evidence of value, using an appraisal carried out after the fact, or after the activity has taken place. It was originally adapted from the four-level training evaluation model of Donald Kirkpatrick (Kirkpatrick Partners, 2022). Therefore it was initially developed as an evaluative model that asks participants to retrospectively consider and reflect on value that has been created, within a series of cycles. Wenger-Trayner & Wenger-Trayner (2020, p.54) have recently confirmed this as their current position, in that 'as learning theorists, we look at value creation in historical terms'.

The framework shows that community or network interactions produce immediate and potential value in the form of artefacts, relationships or insights (Cycles 1 and 2). It is only when these are used or implemented that they become applied value, for example in a new practice (Cycle 3). However even applied practices do not necessarily lead to achievement of what matters to stakeholders. It is important to measure and evaluate to decide whether or not a practical improvement outcome has been achieved (Cycle 4), and then to critically reflect upon it (Cycle 5).

Wenger et al. (2011) suggest a series of key reflective questions and performance indicators to assess the improvement in each cycle. They also emphasise the importance of 'stories', or narratives, their view being that the value and learning can be identified and assessed by collecting and interpreting the individual narrative stories of the participants in the network.

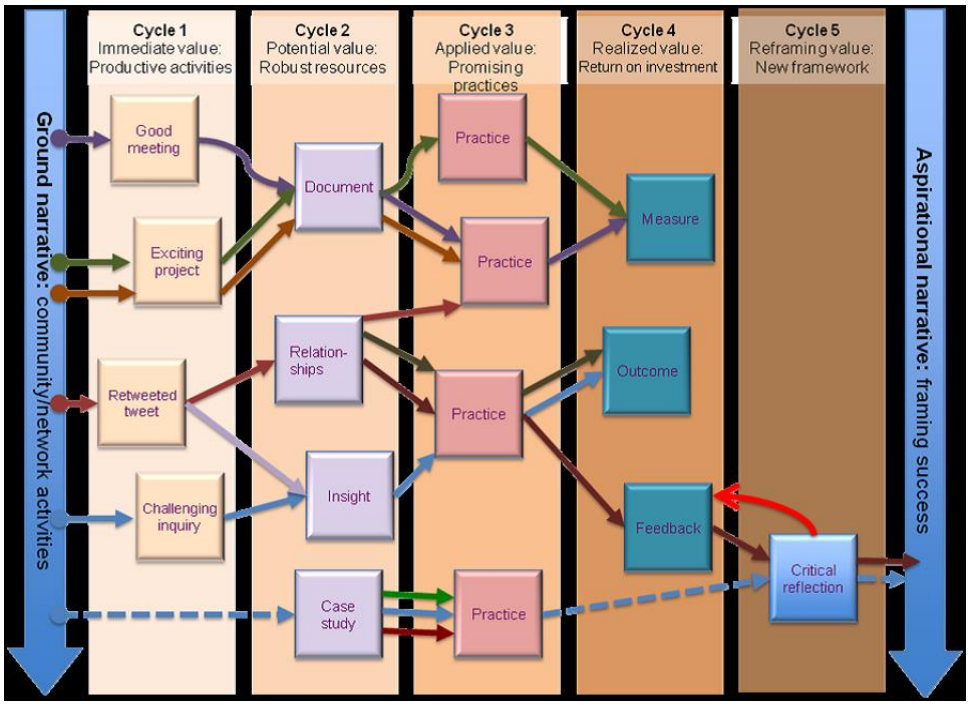


Figure 4. Value creation matrix.

Source: Wenger, Trayner and de Laat (2011).

In Figure 4, the squares represent indicators, and the coloured lines represent the trajectories of stories through the cycles. Dotted lines represent the use of proxies for, and assumptions about, value creation. The red backward arrow represents a reconsideration of success, or critical reflection of an outcome indicator (Wenger, Trayner and de Laat, 2011).

The diagram was later revised to embrace amendments including the identification of several different types of applied value. The critical reflection arrow in Cycle 5, closing the feedback loop, was taken back to the measurement of the outcome. This is illustrated in Figure 5.

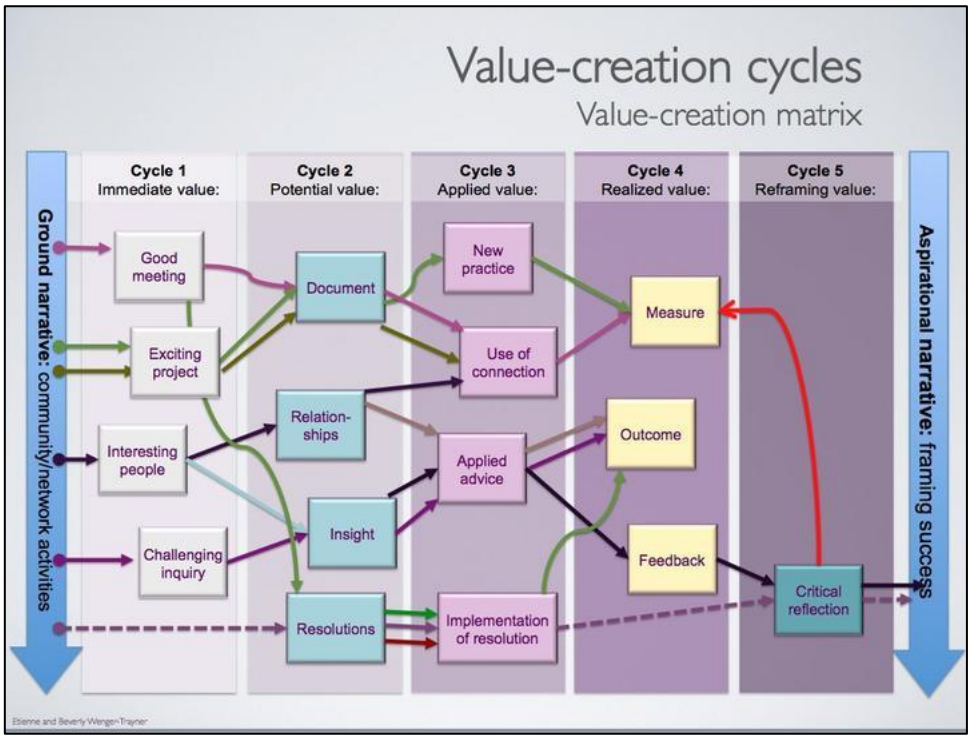


Figure 5. Revised value creation matrix.

Adapted from Wenger, Trayner and de Laat (2011).

Wenger-Trayner (2014) then developed the matrix, introducing several other concepts, to make it more forward-looking, as opposed to retrospective. The first concept they introduced was 'learning loops', which are feedback loops about how things work in practice, or not. Wenger-Trayner (2014) asserts that these are a key element of learning. They take place across the cycles, as illustrated in Figure 6.

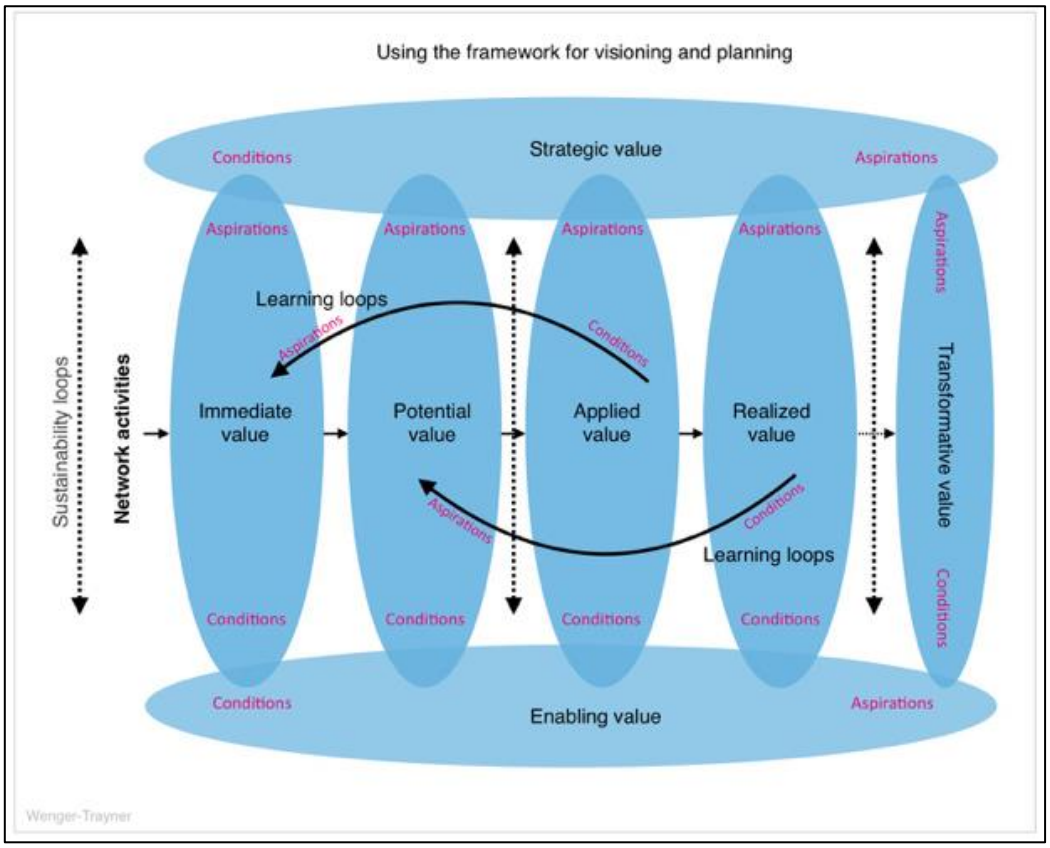


Figure 6. Value creation framework. Source: Wenger-Trayner (2014)

The second concept was that of using the framework prospectively for the visioning and planning of network activities. Within each cycle, an invitation is made to network participants and stakeholders to identify 'aspirations' for that cycle, and what 'conditions' would need to be in place. The third additional concept was that of strategic value and enabling value, taking account of the strategic context of the network and the resources provided for it. Finally, transformative value was added, to indicate a broader effect than realized value, such as a change to policy, institutional change, or individual empowerment. Wenger-Trayner and Wenger-Trayner (2020, p.118) recently confirmed that what they call transformative value 'doesn't always happen – perhaps even rarely'. They characterise it as the 'most conducive to stimulating innovation or opening new possibilities' (Wenger-Trayner and Wenger-Trayner, 2020, p.122). However, they explain that it can also be the most controversial, as it can challenge the status quo, and 'likely to run into systemic inertia, hierarchical tensions, or cultural resistance' (Wenger-Trayner and Wenger-Trayner, 2020, p.122).

All of these refinements indicate that the VCF framework was developed quite substantially from the previous VCM. Although some of the illustrative detail from each cycle has been lost, the new framework is more focussed more on prospective planning for stakeholders and participants, in addition to assessing value created.

However, this framework is still predicated on planning and evaluation, based on aspirations and 'stories' from participants, rather than a rigorous methodological approach to carry out and support the unfolding *process* of collaborative organisational learning required to achieve practical improvement outcomes.

3.2.3 Cultural Historical Activity Theory

The second framework that was critically assessed was Cultural Historical Activity Theory (CHAT), as described in Yrjo Engeström's theory of expansive learning (Engeström, 2001).

Engeström (1987) graphically expanded Lev Vygotsky's original model of the cultural mediation of actions developed in the Soviet Union, into a model of a collective human activity system (Illeris, 2009). This model is illustrated in Figure 7. Activities are carried out by subjects towards *objects* which provide the motivation or purpose for the activity, and which may be subject to interpretation and ambiguity. Outcomes are produced, with the support of tools or mediating artefacts, in the context of a wider community with its associated rules and divisions of labour. Engeström and Sannino (2010, p.6) clarify:

> *Community comprises the individuals and subgroups who share the same general object. Division of labour refers to horizontal division of tasks and vertical division of power and status. Finally rules refer to the explicit and implicit regulations, norms, conventions and standards that constrain actions within the activity system.*

Montoro (2013) highlights that in activity theory:

> *human activity (as opposed to non-human activity, such as that of animals and machines) is mediated by artefacts, which are culturally, historically and socially produced and reproduced, by means of complex and multidimensional relationships.*
>
> (Montoro, 2013, p. 53)

The unit of analysis is the complete activity system. It is important to emphasise the point that the system is considered as a whole and is analysed in its entirety. It is shown in Figure 7.

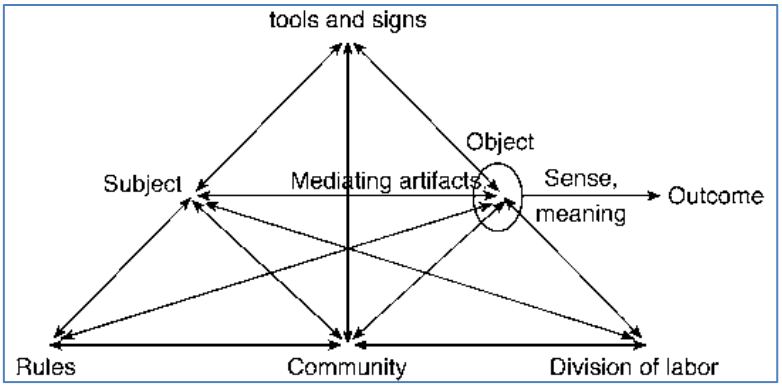


Figure 7. CHAT framework. Source: Engeström (2001, p.135)

Montoro (2013) provides a helpful comparison of *activity*, *actions and operations*, understood as a hierarchy in activity theory. *Actions* are goal-directed, of finite time, and help to realise activity towards an *object* or motivation. Activity is understood to be recurrent or cyclical. *Operations* are understood to be routine methods for accomplishing actions. Using a tribal hunting example from Leont'ev, both Engeström and Sannino (2010) and Lorino (2018) explain how division of labour in a community can lead to the separation of action and activity.

If a hunting tribe have an overall *object* to find food and feed the tribe, they may divide their hunting labour into 'drum beaters' and 'hunters'. The drum beaters beat their drums to frighten the prey into the path of the hunters, who then perform the kill. Time-bound actions are drum beating and firing arrows to kill prey, but undertaken within a cyclical activity of finding food for the tribe. If environmental conditions change, the drum beaters and hunters may therefore need to seek to adjust their entire activity system in order to improve their outcomes.

Engeström (2001, p.133) poses four questions that 'any theory of learning must answer':

1. *Who are the subjects of learning – how are they defined and located?*
2. *Why do they learn – what makes them make the effort?*
3. *What do they learn – what are the contents and outcomes of learning?*
4. *How do they learn – what are the key actions or processes of learning?*

Engeström used the learning theory of Gregory Bateson, a cyberneticist, to help introduce the notion of conflicts, or *contradictions*, which were absent in Vygotsky's framework (Illeris, 2009). This notion became one of the *five principles* of 'third generation' activity theory. Contradictions are 'historically accumulating structural tensions within and between activity systems' (Engeström, 2001, p.137). Contradictions can drive change, development and radical transformation of actions within the system, or between interrelating activity systems, into new forms of activity which is referred to as *expansive learning.*

Engeström (2001) provides a matrix, or analysis grid. This comprises of the four questions about learning above, cross-tabulated with the five principles to analyse the various aspects of expansive learning. The CHAT framework and the matrix are then typically used to describe and analyse the learning situation, charting the journey towards expansive learning, driven by historically developing contradictions in the activity system.

Bell & Thorpe (2013, p.85) highlight how the choice of theory, and the concepts within it, will shape the method, unit of analysis, data collected, and 'ultimately the kind of knowledge you're able to develop'. This is a fundamental observation about the use of theory, and how it frames a research project. Thus, starting with the CHAT framework will lead to identifying subjects, objects, aspects of the community and how it is organised, mediating artefacts, then identifying historically developing *contradictions* at activity system level as sources of change, development and *expansive learning*. Murphy (2019) provides one interesting example of this in a study of 'Learning from Incidents', which explores expectations and contradictions from safety incidents in the energy sector.

The temporality of the historical development and evolution of activity systems and associated contradictions and possible expansive learning can be contrasted with the temporal aspects of a series of progressive value-adding stages such as the Value Creation framework, or with a series of actions taken within an unfolding and emergent *process*. All three are different ways of dealing with and accounting for time.

Activity theory has been extensively applied to technology-enhanced learning environments. Murphy & Rodriguez-Manzanares (2008) provide one example of a review of activity theory studies. CHAT does therefore provide an established and influential systems framework within which to analyse culturally situated collaborative activity and learning towards the achievement of practical improvement outcomes. The learning mechanism is driven by historically developing contradictions over time at activity system level. Recognition of this learning therefore does usually require facilitation by a skilled intervention research team, frequently using face-to-face workshops or 'Change Laboratories'. See Sannino and Engeström (2017), and Englund and Price (2018) for examples.

3.2.4 Activity Centred Analysis and Design Framework

The third framework that was critically assessed was formulated specifically for learning networks and networked learning. It is called Activity Centred Analysis and Design Framework (ACAD) (Carvalho and Goodyear, 2014).

In this framework, co-configured *tasks* (suggestions of things to do), lead to *emergent activity* in pursuit of outcomes, as illustrated in Figure 8. The notion underpinning this framework is that human activity and experience are key to understanding learning.

Carvalho and Goodyear (2014) provide an extensive account of some of the current and historical literature and ideas on learning networks, but interestingly do not refer to activity theory at all, or the theory of expansive learning. They do build on the fundamental observation of Wenger (1998) to put forward that 'learning networks cannot be designed, only designed *for* (Carvalho and Goodyear, 2014, p.11, emphasis in original[1]). This observation does underscore that the type of learning and activity in this framework is emergent, and not predictable beforehand. However, the customarily adopted definition of networked learning, from which this framework arose, restricts itself to formal rather than organisational learning (Networked Learning Editorial Collective (NLEC), 2021).

[1] Carvalho and Goodyear (2014) use this phrase without attribution to Wenger (1998) on p.11: 'As we will argue below, networked learning cannot be designed – it can only be designed *for*'. Later, on p.240, and in at least one subsequent paper, they do attribute correctly that *learning*, [as opposed to *learning networks* or *networked learning*], 'cannot be designed, only designed *for',* to Wenger (1998, p.229). However, the first time, they do not. Subsequently Sloep (2016) concludes that 'In the words of Goodyear and Carvalho, learning networks cannot be designed, only designed *for*'. Thus Carvalho and Goodyear (2014) and then as a result Sloep (2016) appear to have made the attribution error.

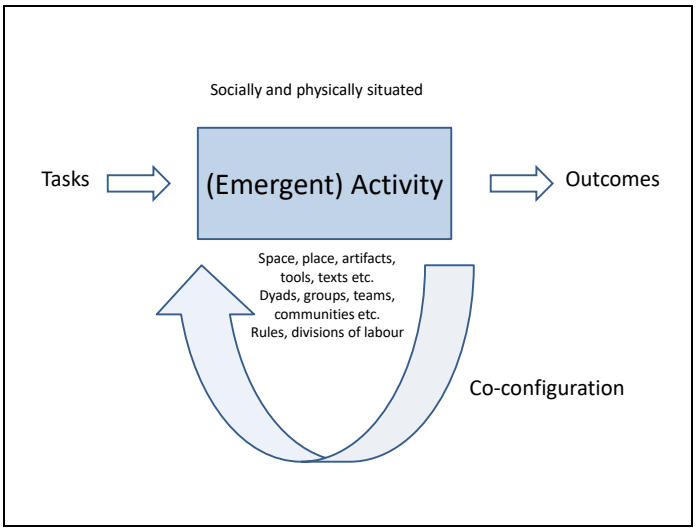


Figure 8. Activity-centred analysis and design framework.

Source: Adapted from Carvalho and Goodyear (2014, p.18)

Although not explicit in their framework diagram, Carvalho and Goodyear (2014) distinguish between three aspects of *design* for learning networks, using a theatrical analogy. These are the *epistemic,* the *set* and the *social*. The *epistemic* aspect relates to the script of a play, (or list of suggestions of things to do), the *set* to the stage set of the production, equivalent to the design of a learning network interface, and *social* to the social relationships and interactions amongst the actors. Sloep (2016) concludes that these distinctions should guide learning network design activities. Sloep (2016) expanded this framework, in a book chapter entitled *Design for Networked Learning.* Both the original ACAD and the Sloep (2016) framework appear to be of less overall utility or sophistication in conceptualising the detailed process and mechanisms involved in a learning network designed for organisational learning. In a subsequent paper aiming to clarify the core purposes and distinctive qualities of ACAD compared to other design frameworks, Goodyear, Carvalho and Yeoman (2021, p.460) confirmed that 'ACAD scaffolds analysis and design work by drawing attention to selected sets of phenomena, and their relationships, without specifying a sequence or process to follow'.

In his keynote address at the 2017 Association for Learning Technology (ALT) conference in Liverpool, Peter Goodyear did however emphasise the need for understanding social mechanisms: 'there is no substitute for an understanding of causes, mechanisms, and how things actually work' (Association of Learning Technology, 2017). Goodyear proposed that there has been too little research generally on 'the actuality of learning activities and the actual interweaving of activity, tools, language etc'. The next section will therefore unpick the notion of mechanisms more closely, before returning to and concluding the critical comparison of the three identified frameworks.

3.3 The role of mechanisms

Social mechanisms have formed a significant focus in social science research in recent years, including the perhaps unsurprising observation that 'confusion abounds as to what exactly a mechanism is' (Gross, 2009, p.359). It is therefore prudent at this point to introduce the fact that there are various terms found in the literature regarding mechanisms, including *social mechanisms*, *theory mechanisms* and *organisational learning mechanisms*. This section will review these terms in general and with specific reference to the mechanisms found in the identified frameworks, and conclude with a critical comparison of these mechanisms.

Gross (2009) reviewed the existing accounts of social mechanisms and identified four points on which there is consensus amongst authors:

1. Social mechanisms are causal in that they mediate between cause and effect.

2. Social mechanisms unfold in time.

3. Social mechanisms are general, although in varying degrees.

4. Because a social mechanism is an intermediary process, it is necessarily composed of elements analysed at a lower order of complexity or aggregation than the phenomenon it helps explain.

All these points of consensus do appear to support the notion of mechanism by which an unfolding *process* of organisational learning might happen, moving from a challenge or problem area to seek, or learn how to address, a specified outcome or goal. That is, moving in some sense from a cause (problem area, or challenge) to an effect (practical improvement outcome). There is consensus that mechanisms unfold over time, and that they can be broken down into a series of elements, which when aggregated together, help to explain the higher order process.

Gross (2009) then integrates the four points to advance a working definition:

> *A social mechanism is a more or less general sequence or set of social events or processes analyzed at a lower order of complexity or aggregation by which—in certain circumstances—some cause X tends to bring about some effect Y in the realm of human social relations. This sequence or set may or may not be analytically reducible to the actions of individuals who enact it, may underwrite formal or substantive causal processes, and may be observed, unobserved, or in principle unobservable.*
>
> (Gross, 2009, p.364)

This working definition of a social mechanism provides a useful initial qualifier as to the type of mechanism which is being sought in this research.

Developing his Pragmatist understanding of social mechanisms, Gross (2009) also highlights the notion of *habitual* routines versus creative responses to problematic situations, (Elkjaer and Simpson, 2011; Morgan, 2014; Lorino, 2018).

Social mechanisms can be also characterised as:

> *composed of chains or aggregations of actors confronting problem situations and mobilizing more or less habitual responses', ie habitual or novel/creative response*.
>
> (Gross, 2009, p.368)

This point emphasises that mechanisms are not just composed of processes or events, but also the individuals or actors who are enacting them - they are *social* – whether in a habitual or problem-solving or learning situation.

This general working definition of a social mechanism can then be situated within the organisational learning and development literature. O*rganisational learning mechanisms* (OLMs) are identified as 'planned organisational structures and processes that encourage dynamic learning, particularly to enhance organisational capabilities' (Coghlan and Brannick, 2014,p.86) and see also Lipshitz, Friedman and Popper (2007); Shani and Docherty (2008).

Insider action research is identified as one way to contribute to the development of these new or enhanced organisational *capabilities*, which enable an organisation or working group to learn and problem-solve (Coghlan and Shani, 2008). As highlighted earlier in this Literature Review, this problem-solving capability across an entire organisational system was also called for by Wenger-Trayner *et al.*, (2015), using approaches that they identified were yet to be invented.

Three different types of OLMs are identified:

- Cognitive – use of language, symbols, theories, values and concepts
- Structural – organisational, physical and technical infrastructures
- Procedural – institutionalised procedures that promote and support learning

Insider action research also embraces three different practices to respectively embrace individual learning and inquiry, learning and inquiry in a working group, and learning for an organisational or impersonal audience, i.e. those who were not directly involved in the inquiry project (Coghlan and Brannick, 2014). These different practices are called *first-person, second-person* and *third-person* practice. They have been related to these *organisational learning mechanisms* by Coghlan & Brannick (2014) and set out as follows.

Firstly, *cognitive* OLMs relate to the cognitive processes happening at individual or *first-person* action research level, in using language, symbols, theories, cultural values and concepts in participants' individual learning. *First-person* action research practice allows an individual to reflect on their own practice, assumptions, desires, cultural dispositions and what they are learning. Cognitive OLMs provide the conceptual, linguistic or cognitive apparatus for individuals to learn in an organisational context (Coghlan, 2019).

Thus the *cognitive* OLM in this research context refers to *first-person* changes that happen in individual learning network participants as they engage in collaborative problem-solving and improvement. They may ask questions of themselves and their own motivation to participate such as:

is my participation and time worth it?

will it benefit the students?

will my voice be heard?

what have I learnt?

Secondly, *structural* OLMs relate to organisational, physical and technical infrastructures that support learning. This relates to *second-person* action research level, or the immediate working group. *Second-person* action research practice underpins a group's ability to investigate and work with others in the group on issues of mutual concern. In this distance learning research context, the working group is the module team, tutors, staff tutors, students, and any supporting staff who are supporting the students or the module, including learning designers. A VLE learning network site for a particular module, using a learning technology infrastructure as in the previous research conducted by Boyd (2017), is an example of a structural OLM. This means it is part of the organisational, physical and technical infrastructures that support learning, and relates to the *second-person* action research level, or the immediate working group. So the VLE learning network site is the infrastructure – or *space* – where the working group can investigate and work with each other on issues of mutual concern.

Thirdly, *procedural* OLMs relate to institutionalised procedures that promote and support learning, beyond the original working group. These relate to *third-person* action research practice, facilitating involvement of those beyond the original *second-person* working group. Coghlan and Brannick (2014, p.7) observe that *third-person* is 'impersonal', in that it disseminates and extends the findings to those not personally involved in the original project.

The final term found in the literature regarding mechanisms is *theory mechanisms.* In writing about mechanisms in 'theoretically informative [quality] improvement research', Kislov (2019) makes a helpful theoretical illumination that:

> *when analysing empirical data in a theoretically informative way, it is crucial to move beyond simply cataloguing different contextual factors towards exploring how these factors work together, mediating QI* [*Quality Improvement*] *outcomes.*
>
> Kislov (2019, p.178)

This point refers to the notion of concepts being *related* together, as explained by Urquhart (2013) in the Introduction. Kislov (2019) points out that a theoretically informative approach implies a *dialogue* between the theoretical and the empirical. If we move beyond the mere cataloguing of factors as prompted by particular theoretical frameworks, then:

> *Broader categories or themes are identified, bringing together multiple contextual factors and highlighting generative mechanisms through which improvement interventions lead (or do not lead) to intended outcomes.*
>
> Kislov (2019, p.178)

Kislov (2019) therefore highlights the vital connection between empirical analysis of mechanisms and the route by which improvement interventions lead (or not) to intended practical improvement outcomes.

Finally we return to Gross (2009) who identifies the need for theory to establish new conceptual language and vocabularies for thinking about problems, and for identifying processes and dynamics that have implications for challenges which may be fragmented or spread across organisational boundaries:

> *Finally, sociological theory is needed to establish new and fruitful conceptual vocabularies for thinking about problems and to identify previously unrecognized social processes and dynamics that have ramifications across empirical domains*'
>
> (Gross, 2009, pp.375-376).

Social mechanisms including theory mechanisms and organisational learning mechanisms are thus a recognised and developing concept in both the social science and organisation studies literature. Although there may be many different literature definitions, the concept helps to illuminate what might be a complex path which can unfold in time, through a kaleidoscope of different factors.

The interdisciplinary understanding of social mechanisms in this technology-enhanced HE distance learning design and delivery context, to develop organisational learning capabilities within a theory-building and action research approach, is summarised in Figure 9.

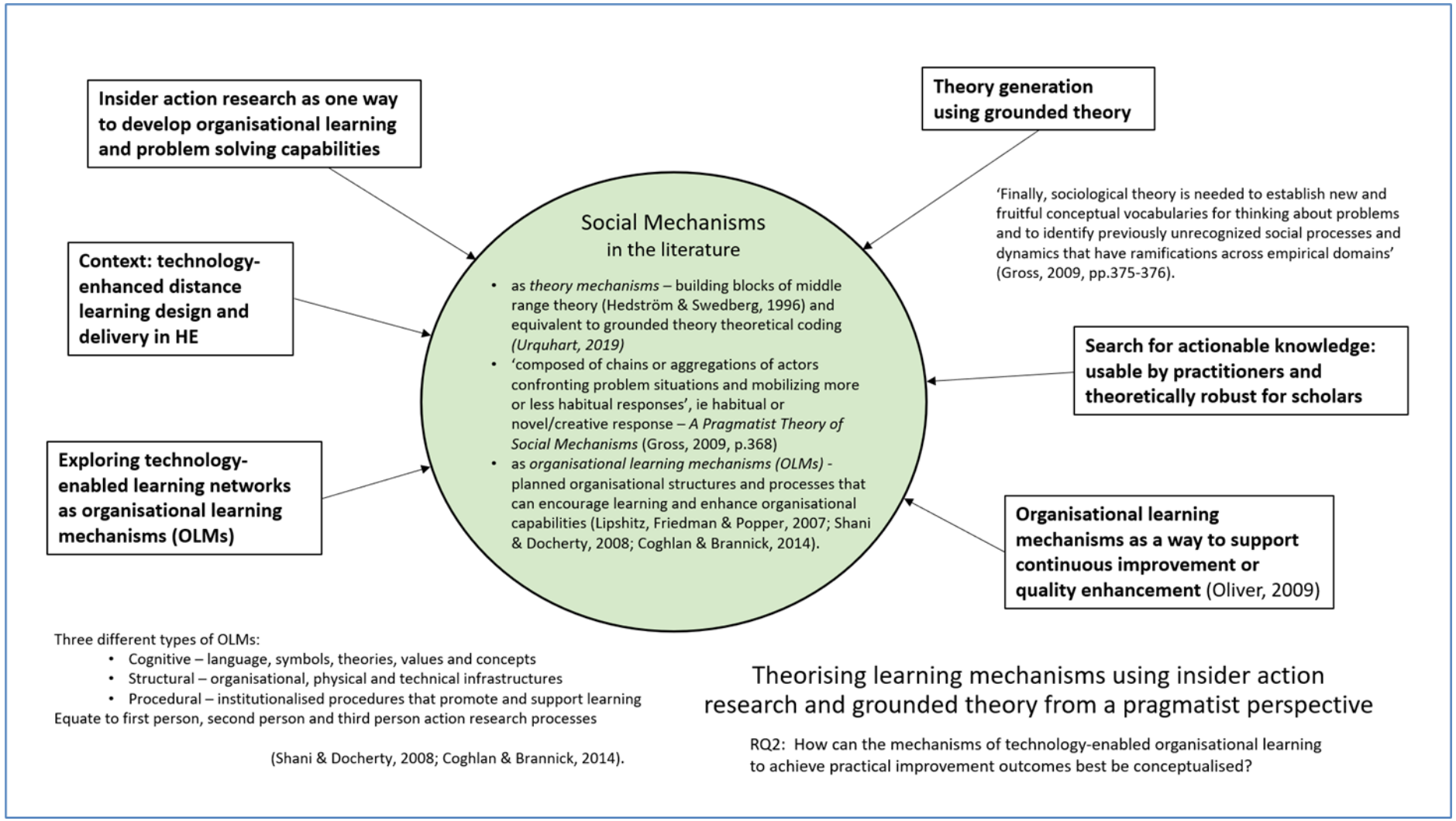


Figure 9. Theory building, action research, and organisational learning mechanisms in a distance learning design and delivery context

Social mechanisms can therefore provide a mediated causal link between a problem or challenging situation and a practical improvement outcome. To conclude this consideration of the role of mechanisms, the mechanisms evident in each one of the three identified conceptual frameworks will now be discussed.

In the ACAD framework, the mechanism is that co-configured emergent activity arises between tasks, or suggestions of things to do, and outcomes. This is driven by interactions between the 'epistemic, set and social' aspects of the learning network design (Carvalho and Goodyear, 2014). However, the detail of the mechanism is not conceptualised beyond this.

The VCM or VCF framework does illustrate a mechanism as the actual interweaving of activity, tools and language in an unfolding sequence of events. The mechanism is that community or network activities are carried out with an aspiration to improve practice, and then modelled from a planning and evaluation perspective to understand how value is added from these activities at successive stages. This framework may well be of use at the reflection and evaluation stages of this research. However, it does not present as a rigorous methodological approach to enact and conceptualise all the detailed stages in a forward-looking process of collaborative organisational learning required to achieve practical improvement outcomes.

In the CHAT framework, which has a very strong theoretical base and historical tradition, the mechanism is modelled at activity system level. It is driven by interactions between different aspects of the activity system, motivated towards the *object. Expansive learning* may be achieved through resolving historically accumulating structural tensions or *contradictions* within or between activity systems. However, this framework does not directly illustrate or conceptualise the actual interweaving of activity, tools, and language in an unfolding *process* or sequence which could be followed by practitioners; the emphasis is on understanding interactions and tensions between the elements at activity system level.

It is possible that the 'excessive emphasis' on system and the 'magic triangle' of the activity system representation risks foregrounding the structural elements of this system 'to the detriment of a processual dimension' (Nicolini, 2012, p.120). The theory is also not readily applicable or understandable by practitioners, and somewhat disconnected from their day-to-day reality. It requires facilitation by a skilled intervention research team.

3.4 Summary of extended comparison of the three frameworks

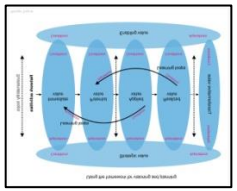
As previously observed, all these frameworks have significant, evolving and expanding historical traditions, albeit over different time periods of development. They are all produced by thought leaders in their respective fields: of communities of practice, of cultural historical activity theory, and of formal educational or professional networked learning. Why then the search for a new framework and why not refine, adapt or extend one of them?

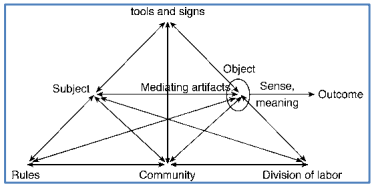
The answer is summarised in the extended comparison table, illustrated in Table 2 overleaf. This table further develops the initial comparison table produced in the earlier research by Boyd (2017), and illustrated in Appendix A. The initial comparison table made a pluralistic comparison of the three frameworks based on six concepts which were identified as common across the frameworks:

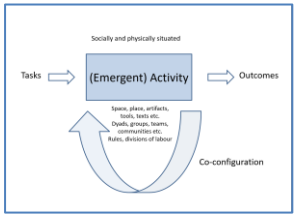
- object (in the sense of purpose, or what is being aimed for)
- social relationships
- artefacts, or tools
- identification of improvement
- outcome
- unit of analysis

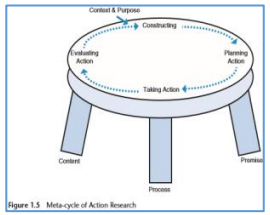
Table 2 reflects the additional critical comparisons discussed in this section, and the conceptual 'gap' in the existing frameworks when applied to organisational learning. The last column of Table 2 is therefore used to summarise the particular characteristics of the conceptual framework that was sought, which reflects the focus of this research. It is important to note that these characteristics do not form a new deductive framework in themselves, but rather a warrant for seeking to conceptualise the new framework, as follows:

1. the explicit **purpose or *object*** is to resolve a problem or address a challenge in which improvement is sought; even if this is or has been difficult to define
2. **social relationships** will be explicit; participants are invited to the learning network on based on their problem-solving role or interest
3. the role of **tools, *mediating artefacts* or resources** will be explicit
4. the **identification of a possible improvement** will be explicit as an intermediary step in the cycle towards achieving a practical improvement outcome
5. the **outcome** will [or will not] be a practical improvement outcome which is an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders
6. the **unit of analysis** will be the learning network for the problem situation as a whole
7. the **learning is driven by** a structured problem-solving *process* or learning *mechanism*
8. **transformation** will be possible as emergent or unpredicted organisational learning, where organisational learning is understood to be 'a process of individual and shared thought and action', (Rashman et al. 2009, p.470).
9. **facilitation** is initially by a dedicated researcher. However the process should be capable of facilitation by practitioners with little or no specialist research methodology expertise, but with the proposed learning network guidelines to assist them.
10. **temporality** is indicated by an unfolding series of activities which may take significant time to yield outcomes, for example over several years.









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	Value Creation Matrix / Framework (VCM/VCF) Wenger *et al.* (2011)	Cultural Historical Activity Theory (CHAT) Engeström (2001)	Activity centred analytic framework (ACAD) Carvalho and Goodyear (2014)	New conceptual framework
Object (in the sense of purpose; what is being aimed for)	Not explicit in VCM; implicit in 'resolution' as 'potential value' and 'implementation of resolution' as 'applied value'. Explicit in VCF as 'aspiration'	Object foregrounded as mutual aim of the activity system, and motivation for joint effort to achieve an outcome.	Task driven, as an 'epistemic' set of suggestions of things to do.	Purpose is to resolve a problem or address a challenge in which improvement is sought
Social relationships	Identified in Cycles 1& 2 as 'immediate value' and 'potential value'	Explicit; identified via rules, community and division of labour	Explicit; identified as dyads, groups, teams, communities, roles and division of labour	Explicit; participants are invited to network on based on problem-solving role or interest
Role of artefacts	Identified in Cycle 2 as 'potential value'	Explicit; identified as tools or mediating artefacts	Explicit; identified as artefacts, tools or texts	Explicit
Identification of improvement	Explicit; identified in Cycle 3 as 'applied value'	Not explicit; identified in narrative after application of model	Not explicit; identified in narrative after application of model	Explicit; identified as an intermediary step in the cycle towards achieving a practical improvement outcome

Table 2. Extended comparison of the three frameworks and justification for a new framework

Outcome	Achieved in Cycle 4 as 'realised value'	Explicit; what is achieved as a result of activity to pursue the object	Explicit; tasks lead to emergent activity which produces outcome	Practical improvement outcome, which is an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders
Unit of analysis	Community or network	The activity system, or multiple interrelating activity systems	The network, as 'not all its qualities can be defined as aggregates of the actions or preferences of individuals'	The problem situation as a whole, including the *second-person* working group or learning network for the particular challenging situation
Learning driven by	Driven by activities with aspiration to improve practice, then evaluated through 'learning loops'	Driven by interactions between various aspects of the activity motivated towards the object and through expansive learning	Emergent activity driven from interactions between epistemic, set and social aspects of design	A structured and rigorous problem-solving process or organisational learning mechanism
Transformation	Could be achieved in Cycle 5 as 'reframing' or 'transformative' value	Achieved as 'expansive learning' through resolving historically accumulating structural tensions or 'contradictions'	Not explicit	Possible as emergent (unpredicted) organisational learning
Facilitation	Facilitated as a CoP	Facilitated by a skilled intervention research team frequently using f2f workshops or 'Change Laboratories'	Facilitated as a learning network project to achieve a particular analysis and design goal	Facilitated initially by a dedicated researcher. Capable of facilitation by practitioners with no specialist research methodology expertise
Temporality	Unfolding series of interconnected events connected by narratives or stories	Historicity: activity systems take shape and get transformed over lengthy periods of time	'Emergent' activity over time which can only be designed *for,* not designed	Unfolding series of purposeful activities which may take considerable time to yield outcomes

Table 2. Extended comparison of the three frameworks and justification for a new framework (continued)

3.5 Research focus and research questions

The research was therefore focussed on facilitating and conceptualising a process-based framework in which the learning was driven by a structured but flexible problem-solving process or learning mechanism. The purpose of such a process is to resolve a problem or address a challenge in which improvement is sought. The process should be capable of facilitation by a practitioner who is supported by good practice guidelines, as opposed being driven by a dedicated and specialist researcher or consultant. It should be capable of leading to transformation as emergent or unpredicted organisational learning. None of the existing identified frameworks satisfied the combination of all these distinctive characteristics.

This research focus led to the formulation of the research questions, which are listed in the following section. Figure 10 illustrates the research focus and research questions as further progressions of the research journey discussed in this chapter, using the framework earlier introduced and adapted from Isaksson et al. (2020). Figure 10 illustrates diagrammatically how the research questions flow from the focus.

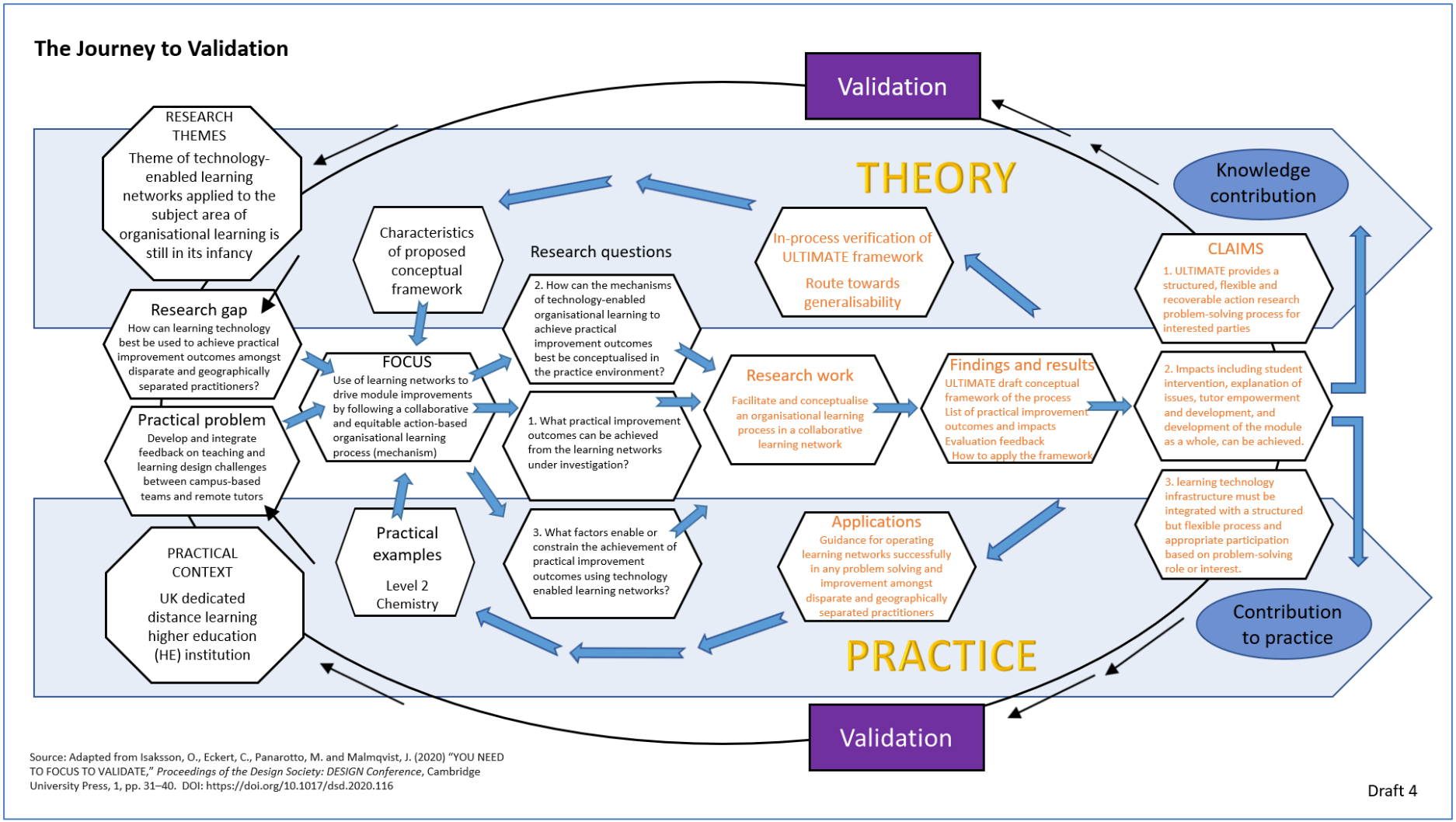

Figure 10. Research focus, characteristics of the proposed conceptual framework, and research questions in the research journey

As introduced in Chapter 2: Interdisciplinary multi-faceted research approach, the research was undertaken from a *strong-process*, *performative,* and *prehensive* perspective. It aimed to simultaneously facilitate and conceptualise an organisational learning process in the pursuit of collaborative and equitable improvements, using networked learning technology in a highly complex and fragmented distance learning institution. This chapter, the Literature Review, has introduced and compared the existing conceptual frameworks in the literature, and indicated the desired characteristics of a proposed new framework that were not being served by the existing frameworks. In particular the research was focussed on facilitating and conceptualising a new framework in which the learning was driven by a structured but flexible problem-solving process or learning mechanism. The purpose of this process is to resolve a problem or address a challenge in which improvement is sought. Whilst this process was being enacted, and once it was complete, it was necessary to reflect on and assess the factors which enabled or constrained it.

The Research Questions were therefore formulated as follows:

1. *What practical improvement outcomes can be achieved from the collaborative technology-enabled learning networks under investigation?*
2. *How can the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment?*
3. *What factors enable or constrain the achievement of practical improvement outcomes using collaborative technology-enabled learning networks?*

3.6 Summary and conclusion for Literature Review

This chapter has started by comparing the concept of technology-enabled learning networks, to other arrangements of learning in groups such as Communities of Practice. It has built on the previous comparison by Boyd (2017) of three existing conceptual frameworks in the networked learning literature, which all explicitly depict the *collaborative activity* of individuals coming together to work towards some purpose, in order to produce some outcome. It has indicated the desired characteristics of a proposed new framework that were not being served by the existing frameworks. This is because existing theoretical frameworks appeared insufficient in capturing the unfolding *process* or learning mechanisms required, in a way which could be readily understood and applied in their own context by practitioners. The chapter has highlighted that if practitioners at the 'sharp end' are interested in theory at all, it is only in looking for something which directly helps them achieve an improvement, either for themselves, their students, or for a wider group (Davidoff *et al.*, 2015). This reflects concerns articulated by Rashman et al. (2009, p.470) on 'a fragmented debate, centred on theoretical conceptualisations' and a dearth of approaches to practically enact, recognise and measure or evaluate organisational learning.

The structured comparison identified the particular characteristics of the conceptual framework that was sought, which reflected the research focus. The focus was to use technology-enabled learning networks to both facilitate and conceptualise a collaborative and equitable organisational learning *process* or *mechanism*, aiming to achieve a practical improvement outcome amongst disparate or geographically separated practitioners.

Finally, the research questions were articulated. Chapter 4 will now set out the underlying Pragmatic approach, methodological considerations, and research design and implementation for the project, in order to answer the research questions.

Chapter 4: Research methodology

4.1 Introduction

This methodology chapter builds on the conclusion of the Literature Review. The justification was made to explore a new conceptual framework, aiming to conceptualise the unfolding *process* of technology-enabled organisational learning required to achieve practical improvement outcomes. Existing frameworks were insufficient in capturing the process or mechanisms required, in a way which could be understood and applied by practitioners.

Firstly, the chapter will explore my Pragmatic philosophical viewpoint, which developed over the course of the research. Secondly the use of insider action research (AR) as the chosen approach will be introduced, Thirdly, there will be an introductory discussion of the use of Grounded Theory Method (GTM) to underpin the AR cycles, in order to search for a new conceptual framework. This discussion will describe the motivation for using GTM whilst also embracing its well-documented philosophical variations. Whilst extremely challenging for a novice researcher to navigate, these philosophical variations are most beneficial to 'take on board', in order to intersect fully with the entirety of the method. A personal position can then be located within the contested ontological, epistemological and practical landscape of GTM. Despite the challenges, the act of engaging with the entirety of GTM can facilitate a profound, rewarding and fundamental grip on the practices of effective qualitative analysis and theory building (Urquhart, 2013). Hence it is most important to include.

Fourthly, there is a brief review of other attempts in the literature to combine AR and GTM together, and some noted considerations for doing so.

Fifthly, there is a description of the research context, this being a particular project in the UK Open University, my own institution.

Finally, an account is provided of the research design and implementation of the two phases of the project. Phase 1 represented one action research cycle. Phase 2 represented a further two cycles in two concurrent years. Thus, three action research cycles were completed.

The chapter concludes with a summary of the methodological implications, ethical considerations addressed throughout the project, and its emerging, evolving nature.

4.2 The Pragmatic approach

Although its origins can be traced back to the work of Charles Sanders Peirce in 1878, Pragmatism has been characterised as having much potential to offer contemporary organisation theory, organisational learning, and the emergent nature of transformational change projects (Elkjaer, 2004; Elkjaer and Simpson, 2011; Morgan, 2014, 2020; Lorino, 2018; Buchan and Simpson, 2020; Simpson and den Hond, 2021). It also explicitly informs and underpins both action research (Harkavy and Puckett, 2014) and some versions of grounded theory (Charmaz, 2014; Birks and Mills, 2015; Corbin and Strauss, 2015).

Pragmatism views the world as a continuously unfolding and emerging process, and seeks to reject prevailing Cartesian dualisms including thought/action, and theory/practice. Within a Pragmatist worldview, thought and action are two facets of the same process, the 'very process of social and human experience, and of learning from experience' (Lorino, 2018, p.94).

Pragmatism conceives of human *experience* as a continuously unfolding *transaction* of a human with their environment. Humans learn how to react, survive and prosper within the ever changing environment, thus continuously *transforming* both in the process. This conception is congruent with the *becoming* ontology, and the *prehensive*, or *from within* and *in-the-flow,* approach that was identified in the interdisciplinary overview in Chapter 2: Interdisciplinary multi-faceted research approach.

As Corbin and Strauss (2015, p.29) observe, 'an important consideration in theory building is what the researcher brings to the research process in terms of philosophies, experience, professional background and interests'. This research has been driven by a culmination of my own personal and professional practical consultancy experience, and a grounding in a particular philosophical approach. The research has been conceived, proposed, designed and implemented from an ever deepening Pragmatist viewpoint.

In *Constructing Grounded Theory*, Charmaz (2014, p.263) Charmaz makes her own interpretation of the assumptions of the Pragmatist tradition, as developed primarily at the University of Chicago in the early twentieth century:

> *Pragmatism assumes that the value of theories or beliefs rests on effective practical application. Meanings emerge through practical actions to solve problems. Through actions people come to know the world. Pragmatism views reality as fluid and somewhat indeterminate, and open to multiple interpretations.*

Corbin & Strauss (2015) also assert that clarity of purpose is a key condition that fosters quality research. Researchers should be very clear from the beginning whether their aim is purely *description*, which has its place, or is *theory building*. As set out in 1.2 Overall aims and research themes, the primary aim of this research was to produce a theory, or new conceptual framework, on the unfolding process of collaborative organisational learning required to achieve practical improvement outcomes. The secondary aim was to seek the achievement of those outcomes using learning networks, to provide a context for theory generation. Both of these aims relate directly to the pragmatist assumptions referred to by Charmaz above.

However, according to the philosophical interpretation of Charmaz (2014), Pragmatism is more congruent with an *interpretivist* as opposed to a *positivist* or *objectivist* philosophical worldview. There are several authors who would disagree, as explained in what follows. Charmaz articulated her own version of *constructivist* grounded theory by juxtaposing it against an objectivist approach (Charmaz, 2014, p.236). She aligns her version of grounded theory with pragmatist underpinnings, but this has been strongly criticised by several authors including Gibson and Hartman (2014) and Morgan (2020). In contrast to the identified 'pragmatist roots and relativist epistemology' of Charmaz, Morgan (2020, p.65) counters that 'pragmatism refuses to locate itself in a traditional epistemological space'.

Pragmatism rejects the dualism of realism and relativism, and rejects the 'epistemological industry' as characterised by Dewey (1941) and cited by Morgan (2020, p.65).

Gibson and Hartman (2014) assert that in building a constructivist version of grounded theory, Charmaz firstly assigned the 'classic' version of grounded theory to be 'objectivist', so she could then compare and contrast the two. Gibson and Hartman (2014, p.63) maintain that this move 'can be confusing and somewhat unnecessary'. It appears to be a further symptom of the 'epistemological industry' as characterised by Dewey (1941). It appears to have contributed towards the proliferation of variants or 'strands' in grounded theory which can cause so much confusion, especially to novices.

Charmaz (2014, p.232) articulated her comparison of positivism and Pragmatism , as shown in Table 3. However as already highlighted, she identified Pragmatism as *interpretivist* (Charmaz, 2014, p.231). In the interdisciplinary overview in Section 2.3 Process and practice theory, it was explained that Pragmatism is fundamentally distinct from *interpretivism*, and thus highlights the potential for confusion. It is most important to emphasise the point that the original or 'classic' grounded theory was developed without incorporating explicit philosophical views (Urquhart, 2013; Birks and Mills, 2015).

	Positivist	Pragmatist
	Follows the scientific method	Emphasises problem-solving
	Assumes an external reality	Assumes a fluid, somewhat indeterminate reality
	Unbiased observer	
	Discovers abstract generalities	Defines multiple perspectives
	Explains empirical phenomena	Studies people's actions to solve emergent problems
	Separates facts and values	Joins facts and values
	Truth is provisional	Truth is provisional

Table 3. Epistemological underpinnings of grounded theory, according to Charmaz

Source: Charmaz (2014, p.232)

The ontology of interpretivism is that reality is socially constructed and 'cannot be understood independent of the actors who make that reality' (Urquhart (2013, p.59). Researchers aim to derive constructs by in-depth examination of the field, and by

constructing interpretations of reality. In a positivist philosophy, an objective world exists which can be measured. Positivist researchers aim to be completely independent and unbiased of the substantive area. They aim to discover causal relationships by amassing a sufficiently credible volume of data, and frequently by testing its statistical significance.

Although the ontology of interpretivism and constructivism did resonate at the outset, this research is more concerned with the Pragmatist notion of Inquiry by the *taking of action* in response to a problematic situation, and not just the *social construction of an interpretation* about the situation and actions being taken by participants.

The essential guidance this critique provides is that this research followed a Pragmatist approach *whilst embracing GTM as a general method*. This means the research did not align itself to one or other of the highly contested GTM strands. Research students are currently earnestly persuaded across the globe to make a choice and to declare their allegiance to one particular GTM version. However this imperative can cause continued confusion and misunderstanding amongst experienced researchers and research students alike. It can continue to exacerbate the philosophical "turf wars" which have been raging amongst different grounded theorists for several decades. Adopting a Pragmatist approach leads to a focus on experience, on taking action and its consequences, as opposed to 'arguing about whether something is true or not', or about the nature of reality (Morgan, 2020, p.65).

The foregoing arguments help to highlight that the core methods of grounded theory can be carried out from a wide variety of philosophical positions. However a Pragmatist perspective played a significant part in the development of grounded theory, through the contribution of Anselm Strauss (Corbin and Strauss, 2015). As Morgan (2020) has recently highlighted, pursuing a more fully Pragmatic position in grounded theory could help to resolve the ongoing philosophical confusion around the different variants. Pragmatism is commensurate with my personal and professional experience, background, and interests, and for all these

reasons was my underlying philosophical position, which developed and became increasingly deeper and richer during the course of the research.

Symbolic interactionism is also a perspective which was considered in the early stages of this research as it is repeatedly associated with grounded theory (Locke, 2011; Charmaz, 2014; Corbin and Strauss, 2015) and also derives from the Pragmatist tradition:

> *Symbolic interactionism encourages you to learn about people and places, times and troubles, actions and accomplishments as members of your studied world understand them. Symbolic interactionism sees people as active beings engaged in practical activities in their worlds and emphasises how they accomplish these activities. This perspective produces a dynamic understanding of actions and events.*
>
> Charmaz (2014, p.263)

The points to emphasise in this passage are encouraging learning *as members of the studied world understand it*, the focus on problems and actions, and attention to temporal aspects which bring about a dynamic understanding of unfolding developments and events. However symbolic interactionism assumes the position of researcher as *observer*, albeit seeking a dynamic understanding of others' interactions. Locke (2011, p.5) comments that 'Within this tradition, not surprisingly, participant observation, is the research ideal'. Action research with a *prehensive* perspective, however, goes one step further as the researcher becomes an intrinsic part of the context. The researcher is located *in-the-flow* of the process, investigating in a collaborative and equitable way with others. Instead of an *interpretation* of the behaviour or actions of research subject(s) as an outsider, which is subsequently translated into a grounded theory, the researcher is an intrinsic part of action-taking, carrying out practice, and part of the unfolding sequence of events in the researched context.

Thus, symbolic interactionism, although resonant to some extent in its observation of practical action, was not appropriate in this case.

This section has thus set out the Pragmatist philosophical position of this research in more detail. Pragmatism has played a key role in the development of grounded theory, explicitly informs action research, and has much to offer research projects in organisational learning.

During the course of the research, I therefore considered deeply the separation of researcher and context, and the *taking of action* with a *prehensive* perspective in contrast to the *study or observation of action*. I decided to chart these in relationship with one another, and produced the diagram in Figure 11.

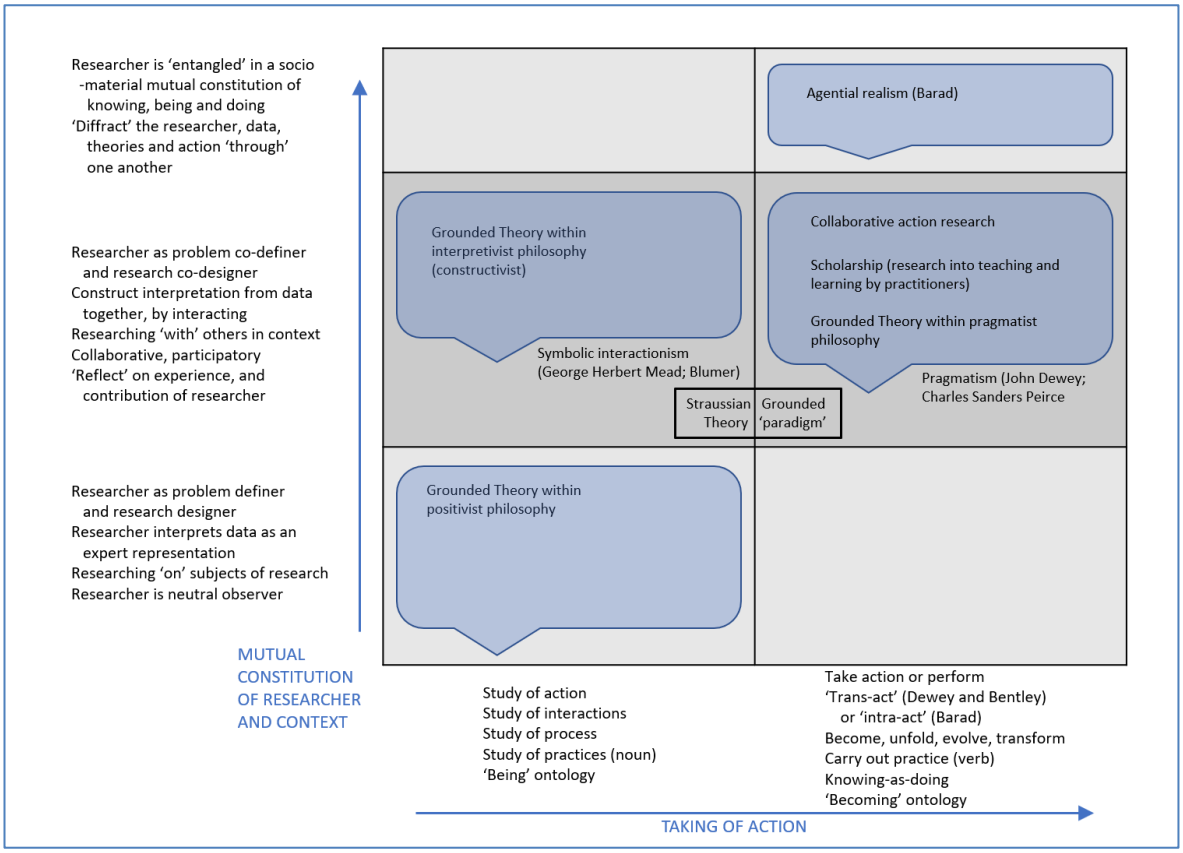

Figure 11. Grounded theory and action research philosophical grid

Referring to Figure 11, methodological approaches which aim to *study action* can be juxtaposed on the horizontal axis against approaches that aim to *take action* in a *prehensive* or *performative* manner. The mutual constitution of researcher and context is categorised on the vertical axis. Positivist approaches exhibit a high degree of separation between a researcher and their subjects. Interpretivist approaches, such as constructivist grounded theory, favour working with others to construct interpretation from the data together, but the

approach is studying or observing action as opposed to taking it. Both collaborative action research and grounded theory under a Pragmatist philosophy favour working with others in context and aim to *take action* as opposed to *study action*. Approaches such as Barad's agential realism (Barad, 2003) go one step further, in that the researcher is 'entangled' in a mutual constitution of knowing, being and doing.

Figure 11 positions the approach to Grounded Theory that I took, amongst the different variants or strands. As the diagram shows, my approach was located in the middle right portion of the grid. It proved very helpful over the course of the research to make these distinctions and to separate out the underlying approaches in the different GTM strands.

The diagram also underscores the more recent calls for a more comprehensive Pragmatic position in grounded theory by Morgan (2020), and in organisational learning and managing projects by Elkjaer and Simpson (2011) and Buchan and Simpson (2020). By locating the research in the middle right portion of the grid in Figure 11, the *prehensive*, *performative*, *action-taking* and *becoming* nature of this *organisational learning* endeavour was confirmed. As the research progressed, it became possible to discriminate this particular type of *organisational learning* from the currently predominant positivist or interpretivist approaches that take a detached, or relatively separated, viewpoint. Once again this *prehensive* aspect was introduced in the interdisciplinary overview in Section 2.3 Process and practice theory.

This section has therefore introduced the Pragmatist foundations of this research, with the emphasis on action-taking and built-in practical application of the work. The next section starts to articulate how this was achieved using an overarching action research methodology.

4.3 Insider action research

The following section provides the background and justification for the action research strategy. The Pragmatic research philosophy has just been explained. The expressed

philosophical emphasis on meanings emerging through practical actions, plus researching *with* people engaged in practical activities in their worlds, means action research seems a natural choice. My personal motivation in doing this research is to develop and underpin and previous practical consultancy career experience with academic research rigour. Within this, is a deep personal drive to carry out collaborative and participatory research which seeks *impact* as an intrinsic part of the research process, as opposed to a descriptive PhD in which action, practical improvement and impact may be a far-off or subsequent aspiration.
Action research was therefore chosen because the purpose of a collaborative action research strategy is to 'understand and improve' (Bradbury, 2015), and to engage in a project which actively *seeks* the achievement of a practical improvement outcome, in order to research about the mechanisms required to achieve it. It could have been possible to monitor, observe or describe attempts at learning in other learning networks or networks of practice, such as the school improvement networks described in What is a technology-enabled learning network? These networks devote themselves to improvement in a particular practice area, that of improving teaching and learning practice in schools. However – this would then appear to demand a descriptive research endeavour, in which whilst an unfolding process of organisational learning might be successfully conceptualised, it would be de-coupled from practical impact – the conceptualisation would be treated as an artefact produced by a specialist researcher external to the practice area, with potential risk of lack of acceptance or uptake by practitioners.

The preceding explanations have helped to highlight the gap that this research addresses – *whether* learning networks of disparate practitioners connected by technology across an organisation, can use collaborative learning affordances to grapple with a problem area requiring improvement, and then to seek, implement and evaluate a practical improvement outcome. If so, how can this process best be conceptualised?

The three conceptual frameworks described in the initial literature review are all explicitly based on collaborative activity, this being defined as the practical actions jointly undertaken by the participants. All the frameworks are inherently practical in nature, as is the nature of organisational learning itself, already described as 'a process of individual and shared thought and action' by Rashman et al., (2009). The research gap indicates that there is insufficient conceptualisation of this process, *if it is possible to achieve*. In order to address the research gap and the research questions, it is necessary to undertake the actions as an intrinsic part of the process.

As a leading writer on action research, McNiff (2014, p.13) highlights that 'nowadays it is not possible to say definitively what action research is, and what it means, given that there are many action research traditions, all with varying perspectives. However, drawing on (Herr and Anderson, 2005), she goes on to identify a series of goals for action research on which most people agree:

a) *the generation of new knowledge*
b) *the achievement of action-oriented outcomes*
c) *the education of both researcher and participants*
d) *results that are relevant to the local setting*
e) *a sound and appropriate research methodology.*

McNiff (2014, p.14) further observes that these five points are 'taken as standard', no matter how the action research is being done, or who is doing it. However, a consideration is that since action research is about collaborative and democratic practices, and aims to achieve or influence change, the rhetoric and practices of action research can sometimes differ.
Action research was named as a specific strategy in the 1940s, and one of its founding fathers was Kurt Lewin (Lewin, 1946). Cohen et al. (2011) produce a review of lists of criteria or aspects of action research from a variety of different authors in the educational field. One

such list resonated particularly for this research, providing some helpful qualifications to the series of goals offered by McNiff, as shown in Table 4:

Principles and characteristics of action research
• makes for practical problem solving as well as expanding scientific knowledge
• enhances the competencies of participants
• is collaborative
• is undertaken directly *in situ*
• uses feedback from data in an ongoing cyclical process
• seeks to understand particular complex social situations
• seeks to understand processes of change within social systems
• is undertaken within an agreed framework of ethics
• seeks to improve the quality of human actions
• focuses on those problems that are of immediate concern to practitioners
• is participatory
• frequently uses case study
• tends to avoid the paradigm of research that isolates and controls variables
• is formative, such that the definition of the problem, the aims and the methodology may alter during the process of action research
• includes evaluation and reflection
• strives to render the research usable and sharable by participants
• is dialogical and celebrates discourse
• strives to be emancipatory

Table 4. Principles and characteristics of action research

Source: Extracted from (Cohen et al., 2011, p.346)

Nearly all of these characteristics informed the action research strategy. One aspect worthy of particular note is the principle of all action research that it is *participatory*, in the sense that it is characterised by collaborative participation between the role players involved, who work equitably with each other. The contrast to be drawn, as highlighted before, is between 'conventional' social research in which the specialist researcher is external to the context, researching *on* the subjects of research, and action research in which the researcher is embedded within the context, researching *with* problem co-definers and research co-designers.

Reflexivity is essential in considering the nature of the researcher's personal involvement in the entire research process, and the way this shapes its outcomes (Corbin and Strauss, 2015). Reflexivity and reflection on the different aspects of the process as it unfolds, is built in as part of the fundamental approach of action research (Cohen, Manion and Morrison, 2011; Coghlan and Brannick, 2014). Table 5 compares three different types of research, including applied research or consultancy where an invited expert is paid for previously acquired expertise which is provided to clients.

	Action research	Applied research & consultancy	Conventional research
Purpose	To understand and improve	To improve	To understand
Basic (power) orientation	Researching 'with'	Researching 'for'	Researching 'on'
Researcher	Embedded within the collaborative research. Problem co-definer & research co-designer	Invited expert who knows what good outcomes should look like and helps move situation towards them	External to the context. Problem definer and research designer
Stakeholders	Problem co-definers & research co-designers	Clients of the research and sources of data	Subjects of the research, sources of data and samples for testing conclusions

Table 5. Comparison of action research with applied and conventional research

Source: Adapted from Bradbury (2015)

The chosen research strategy for this study was therefore to pilot an innovative *technology-enabled participatory action research* strategy, in which both researcher and participants learn together in an unfolding and emergent process, how to address a particular organisational challenge and achieve change or improvement. The intention in such a strategy is that the resultant practical improvement outcomes are owned and recognised as such by the project participants, as opposed to being imposed or imported from elsewhere, which is a fundamental part of action research.

A key aspect of this ownership is that participants are involved in the construction of issues, planning of action, taking action and evaluation. Achievement of practical improvement outcomes is assessed as having taken place when it resonates with stakeholders and participants and is recognised as making a significant improvement to the practice area. In this way *actionable knowledge* (Coghlan and Brannick, 2014; Sannino and Engeström, 2017) has been produced. Evaluation is done jointly with participants, and not by the researcher using the subjects as data sources.

In addition to the identified fundamental characteristic of action research as participatory, there is a specific tradition named *participatory action research* (PAR). PAR focuses on the advocacy of empowerment and emancipation. It is overtly part of a political process, for example giving a voice to marginalised, dominated, powerless or vulnerable groups, and is rooted in critical theory (Cohen, Manion and Morrison, 2011; Coghlan and Brannick, 2014). It is the former of these two understandings that is intended for this research, in which the research is fundamentally characterised by collaborative participation.

A point of departure is that action research carried out inside organisations also explicitly enhances capacity-building (Harkavy and Puckett, 2014; Coghlan and Shani, 2015). It is one way to develop organisational *capabilities* to problem-solve (Coghlan and Shani, 2008). As highlighted in the literature review, this problem-solving capability is also called for by Wenger-Trayner et al. (2015), when they refer to the 'systems' view necessary to analyse the learning and problem-solving capability of an entire system, using approaches which are yet to be invented.

Action research takes place in an unfolding spiral, in which stages of diagnosing or *constructing issues, planning, taking action* and *evaluating* are applied for a particular context and with a particular purpose, as illustrated in Figure 12. This is a very widely known spiral aiming to gradually achieve an improvement outcome via successive and ongoing stages which gradually progress towards the desired goal. The spiral mirrors the unfolding nature of organisational learning and problem-solving activity over time.

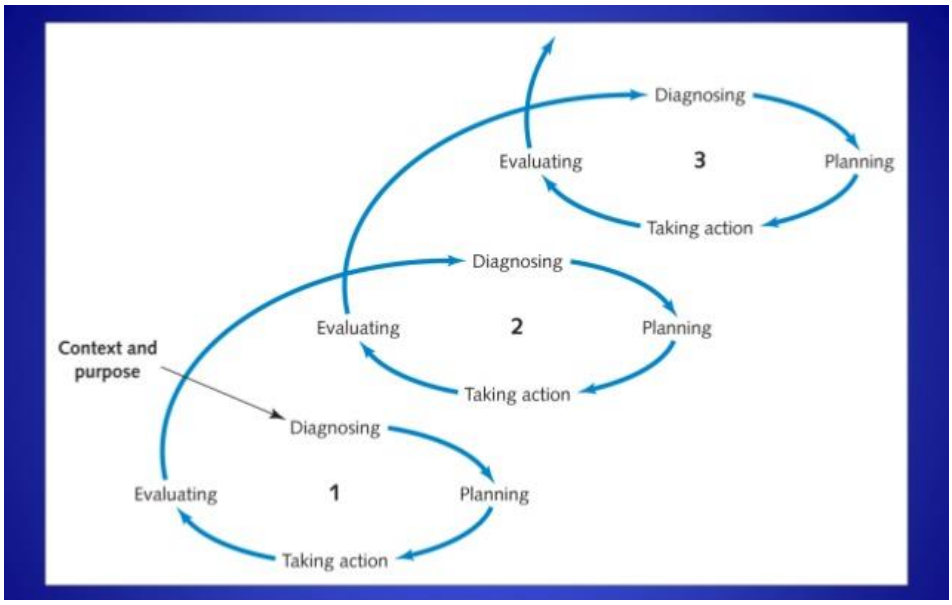

Figure 12. The action research spiral. Source: Saunders & Lewis (2012, p.118)

Coghlan (2019); Coghlan and Brannick (2014) specifically address action research inside one's own organisation, characterising this as *insider action research*. They build on the spiral in Figure 12, to illustrate a three-legged table top model as shown in Figure 13.

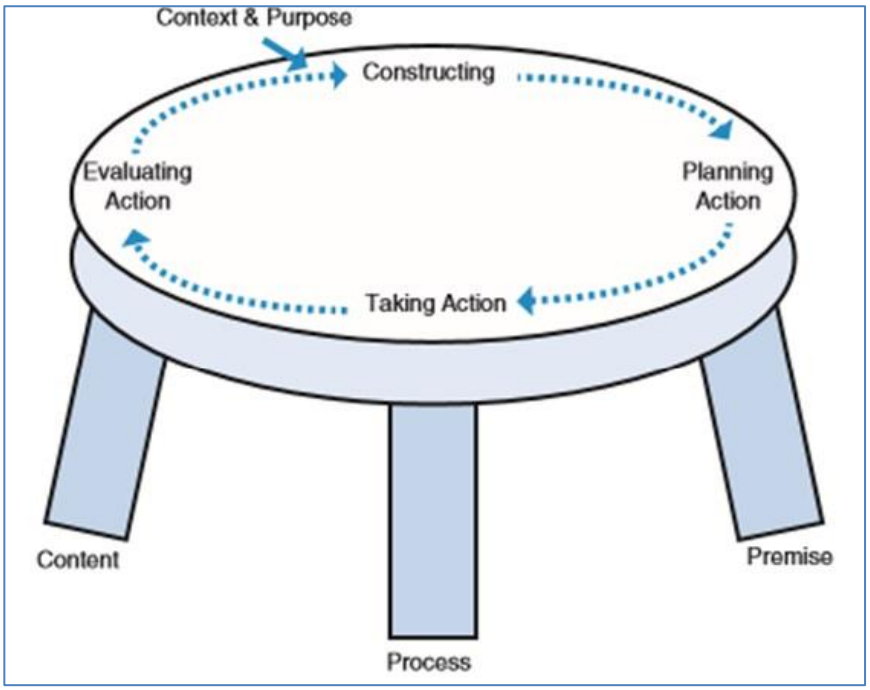

Figure 13. The action research 'meta-cycle' table top model.

Source: Coghlan (2019, p.14); Coghlan and Brannick (2014, p.13)

This model indicates three reflective cycles operating in parallel, each progressing along the spiral path. To characterise each cycle (or table leg), Coghlan and Brannick utilise the three forms of reflection identified by Mezirow (1991), who was responsible for *transformative learning theory* in the field of adult learning. These forms of reflection are *content*, *process* and *premise.* In a review of the operationalisation of Mezirow's theory, Lundgren and Poell (2016, p.20) explain that Mezirow (1991) 'drew heavily from Dewey to explore the role of experience and reflection in adult learning', and to develop his own three forms of reflection.

Although these three reflective forms were originally developed for individual thought, the table top model in Figure 13 takes the further step to apply them to collaborative thought and action, within a working or project group.

The first cycle in Figure 13 is in relation to the project aims or *content*. This is not the understanding of educational subject content, but the practical aspect of the project or challenging situation, the issues surrounding it, and the practical actions being considered or

implemented. The second cycle in Figure 13 reflects on how the project is going, and what is being learned. This is where the working or *second-person* project group are learning *how to* address a specified outcome or goal, or complex or challenging problem area. This is the unfolding and emergent *process* of organisational learning. Learning and reflecting about the *process* of learning taking place is *meta-learning*, as Coghlan and Brannick (2014, p.13) describe it. Therefore inquiry is undertaken into both the *content* and the unfolding learning *process* of the project, as well as examining and reflecting on and critiquing *premises* or underlying assumptions and perspectives. Mezirow (1997, p.5) proposed that *transformative learning* is 'the process of effecting change in a frame of reference', where a frame of reference consists of habits of mind and a point of view. Habits of mind are habitual ways of thinking, feeling and acting influenced by assumptions, which may be unconscious, and are 'primarily the result of cultural assimilation' (Mezirow 1997, p.6). Points of view however, are less durable than habits of mind and 'subject to continuing change as we reflect on either the *content* or *process* by which we solve problems and identify the need to modify assumptions' (Mezirow 1997, p.6). This aspect of Mezirow's theory has been alternatively described by Closs and Antonello (2011, p.70) as follows: 'Transformative learning aims at changing the individual's frames of reference, consciously, through critical reflection about assumptions built noncritically'. Lundgren and Poell (2016, p.6) confirm Mezirow's practical equivalence of the terms 'critical reflection' and 'premise reflection'. Lundgren and Poell (2016, p.7) also draw a connection of premise reflection with the qualities of 'double-loop' organisational learning of Argyris and Schön (1978) that was described in Section 2.4 Organisational learning.

The important message is that within the insider action research table top model shown in Figure 13, is the potential to collaboratively solve a problem, reflect on and manage the emergent process of organisational learning about how to solve the problem, and also to achieve transformative learning by which a culturally assimilated frame of reference about "how things are done around here" in the organisation is changed.

"How things are done around here" is a phrase that I have personally articulated and used in my consultancy activities with clients. Since the implementation of quality management systems requires the documentation and assimilation of organisational processes and procedures, a first step is for clients to recognise that they need to make their accustomed practice explicit and documented. Once this is achieved, the second step is to take a step back to reflect on "how things are done around here" in order to plan, implement and evaluate any improvement actions. The second step involves both documenting process and procedure steps, and recognising cultural assumptions about the way things are done. All of this underscores the fundamental linkage between action research, quality improvement and transformative or *organisational learning*. The capacity-building characteristics of insider action research were previously highlighted in this section, contributing towards the development of organisational *capabilities* to problem-solve and improve.

'Purpose' in the table top model in Figure 13 equates to *object* in the CHAT conceptual framework, the motivation for activity or what is being aimed for. The purpose or *object* drives collaborative action or movement around the cycles. In this context it is a problematic or challenging learning design and delivery scenario - aiming to achieve a practical improvement outcome.

At the beginning of this research, the unfolding *process* was identified as the primary focus for the PhD research. The practical purpose of seeking and possibly achieving practical improvement outcomes, in the *content* part of the project, was the secondary aim, to provide a context for theory generation. Coghlan and Brannick (2014, p.14) emphasised the need to remember that the practical action research project *(content)* and the thesis project *(process)* are not the same, and each have independent lives as well as being bound up with each other. The action research project may go ahead and achieve useful outcomes, without the need to write a thesis or generate *actionable knowledge.* However, in this case, the action research project was completely facilitated by myself and would not have existed at all, were it not for

the PhD. This point about the relationship between *content* and *process* is considered further in the subsequent Section 4.5 Combining action research and GTM. It is also revisited at the conclusion of the thesis.

Finally it is worth revisiting the distinction of *first-person, second-person* and *third-person* inquiry in action research, as introduced in the discussion on *organisational learning mechanisms* in Section 3.3. *Second-person* inquiry addresses the joint or collaborative investigation into issues of mutual concern amongst a working group of practitioners.

Traditionally, *second-person* collaborative inquiry in action research has been characterised as face-to-face (Coghlan and Brannick, 2014, p.7). However, the identified challenge in this research was whether the affordances of collaborative learning technology could be used to connect disparate and geographically separated practitioners who were not routinely working face-to-face, and who may not have a direct relationship with each other, to work together collaboratively on issues of mutual concern. If successful, this would be an innovative form of *second-person* practice, using technology-enabled learning networks.

Coghlan and Brannick (2014, p.7) effectively summarise how the three practices or types of inquiry are integrated:

> *In our view, second-person practice is primary. It is through working with others through collaborative processes of engaging in constructing the project, planning action, taking action, evaluating action and framing learning that individual (first-person) learning takes place, and it is from that second and first experience and learning that actionable knowledge for a third person audience emerges.*

This explanation illustrates how collaborative action research is a combination of these three inquiry practices. Individual practitioners learn through being a part of a *second-person* group

inquiry, which relates to the *content* part of the project in Figure 13. *Actionable knowledge* – knowledge that is usable by practitioners and theoretically robust for scholars – is created in the *second-person* part of the project. This is when achievement of practical improvement outcomes is assessed as having been achieved, when this resonates with stakeholders and participants and is recognised as making a significant improvement to the practice area. Reflection on the learning that has taken place and then sharing this with a *third-person* audience who were not involved in the original working group completes the dissemination of the knowledge and facilitates its transfer to other contexts. This could happen via theory, theoretical contributions and/or dissemination reports. It is this reflection and sharing that distinguishes action research from everyday problem-solving.

This section has introduced the principles and goals of action research as a research methodology, and justified the reasons for using it. The action research spiral and the 'table top' or meta-cycle model of insider action research shown in Figure 13 (Coghlan and Brannick, 2014; Coghlan, 2019) have been introduced. This model has the potential to accommodate collaborative problem solving, *organisational learning* and *transformative learning* by which assumptions about habitual ways of thinking and doing are critically reflected upon and possibly changed.

The integration of *first-person, second-person* and *third-person* action research or inquiry has been explained, to enable *actionable knowledge* for a third-person audience, beyond the original working group, to emerge. An aspect of action research is that although it aims to generate new knowledge and theory, it does not embrace specific or rigorous methods for doing so; only that these should be in place (see list of goals provided by McNiff (2014, p.14) at the beginning of this section). The next section considers GTM as a rigorous theory-building method to underpin the action research approach.

4.4 Grounded Theory Method

This section will introduce Grounded Theory Method (GTM) as an established and rigorous qualitative research method for theory generation. The combination of action research and GTM, and the benefits and challenges of doing so, will then be discussed.

4.4.1 Use of GTM as a theory-building approach

It has already been observed that the process of concept formation is still in an immature state in the field of learning networks and networked learning generally (Sloep, 2016). The three identified conceptual frameworks in the literature review were found to be insufficient to represent the collaborative mechanisms by which technology-enabled organisational learning may occur (Boyd, 2017). In addition, *organisational learning mechanisms* were identified in the literature review as planned organisational structures and processes that can encourage learning and enhance organisational capabilities (Lipshitz, Friedman and Popper, 2007; Shani and Docherty, 2008; Coghlan and Brannick, 2014). Boyd (2019, p.5) concluded that 'despite the affordances of collaborative learning technology and the emerging research area of networked learning, there is little conceptualisation of possible organisational learning mechanisms using learning networks, especially in a way which may be transferable to other contexts in an actionable manner'.

The theory-building aim of this research, to explore a new conceptual framework regarding the unfolding learning process, was therefore clear. It was articulated in RQ2:

> *How can the mechanisms of collaborative technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised?*

Grounded theory method (GTM) is a 'qualitative research method that seeks to develop theory that is grounded in data systematically gathered and analysed' (Urquhart, Lehmann, & Myers, 2010, p.357). It therefore appeared a good fit for the research aim, and as a rigorous theory-building method to underpin the action research approach.

A grounded theory is a product of the method, hence the prevalent use of the acronym GTM to differentiate between method and product. However, in the literature they are used interchangeably.

In GTM, data is coded to identify categories and then the relationships between those categories are explored, to integrate and refine an emerging theory. Grounded theory promises a rigorous and systematic approach to qualitative data analysis and theory building, which is especially suited to understanding *process* (Corbin and Strauss, 2015). A frequent criticism made of action research is that it lacks rigour, and built-in systematic analysis procedures. My intention was that the systematic nature of GTM could help to drive around the progressive action research cycles in a structured and rigorous manner, each cycle developing from the analysis in the preceding one. GTM could offer a structured and rigorous way to achieve the generation of new knowledge and contribution to theory; which as highlighted are inherent aims in action research (Coghlan and Brannick, 2014; McNiff, 2014).

The joint originators conceived grounded theory in 1967, as a methodology to *discover* theory from data and thus respond to a 'major task confronting sociology today', that of producing theory that resonates or fits with empirical situations and is understandable to 'sociologists and laymen alike' (Glaser and Strauss, 1967, p.1). With its emphasis on producing theory that resonates with practitioners, GTM would seem a natural fit within an action research approach, where the emphasis is on 'researching with', co-defining the problems amongst practitioners, and equitable ownership of the research process and its resulting outcomes. Any theory which is 'imported' from another discipline, too abstract, too disconnected from day-to-day realities, or not readily understandable or applicable by practitioners, is likely to rejected or dismissed. If, however, practitioners can immediately relate to the theory and can see how it could be applied in their own contexts, it could potentially underpin an action research *meta-learning* process (see Figure 13). Coghlan and Brannick (2014) refer to this as creating *actionable knowledge* - knowledge which is usable by practitioners whilst being sufficiently theoretically robust.

4.4.2 Historical development and key characteristics of GTM

Urquhart (2013) provides an account of the background, development and intellectual foundations of the Grounded Theory Method. Since the publication of *The Discovery of Grounded Theory* (Glaser and Strauss, 1967), there has been a chequered and controversial history. A now infamous disagreement between the two originators after publication of *Basics of Qualitative Research: Grounded Theory Procedures and Techniques* (Strauss and Corbin, 1990), produced two contested 'strands' or variants. These were "Glaserian" or "classic", and "Straussian". Kathy Charmaz (Charmaz, 2006) later introduced a third variant: "constructivist" grounded theory, based on social constructivist principles. If the research aim is theory building, it is vital to understand and reflect on this contested history to understand the entirety of GTM itself (Urquhart, 2013).

Glaser, Strauss and Charmaz all had differing epistemological and ontological orientations. Although GTM was developed and is still recognised as philosophically neutral, individuals were bound to develop their own ways of thinking about data when carrying out GTM procedures (Corbin and Strauss, 2015).

(Urquhart et al., 2010, p.359) identify four distinctive characteristics of GTM, as shown in Table 6 below:

Four distinctive characteristics of GTM	
1.	The main purpose of the grounded theory method is *theory building*.
2.	As a general rule, the researcher should make sure that their prior – often expert – *knowledge of the field does not lead them to preformulated hypotheses that their research then seeks to verify* – or otherwise. Such preconceived theoretical ideas could hinder the emergence of ideas that should be firmly rooted in the data in the first instance.
3.	Analysis and conceptualization are engendered through the core process of *joint data collection and constant comparison*, where every slice of data is compared with all existing concepts and constructs to see if it enriches an existing category (i.e. by adding/enhancing its properties), forms a new one or points to a new relation.
4.	*Slices of data*' of all kinds are selected by a process of *theoretical sampling*, where the researcher decides on analytical grounds where to sample from next.

Table 6. Four distinctive characteristics of GTM

Source: (Urquhart et al., 2010, p.359)

Numerous examples exist of researchers using the systematic data gathering and analysis methods in GTM for coding and *describing* empirical situations. However, as Urquhart *et al.* (2010) point out, the first characteristic in Table 6 implies that those researchers are neglecting the main purpose of the method, which is to build theory. That is why the method was developed. The second characteristic leads on from the first, to emphasise that GTM is a *theory-building,* not *theory-testing* or *theory-verification* methodology. The researcher may well find it challenging not to impose their prior knowledge of concepts from existing theories onto the data. However, if this happens, the researcher will lose what Urquhart (2013, p.17) describes as the 'key delight' and 'key edge' of the method – that of *emergence.* Glaser wrote an entire book on this subject, and it is the crux of the dispute between the two originators, Glaser and Strauss. Glaser's entreaty was to let the data speak for itself, rather than *forcing* it into pre-conceived categories and relationships (Glaser, 1992).

Referring to the second characteristic in Table 6, Glaser's procedures to produce substantive theory involve the use of *theoretical codes*, provided as *coding families* (Glaser, 1978, 2005). Theoretical codes conceptualise how the substantive codes of research may relate to each other; a vital part of theory building. Glaser and Holton (2005) advise grounded theory researchers to familiarise themselves with, and be open to, as many theoretical codes as possible. They observe that theoretical codes are not well understood, and frequently confused with substantive codes. Glaser continually warns of the dangers of using pre-conceived theoretical constructs from one's own discipline, or from elsewhere. The essence of GTM is to *put aside existing theoretical frameworks and concepts* despite the researcher's potentially expert knowledge of them. As Urquhart (2013, p.17) explains:

Far better to allow the data to tell its own story in the first instance, build a theory, then, subsequently, engage your theory with the theory that you thought you might impose initially. You can see if your emergent theory confirms or challenges existing theories. So, potentially GTM has a huge role to play in theory building, in all disciplines.

The third and fourth characteristics in Table 6 refer to some of the fundamental methods of GTM, which guide systematic data gathering and analysis to achieve rigorous conceptualisation. Coding is the act of attaching conceptual labels to segments of qualitative data (Urquhart, 2013). *Open coding* is the first stage in the analysis and represents a very close examination of the data. Data are compared using a process of *constant comparison,* so that 'incoming data are compared with existing data in the process of coding and category development' (Birks & Mills, 2015, p.177). This method enables concurrent data collection and analysis, which as Birks and Mills (2015) observe is one of the essential methods that differentiates GTM from other research designs. It is thus carried out in an unfolding and iterative manner, which has pronounced similarities with action research.

In the fourth characteristic, *theoretical sampling* is used to guide where to sample from next, which is on analytical grounds. Thus, data are used to support or refute the emerging theory.

In recognition of the ongoing challenges facing novice grounded theory researchers in understanding the application surrounding discourse of GTM, Chun Tie, Birks and Francis (2019) produced a very helpful diagrammatic framework. This framework illustrates the essential GTM procedures, the analysis or coding levels, and how they all relate together. It is illustrated in Figure 14. Initial data collection leads to open coding and the initial identification of possible categories. Data collection, constant comparison and analysis continue in an ongoing cycle, driven by *theoretical sampling*. Each of the three GTM versions have different names for the next coding level, but Chun Tie *et al*. (2019) summarise these different names and refer to the next level as 'intermediate'.

This is where a key *core category* is identified, which captures the essence of the process being investigated. It is also the stage where sufficient data is collected to make a credible claim to *theoretical saturation*; the point at which no new categories or open codes can be identified. In the final coding level, the categories are related to the core category using *theoretical codes* and the entire theory is integrated together.

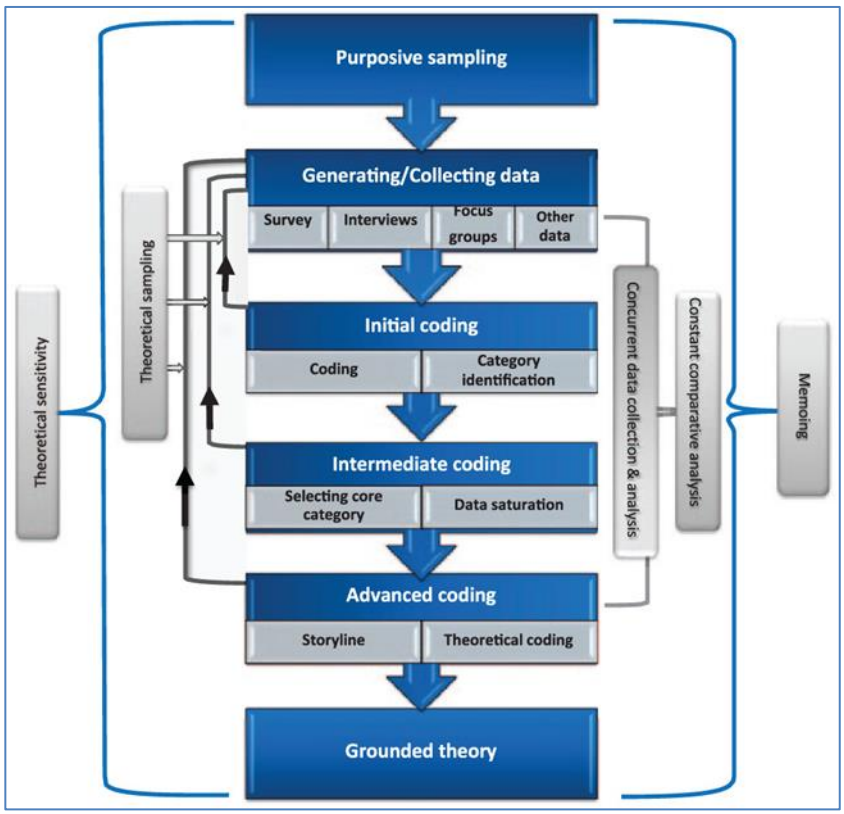

Figure 14. Diagrammatic summary of the interplay between the essential grounded theory methods and processes.

Source: Chun Tie et al. (2019, p.3)

The diagram illustrates a key similarity between grounded theory and action research. Both follow an iterative or cyclical process to gain increasing insight about the phenomenon under investigation. Urquhart (2013, p.68) comments on 'a natural synergy between the idea of theoretical sampling and action research', but warns however that 'to do an action research study using GTM is complex, but not impossible'.

Urquhart (2013) underscores the question as to whether the primary aim of the investigation is to study the action research interventions and their impact, or to produce a theory.

Corbin and Strauss (2015) assert that clarity of purpose is a key condition that fosters quality research. Researchers should be very clear from the beginning whether their aim is purely description, which has its place, or is theory building. Otherwise 'findings are likely to appear muddled and fail to live up to either good description or good theory' (Corbin and Strauss, 2015, p.348). Grounded Theory can, and frequently is, used only for its systematic analysis and coding techniques for description, as opposed to full theory building (Urquhart, 2013).

4.4.3 Researcher positionality on theoretical codes

The contested history has driven a need for researchers, and particularly PhD students, to align themselves with a particular 'strand' of GTM, and declare this in their thesis and subsequent publications. Within each strand, the use of theoretical codes is very different. Only Glaserian, or "classic" GTM provides these codes and considers their use to be vital in the process of theory generation.

Strauss and Corbin (1990); Corbin and Strauss (2015) provided a single coding 'paradigm', about the relationships inherent an unfolding process. This paradigm is the original cause of the dispute between Glaser and Strauss, as Glaser considered that a single coding paradigm was too rigid and 'pure forcing' (Glaser and Holton, 2005; Seidel and Urquhart, 2013).

Charmaz (2014) critiques Glaser's use of theoretical codes and considers them to be optional. However Urquhart (2019) and also Urquhart (2013 p.116) emphasises that 'without thinking about relationships, we cannot claim to be building theory'; as also highlighted in the Literature Review. Therefore a critical consideration of theoretical codes and relationships – however they are understood - is vital in the process of theory building. This translates to thinking about relationships between categories.

My working position initially taken up during the early stages of this research was that all three strands had their merits, and my research embraced aspects from them all. As the research progressed, I refused to be drawn into aligning myself with a particular strand. It was fundamental to critically consider Glaser's theoretical codes in my GTM theory building (Urquhart, 2013). The Strauss and Corbin coding paradigm could be appropriate in certain situations, and could be considered as an appealing 'jumping-off point' or 'sensitising device'; being only one particular way to analyse data and infer relationships instead of 'forcing' them (Seidel & Urquhart, 2013, p.250). In addition it was clear that I was *constructing issues* and working to mutually construct data through interaction, as specified by Charmaz (2014, p.236). So my work seemed to be embracing all three strands and it was very difficult to identify an allegiance to one or the other. Indeed, the customary need to do this as a novice researcher was very troubling, as explained at the beginning of this Chapter.

This section has introduced GTM as an established and rigorous method of qualitative research and theory generation. GTM can be used to underpin the action research cycles. Both operate in an unfolding and iterative manner, embracing an ever more sophisticated and progressive understanding of issues under investigation, and the data associated with the investigation. The principles associated with GTM have been set out, and a brief critical overview of the three contested strands has been put forward. The working position throughout this research was that all three strands have their merits, and elements from each of them could be feasibly integrated together. I resisted aligning myself with one particular strand, which is counter to accepted practice in the GTM research community.

However, the next methodological question presented itself - had GTM and action research been successfully combined before? This question is explored in the next section.

4.5 Combining action research and GTM

Various researchers have attempted to combine GTM and action research.

In the *Sage Handbook of Grounded Theory,* Dick (2007) provides an account of some attempts, and considers what grounded theorists and action researchers can learn from one another. Since the aim of GTM is to build theory from data, and the aim of action research to build theory and practical improvement outcomes from collaborative action, there may indeed be much to learn, as Dick (2007) suggests. This section will consider some issues about, and the ways in which, some researchers have attempted the combination. A key part of this research is assessing and evaluating the quality of the combined approach.

In considering the tensions associated with action research, Hammersley (2004, p.176) urges recognition of 'the distinctiveness of two kinds of inquiry [....] inquiry-subordinated-to-another-activity and research as a specialised occupation'. Participants in a learning network or action research project are interested in expressing their voices as problem co-definers, in helping to identify interventions and to evaluate them, but they are not interested in producing theory. That is the task of the "specialised researcher", in the Hammersley (2004) terminology. The primary aim of this PhD research is to produce a theory. Hammersley (2004, p.165) acknowledges the legitimacy of the two approaches, but warns of 'severe tensions' and contradiction if both aims are treated as equal.

There are a small number of examples of combining grounded theory and action research in the literature. Butterfield (2009) described a project that used constructivist grounded theory procedures to provide an analysis and evidence base of teacher perceptions and experience on raising attainment in, and enjoyment of, reading in a primary school. This example productively used GTM for its systematic analysis techniques, to support the 'action' or *content* of the project, as opposed to full theory building.

The alternative approach is to use GTM to add rigour to the task of theory generation. Arguing that theory development is an essential but not well understood part of action

research, Baskerville and Pries-Heje (1999) provide an account of how they integrated grounded theory techniques into the action research cycle of an information systems project. They suggest that as action research is normally focussed on a problem area with a view to achieving specific improvement or practical outcomes, this will tend to pre-define a core category, as opposed to the core category emerging from the data analysis. Nonetheless they contend that grounded theory techniques add rigour to produce what they call 'grounded action research'. Coghlan and Brannick (2014, p.15) agree that this may be a useful approach, once 'compatibilities and incompatibilities between the two approaches are recognised'. The key point in this PhD research is that GTM is being used to support conceptualisation of the unfolding *process* of organisational learning in the project and subsequent theory generation, as opposed to just supporting the *content,* or action, part.

Notwithstanding this, content and process concerns are inextricably linked. An initial analogy was the two spiral strands of a DNA double helix, linked together by the paired nitrogen bases, as illustrated in Figure 15 below. The two strands represent *content* and *process*. The bases represent the continuous connections between the unfolding action and the learning process required to achieve practical improvement outcomes. This analogy complements the Coghlan and Brannick (2014) table top model illustrated in Figure 13.

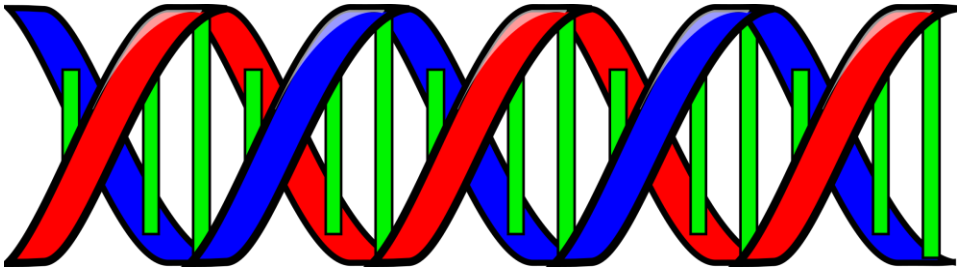

Figure 15. Initial DNA double helix analogy for the connections between the unfolding action or 'content' and the learning process required to achieve it

Thus the research aimed to make an original contribution to this call for *actionable knowledge* in organisational research understood as 'collaborative and generative possibility knowledge intertwined with transformative action' (Sannino and Engeström, 2017, p.80).

With the emphasis placed on collaboration, transformative action, and theoretical and methodological ambition by Sannino and Engeström (2017), the methodology of insider action research underpinned by GTM seemed appropriate.

Thus there were seven main reasons for the combination:

1. it provided a rigorous and systematic approach to qualitative data analysis and theory building, to underpin the action research cycles
2. it was particularly suited to conceptualising unfolding *process* and possible *transformation*
3. it aimed to produce a theory that resonates with practitioners – understandable and applicable by them whilst also being sufficiently theoretically robust for scholars
4. it provided a theory-making approach for an area which is under-conceptualised in the literature, and is characterised by interdisciplinarity
5. it provided an approach for achieving *impact* as an intrinsic part of the research endeavour as opposed to impact as a *far-off aspiration.*
6. it promoted collaborative team working and joint ownership of the research process
7. it aimed to make an innovative contribution and to provide a framework which could be applicable and transferable to other contexts.

This section has set out some examples in the literature of combining action research and GTM, some considerations for doing so, and concluded with a series of reasons justifying the combined approach.

The chosen methodology was therefore to combine insider action research and grounded theory research strategies to support theory generation of the unfolding process of organisational learning. The *content*, or practical aims of the project, whilst of primary importance to the project participants, were - at the outset - identified as the secondary or subordinate aim in the PhD research. This was in order to avoid the severe tensions, contradictions and lack of clarity in theorising, identified by Hammersley (2004) and Corbin and Strauss (2015), if both aims were treated as equal.

However, as the action research cycles successfully unfolded during the research work, it became clear that the *content* or action and the emergent *process* were indeed inextricably linked as per the DNA analogy in Figure 15; and that one could not exist without the other.

Figure 16 illustrates schematically how the GTM conceptualisation of the unfolding process and the unfolding action in the action research cycles were both integrated together over the entire project.

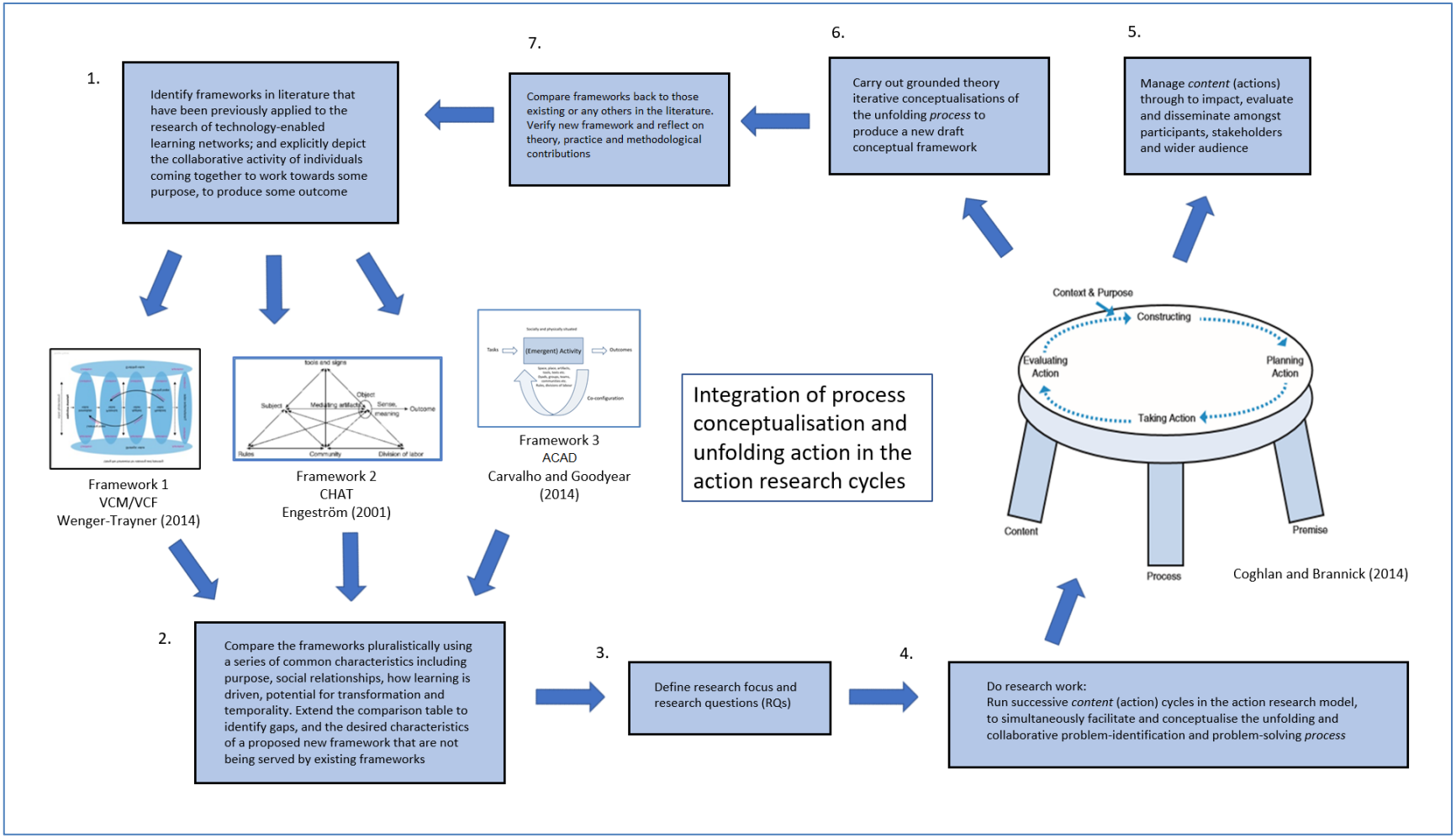

Figure 16. Integration of process conceptualisation and the action research cycles

4.6 Evaluating and ensuring quality and rigour in the methodological approach

There are several works in the literature that provide overall guidance and quality criteria for qualitative research in general. For example, (Tracy, 2010) asserts that high quality qualitative methodological research is marked by (a) worthy topic, (b) rich rigour, (c) sincerity, (d) credibility, (e) resonance, (f) significant contribution, (g) ethics, and (h) meaningful coherence. Twining *et al.* (2017) provide a summary guidance for qualitative research, to indicate how the various aspects of ontological, epistemological and theoretical stance should be integrated with methodological approach, to achieve consistency. However as Coghlan (2019, p15) points out, action research 'requires its own quality criteria'. It should specifically not be judged by criteria from a positivist or interpretivist viewpoint, but on its own terms. The goals, principles and characteristics of action research listed in 4.3 Insider action research are helpful reflective aspects for the entire research work.

In addition, the British Educational Research Association (BERA) carried out a research project to identify the concept of *Close-to-Practice* (CtP) educational research, as 'a shorthand for any research that focusses on educational practices in order to better understand or improve them'. A report and BERA statement was produced which defined CtP research as:

> *Close-to-practice research focusses on issues defined by practitioners as relevant to their practice, and involves collaboration between people whose main expertise is research, practice, or both.*
>
> (BERA, 2017, p.2)

This research project clearly falls under this remit. The definition above contrasts with views that educational research should have an only immediate goal of production of knowledge and that practitioners are 'lay users' of educational research, as expressed by Hammersley (2007, p.289) in a discussion on the issue of quality in qualitative research. The previous

section also highlighted that Hammersley (2004) sees tensions in the dual goals of action research.

The BERA statement, however, provides a definition of quality in CtP:

> *High quality close-to-practice research requires the robust use of research design, theory and methods to address clearly defined research questions, through an iterative process of research and application. The research process will be well documented and the conclusions that are drawn will be appropriate to the strengths and weaknesses of the design, theory and methods used. Such research will draw upon practitioners' and researchers' reflections on both practice and context.*
>
> (BERA, 2017, p.1)

Figure 16, just discussed and showing the integration of process conceptualisation and the action research cycles, illustrates just such an iterative process of research and application as defined by BERA. In combining insider action research with GTM, this research also addressed the CtP requirement for robust research design, theory and methods.

Action research was identified in the accompanying BERA research article (Wyse *et al.*, 2021) as belonging to one of three knowledge traditions that have been part of the development of education. 'Integrated knowledge traditions – those traditions that explicitly attempt to bring academic and practical knowledge into some kind of relationship with each other' were contrasted with the other two traditions - those foregrounding academic knowledge, and those based primarily on practice. Thus this project could be characterised as high quality CtP research using the legitimate and recognised approach of insider action research.

The research journey diagrams adapted from Isaksson *et al.* (2020) and used throughout this thesis are also designed to integrate the theoretical knowledge and practice research journey and claims, thus helping to scaffold an example of a high quality CtP research journey.

There also are separate works from each of the originators of the three strands of GTM, each explicating their own particular views on requirements for quality. In their discussion on quality in qualitative research, Corbin and Strauss (2015) provide a series of comprehensive criteria within which to evaluate the quality of a study using GTM.

In addition, the combination of techniques within the entirety of GTM, embracing all strands, ensures that the researcher remains open to as many *theoretical codes* as possible. This means that relationships between categories are not presupposed or *forced*. The resultant conceptual framework with its concepts and relationships is compared back to the concepts and relationships in the existing frameworks in the literature, through the GTM procedure of *theoretical integration* (Urquhart, 2013). Theoretical integration is thus a critical aspect of establishing quality and rigour in the process of conceptualisation. It provides a sense-check to compare against other concepts which have been identified in alternative frameworks, often by thought-leaders in their fields. Does the new framework embrace these concepts? What new concepts or relationships does it propose? In what ways does the new framework compare to existing ones? Thinking through the concepts and categories in the extended comparison Table 2 formed an essential precursor to the theoretical integration process. It provided both the initial justification for exploring a new framework, and the means to integrate it with the literature afterwards. Theoretical integration provides a robust method for advancing a new conceptual framework to the interdisciplinary research community.

As the list from Tracy (2010) underscores, a key aspect is whether the framework *resonates* with the various disparate practitioners directly involved in the improvement process, or stakeholders having an interest in it. If the framework does resonate, then practitioners will be able to readily relate to it and envision how it may be applied. They will be able to imagine how it might be transferable to their own contexts. To achieve credibility, it is <u>not</u> necessary

to amass a sufficient amount of data to statistically infer relationships or hypotheses with a convincing measure of provable certainty, as demanded in quantitative research endeavours.

Both quantitative and qualitative endeavours frequently aim to convince readers with sufficiently watertight or "thick" descriptions of reality, acquired from large volumes of data. Although large volumes of data were not demanded in this research, the production of an appropriate evidence base to back up and illustrate coding structures interpreted by myself as researcher, was essential. This evidence base had to integrate the variety of voices from the participants, and engage them in reflection about the results.

The extended comparison illustrated in Table 2 therefore provided a specific set of critically derived quality criteria for the new conceptual framework. Taken from the final column of Table 2, these criteria provided a way to shape the characteristics of, and evaluate the emergent framework. They are illustrated below in Table 7.

Ten desirable quality criteria derived from extended comparison Table 2	
1.	have an *object*, in the sense of purpose, or what is being aimed for, which is to resolve a problem or address a challenge in which improvement is being sought
2.	be explicit in depicting the social relationships involved
3.	be explicit about the use or production of artefacts
4.	be explicit about the identification of an improvement as an intermediary step in the cycle towards achieving a practical improvement outcome
5.	identify a practical improvement *outcome* which is an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders
6.	be analysed at a network level consisting of potentially geographically separated disparate practitioners, participation based on their problem-solving role or interest
7.	depict a structured and rigorous problem-solving process or learning mechanism
8.	lead to possible emergent (unpredicted) transformative organisational learning
9.	be capable of facilitation by practitioners with no specialist research methodology expertise
10.	depict an unfolding temporal series of activities which may take significant time to yield outcomes

Table 7. Ten desirable quality criteria for the new conceptual framework

Source: Drawn from the extended comparison Table 2

These criteria, driven by the extended comparison of the three frameworks, can also be augmented by some further underlying principles and questions from each of the existing framework originators, as identified in the Literature Review. These underlying principles include the four questions that Engeström, (2001) asserts 'any theory of learning must answer':

1. *Who are the subjects of learning – how are they defined and located?*
2. *Why do they learn – what makes them make the effort?*
3. *What do they learn – what are the contents and outcomes of learning?*
4. *How do they learn – what are the key actions or processes of learning?*

In order to satisfy Engeström's questions and be credible to the interdisciplinary research community, these questions had to be explicitly answered in relation to the new conceptual framework. The concepts and relationships within Engeström's CHAT framework were also used as a comparator during theoretical integration.

The characterisation of learning mechanisms by Goodyear (Association of Learning Technology, 2017) was important to embrace, as the 'actuality of learning activities and the actual interweaving of activity, tools, language etc'. How the emerging framework would handle this interweaving, and the interactions between the *epistemic*, *set* and *social* learning network elements as associated with the Carvalho and Goodyear (2014) ACAD framework, was considered during analysis and theoretical integration.

Finally the value-adding approach of the Wenger-Trayner (2014) Value Creation Framework, with its learning loops, aspirations, and conditions, ultimately leading to strategic or transformative value, provided a third comparator during theoretical integration.

The criteria lists described, plus the existing conceptual frameworks, were all used in guiding iterative conceptualisation, theoretical integration, and evaluation of the emerging conceptual framework, thus ensuring the rigour and credibility of both the emerging framework and the combined action research and GTM methodology.

4.7 Research design

This section will describe the research design for both Phase 1 and Phase 2 of the project, which took place over three consecutive years.

The following schematic diagrams in Figure 17a, 17b, and 17c provide an overview of the entire methodological path that was taken, indicating the stream of tasks in both the *content* (or action) and the *process* parts of the project. The context, and design and implementation of the action research cycles (*content* of the project as per Figure 13) is shown alongside the data analysis and conceptualisation activities using GTM, (conceptualising the unfolding learning *process* of the project as per Figure 13).

Please note that in reading Figure 17, it is most important to refer back to Figure 13 and the subsequent explanation of *content* and *process.* These terms also appear in the Glossary.

The diagrams indicate the approximate temporal synchronisation of the *content* and *process* parts, and how they were integrated with each other so that the GTM analysis of the unfolding process underpinned the action research cycles. It is important to emphasise once more that the nature of this unfolding process was emergent, and not predicted or predictable at the outset; it took shape as time progressed.

For clarity in writing up, Phase 2 has been divided into Phase 2A and Phase 2B.

Figure 17. Schematic diagram of integrated AR and GTM methodology

therefore appears on the following three pages as follows:

Figure 17a Phase 1

Figure 17b Phase 2A

Figure 17c Phase 2B

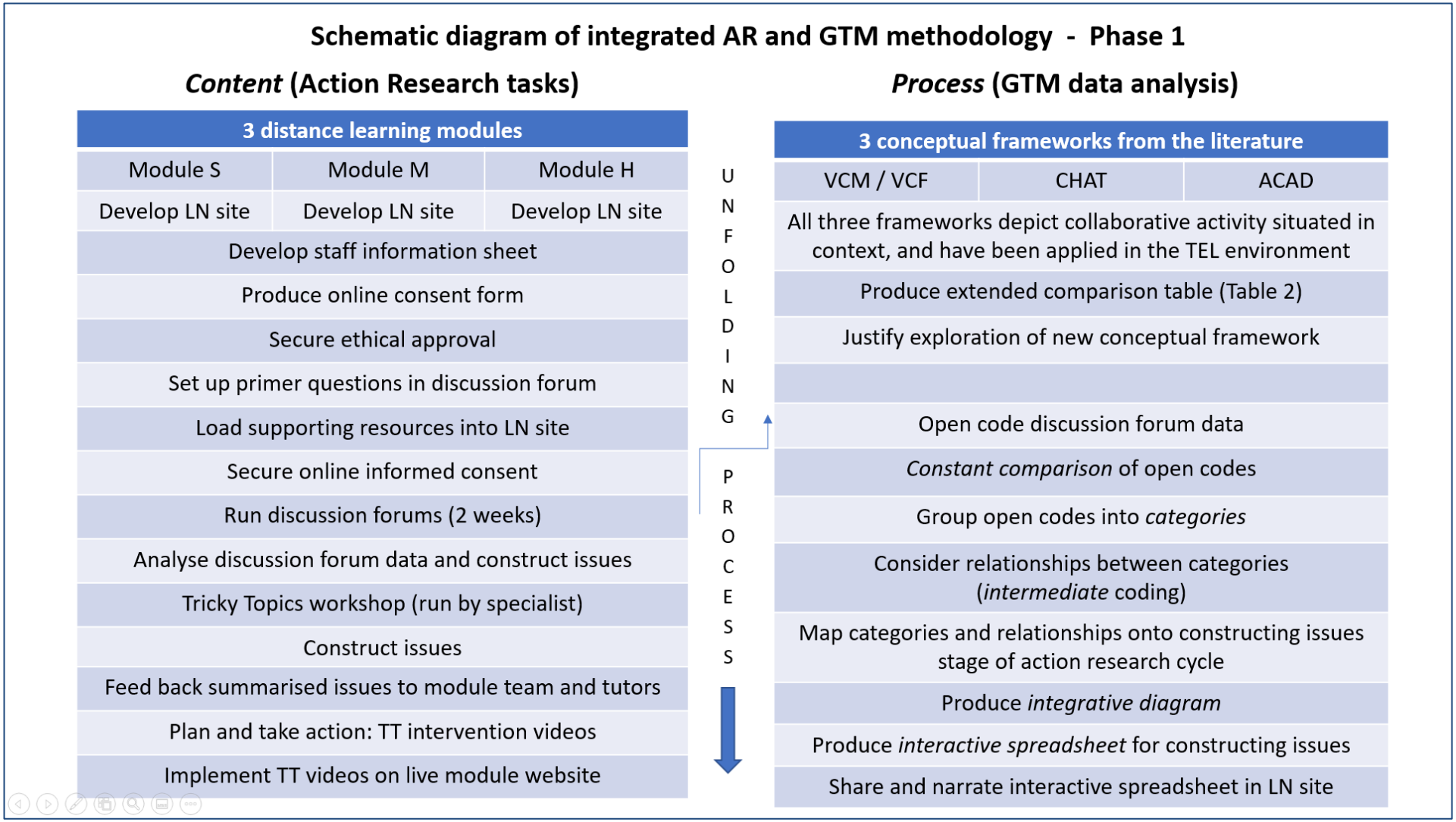

Figure 17a. Schematic diagram of integrated AR and GTM methodology - Phase 1

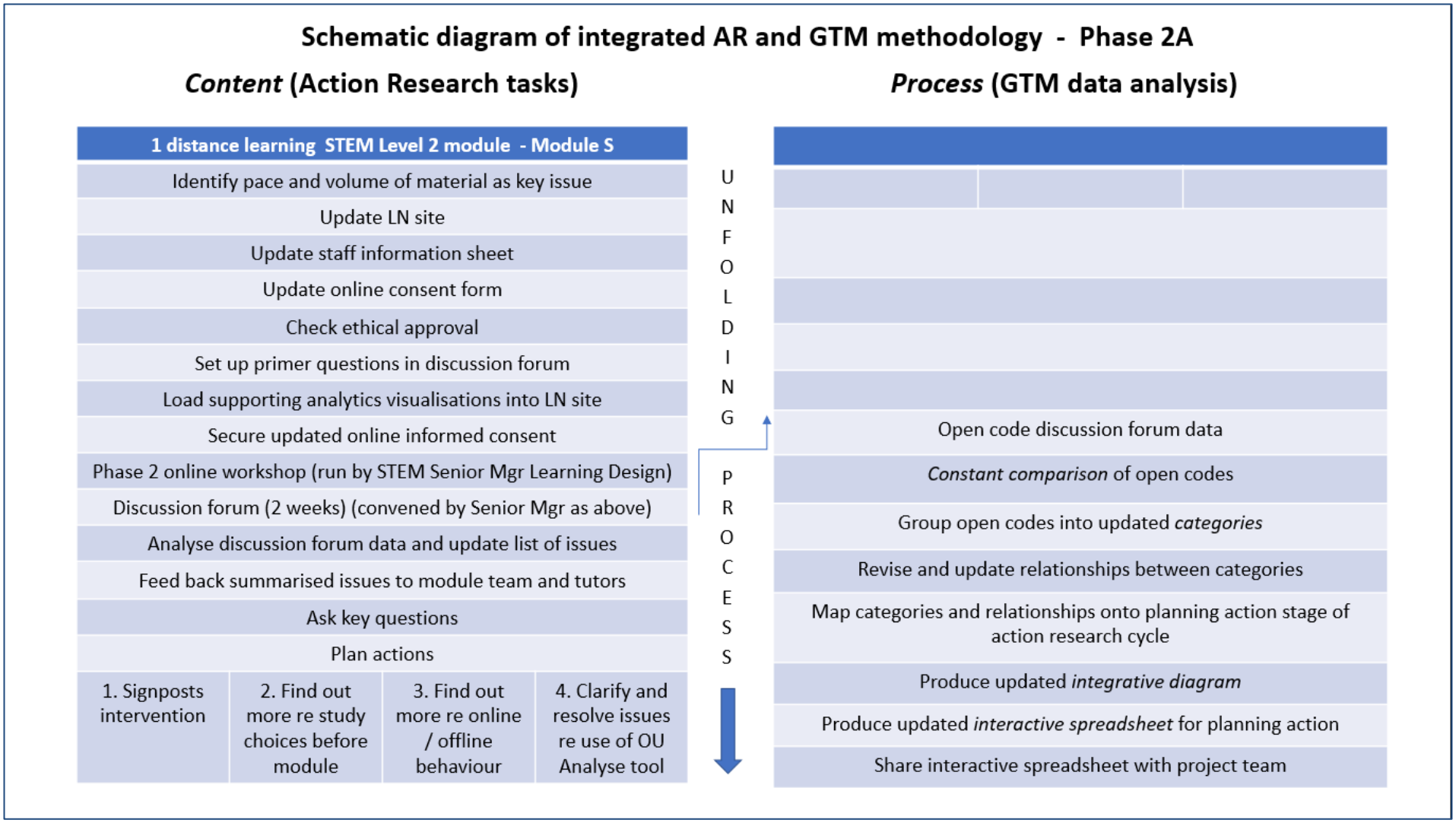

Figure 17b. Schematic diagram of integrated AR and GTM methodology - Phase 2A

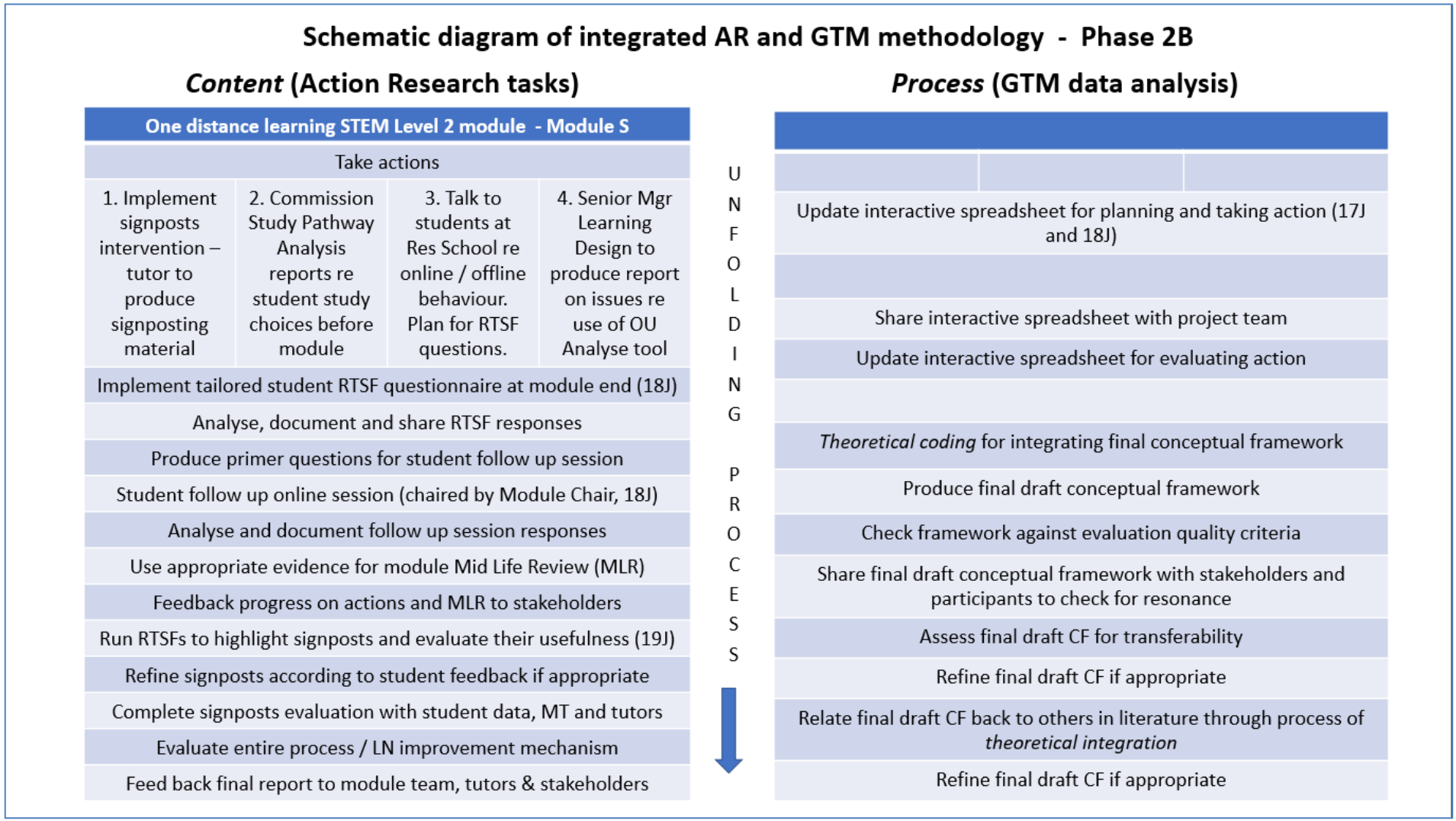

Figure 17c. Schematic diagram of integrated AR and GTM methodology - Phase 2B

In Phase 1 of this research, three OU modules were selected for a pilot project using similar learning networks. For each module, an attempt was made to move through an action research cycle of constructing issues, planning action, taking action and evaluating. In Phase 2, a single module was selected to move forward into a second action research cycle, building and progressing from the results of the first. Ongoing project evaluation in each of the cycles was followed up with evaluation by participants and reflection among affected stakeholders at the end of the project.

As introduced at the beginning of this section and in the schematic diagrams of Figure **17**, each project phase will now be described in the two parts of *content* (action research cycles) and unfolding learning *process* (data analysis and conceptualisation activities using GTM).

4.7.1 Identification, inception and ethical approval for Phase 1 - *content*

Phase 1 of the project was conceived in the developing research and practice area of Tricky Topics at the Open University. The OU Institute of Educational Technology (IET), in collaboration with the University of Oxford, had recently developed a Teaching Tricky Topics (TTT) process. This is a three-stage process which helps teachers to *identify, capture* and *assess* difficult topic areas commonly encountered in teaching science, technology, engineering and mathematics (STEM) subjects (Open University, no date a). The process had primarily been implemented in secondary schools to date. A management decision had been made that the process should be trialled in three OU modules to form an official internal TTT project. The TTT project was convened and chose two modules in STEM subjects, and one further non-STEM module, for the trial. The three anonymised modules selected by this project team were:

- Module S: Level 2 Chemistry
- Module M: Level 1 Mathematics
- Module H: Masters Level Technology-enhanced Learning for Professionals

The TTT process was designed to identify what topics students find conceptually challenging in OU modules, what the stumbling blocks were, and what possible module interventions may be made to better support students. The results of these interventions could be vital to module outcomes, including improved student experience and retention. A special template, called a 'structure chart', had been designed by the TTT project team to support the collaborative identification of Tricky Topics by a number of participants, as illustrated in Figure 18.

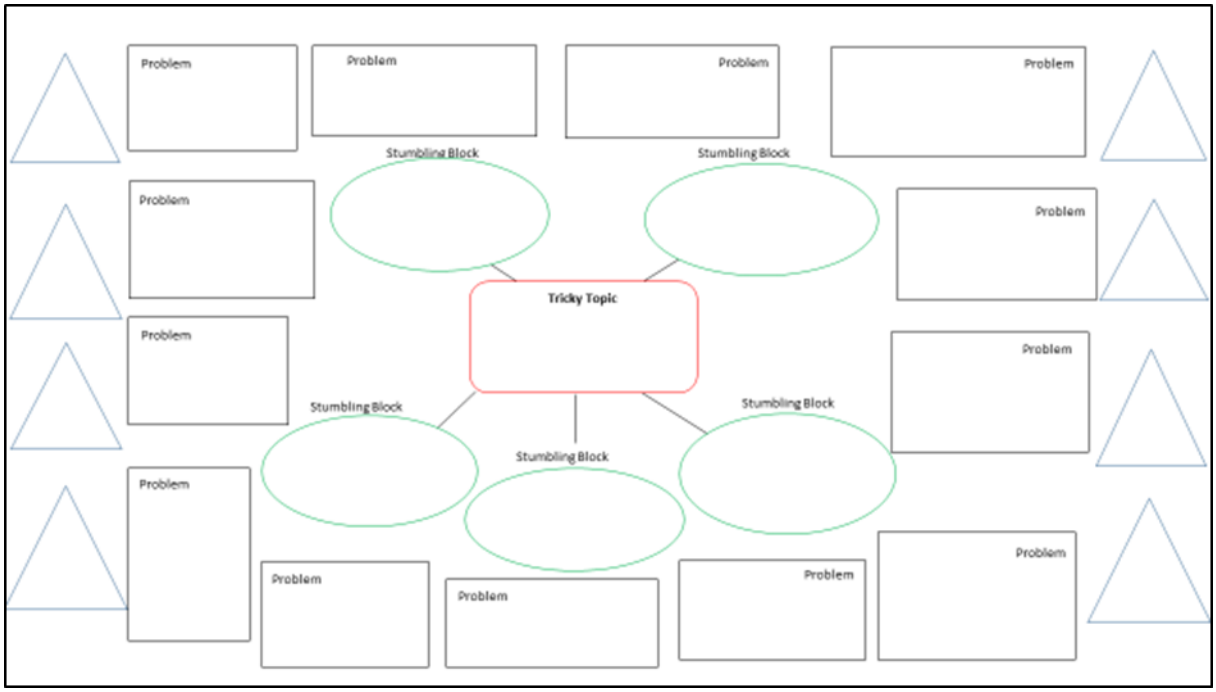

Figure 18. Blank 'structure chart' for collaborative identification of Tricky Topics

Source: (Open University, no date b)

The idea of the structure chart is that participants can brainstorm potential Tricky Topics, by starting from the outside of the chart and discussing problems that are experienced by students, what stumbling blocks these problems represent, and therefore stimulating agreement on the nature of the Tricky Topic itself. Alternatively, they could start by naming the Tricky Topic and working outwards towards stumbling blocks and problems which may be evidenced.

Prior to the project, the TTT process and completion of the structure chart had been carried out in a face-to-face Tricky Topic workshop. However, the complexity of the OU, and the numbers and scattered locations of tutors (Associate Lecturers) who hold vital experience and insight into topics and aspects of module materials that students find challenging, meant that something more was required. It was agreed by managers in the TTT project that a learning network as defined in this research could be used to gather insights from tutors via discussion forums before holding a Tricky Topic workshop. It could also allow all participants to feed into evaluation activities afterwards. It could be used to share both the gathered insights and learning on how best to carry out the process in other modules.

The problem scenario relates closely to the need for 'closing the 'feedback loop' between remote tutors and campus-based module teams. This is an organisational learning aspect which has frequently been identified and traditionally been very challenging for the OU. There is a perennial and recognised institutional need for more systematic procedures – not only for gathering tutor feedback, evaluating it, and planning possible interventions or taking action on it, but also for bringing tutors more actively into any improvement processes so that they can become "part of the solution". This need has been recognised from the highest levels of management. In this sense the project met the 'red and hot' criterion highlighted by Coghlan and Brannick (2014) as essential for securing project sponsorship, creating interest amongst participants and allocating time and financial resources for participation.

The project therefore represented a recognised organisational need, and a way to connect disparate stakeholders spread over many internal boundaries, who did not routinely meet face-to-face. It was therefore agreed that Phase 1 of this PhD research should support the TTT project; a decision taken in consultation with the project team, with stakeholders from the STEM faculty, and with the relevant module teams.

The objectives of Phase 1 of this research were:

1. to implement a series of learning networks in a similar manner to that carried out by Boyd (2017), using standard VLE course websites
2. to gather initial feedback from tutors regarding Tricky Topics on the three selected modules, before an online or face-to-face Tricky Topics workshop for each module
3. to use the learning network to collaboratively evaluate any module interventions after their implementation, amongst the remote tutors and the module team
4. to undertake an initial GTM analysis on the learning network interactions, to begin to conceptualise the unfolding *process* of collaborative organisational learning
5. as a whole TTT project activity, to evaluate tutor and module team perceptions of the learning network and operation of the TTT process.

Thus the learning network was considered an appropriate approach to both precede and to follow a Teaching Tricky Topics process which had already been developed, and previously implemented in school and other public service settings. The learning network would facilitate the gathering of feedback from the remote tutors, in order to prime the subsequent online or face-to-face Tricky Topics workshops, and help to evaluate them afterwards.

During the TTT project inception, a management decision was made to submit a bid for internal eSTEeM project funding. As the OU centre for scholarship of teaching and learning (SoTL) in STEM, the core activities of eSTEeM concern 'innovation and scholarship in STEM learning, teaching engagement aligned with the strategic priorities of the University' (Open University, 2021g). The project proposal was produced collaboratively amongst all the TTT project team members and was successful in securing internal funding. The funding was mainly to be used to finance the participation of remote tutors, who are employed on casual teaching contracts and require additional funding for any other activities.

Full ethical approval was obtained for the project (ref number HREC/2017/2480/Boyd), see HREC approval. Staff Survey Project Panel (SSPP) approval was also secured, which is the OU internal panel for approving internal research projects involving over 30 staff. The project was also registered with the OU Data Protection Co-ordinator, as staff discussion forum data held in the VLE sites would be identifiable to individuals.

The project embraced the current version of the BERA Ethical Guidelines for Educational Research (BERA, 2018). Aspects include informed consent of participants, confidentiality, right of participants to withdraw, and well-being of the researcher. At the outset of the research, I conformed to the institutional requirements of the Open University Human Research Ethics Committee (HREC). The project was regarded as low risk by HREC. In her discussion of 'big tent' quality criteria, Tracy (2010, p.847) identifies four forms of ethical practice, which are 'procedural, situational, relational, and exiting' ethics. Procedural ethics refers to those practices 'dictated as universally necessary by larger organizations, institutions or governing bodies' (Tracy, 2010, p.847). These procedural institutional requirements tend to reflect established ethical considerations associated with conventional quantitative or qualitative research by specialised researchers, who are separated or relatively separated from the participants. Conventional research is conducted *on* or *for* participants, and not *with* them, as per the comparison shown in Table 5. Such ethical requirements tend to focus on the protection of participants' rights and protection from harm, in the context of data being collected from participants and used for specialised research purposes. However, as this research work unfolded and my engagement with both action research and Pragmatism deepened, I was able to reflect more deeply on the ethics associated with collaborative and equitable inquiries being conducted by mutually accountable researchers and practitioners. This ethical reflection feeds into the discussion on high quality *Close-to-Practice* (CtP) research introduced in Section 4.6 Evaluating and ensuring quality and rigour in the methodological approach.

Action research can be argued to be a fundamentally ethical approach, in that it strives to achieve improvements in people's lives. It can be argued that ethics does not always need to start at a set of rules or guidelines with which researchers should check compliance. Ethics can rather be a continuously unfolding way of putting values into action, and reflecting on the relationship that we as researchers have with other human beings, with creatures and the physical world (Brydon-Miller and Coghlan, 2019). These values and relationships can be reflected on at the action research *first-person, second-person* and *third-person* levels:

> *'ethics is not a set of rules or a calculus of risks and benefits, but rather the embodiment of the intelligent, reasonable and responsible selves that action researchers try to become through first-, second- and third-person inquiry/practice.*
>
> Brydon-Miller and Coghlan, (2019, p.304).

F*irst-person* ethical practice reflects the values held by the researcher and the individual participants. *Second-person* ethical practice reflects the joint collaborative and equitable values and relationships of the working group. *Third-person* ethical practice challenges action researchers to promote and disseminate these values to a wider impersonal audience, including 'intellectual, moral and affective dimensions' (Brydon-Miller and Coghlan, 2019, p.315).

Of particular concern in collaborative insider action research is the communication of mutual respect and resonance of values within and between the facilitator and the participants, thus affording each participant an equal voice. Brydon-Miller and Coghlan (2019, p.310) provide an example list of values within a 'structured ethical reflection' process, embracing the *first-person* individual values, *second-person* shared values and *third-person* wider understanding of values based ethics in collaborative research, which could be very usefully used and developed by facilitators in future projects.

Hilsen (2006) underscores the importance of living ethics through everyday practice, by the action researcher making their ethical values explicit. Hilsen (2006, p.23) emphasises 'human interdependency; cogeneration of knowledge; and fairer power relations' as aspects to be taken into account in action research. Power over others occurs as 'we can and do influence each other's lives', and human lives are interdependent (Hilsen (2006, p.29). Action research has the capacity to directly influence others' lives; therefore collaborative action researchers should 'be known by their deeds' when converting ethics values into daily practice (Hilsen (2006, p.29). Although the initial ethical values embraced in this project were related to the institutional ethical approval process, the following fundamental values of action research were always communicated and enacted in the day to day unfolding work of the project:

- mutual and equitable respect for the viewpoints of disparate practitioners, including remote tutors, the module team, module Chair and myself as facilitator
- collaborative approach to working with the intention of empowering remote tutors and implementing interventions suggested by the integration of their joint insights
- design of interventions by tutors themselves
- sharing, for example the details and results of the analysis process for anyone interested
- respectful and inclusive project communication – keeping all stakeholders and participants up to date with project progress via periodic newsletters, and to confirm to them that their views were being listened to, embraced and acted upon.

All of these enacted values helped to mitigate and manage the project risks associated with collaborative action research, as will be identified in Section 4.7.12 Managing project risks.

As the project with Module S evolved and became more successful, it became clear that a level of *transformational learning* and the development of the module as a whole was also taking place.

This promoted further personal reflection about the ethical considerations involved in Pragmatic and transformational projects, within the context of an ever-developing and currently unfolding dialogue in the management and organisation studies literature. In a special issue on 'power, performativity and process', Simpson *et al.* (2021) refer to the earlier Simpson and den Hond (2021) article in *Organisation Studies*:

> *This notion of an affirmative ethics is remarkably resonant with the ameliorative stance of the classical Pragmatists, who argued that ethics is a participatory and experimental process that transforms present situations for the better (Simpson & den Hond, 2021).*
>
> Simpson *et al.* (2021, p.1786)

Simpson and den Hond (2021) also make the ethical connection between values, as just discussed, and moral action:

> *Research in the field of organization and management is still very much founded on a metaphysics of universal truths, objective knowledge and representational validity. It is true that these assumptions have been somewhat unsettled by interpretive researchers, but even they typically adopt a relatively disinterested, independent-researcher stance. This 'outsider' perspective advances an amoral position where 'facts' become separated from 'values', and are reduced to data, to variables whose numerical values are more important than their practical meanings.*
>
> Simpson and den Hond (2021,p.13)

This reflection confirms the vital importance of communicating and continuously enacting shared values during the unfolding action research process, and linking these with action.

The five international editors of the special issue in *Organisation Studies* highlight the connection between posthumanist approaches, see for example Barad (2003), and Pragmatism. The relationship between intertwined or entangled ethics, taking action, knowing and becoming within an ever-unfolding process is at the heart of this understanding. The earlier Figure 11 in Section 4.2 The Pragmatic approachencapsulated my positioning of my combined methodology as it emerged within this understanding. Simpson *et al.* (2021, p.1776) point out that such research endeavours involve 'visibly making' reality, in contrast to the 'making visible' of conventional positivist or interpretivist approaches. A new way of thinking is required, with few standard approaches available. More than two decades ago, in a book chapter on the 'action turn' and the road towards a transformational social science, Reason and Torbert (2001) forecasted that:

> *It will require fundamental epistemological, political, and spiritual transformations if we are to learn, through constructive, compassionate, and validity-testing actions in real-time communities, the nature and quality of inquiring action.*
>
> Reason and Torbert (2001, p.6)

To summarise the ethical considerations in this section, the institutional and procedural ethical requirements for protection of participants' rights and protection from harm were initially followed. This was coupled with continuously enacting the values of the fundamentally ethical approach that was inherent in the Pragmatic approach to action research, to facilitate the collaborative improvement and transformation of a situation for the better. During the unfolding process over successive years, I progressively reflected on ethics and the emerging literature associated with collaborative, becoming and transformational projects, and how the ethical approach might be developed and refined in future work.

The ethical grid supplied by Stutchbury and Fox (2009), that was developed for research in schools, may also provide useful reflective questions for future work.

4.7.2 Development of the Phase 1 project - *content*

This section will describe the practical actions that were taken to establish Phase 1 of the project. Three VLE websites were obtained from the relevant OU internal department. These were each developed into dedicated websites for each module, each with a similar appearance. On the home page of each site, an introduction to the eSTEeM project and to the Teaching Tricky Topics process was inserted. A discussion forum was included, with an explanation of its function. The objective of the discussion forum was to seek tutor views and build joint understanding on Tricky Topics, as the precursor to a Tricky Topics workshop. The discussion forum was equivalent to the *constructing issues* stage of the action research cycle even though this terminology was not foregrounded to the participants. Instead the three phases of the Tricky Topics process were foregrounded – *Identify, Capture* and *Assess*. An online consent form was designed (see Appendix C. Tricky Topic Consent Form for Staff and ALs) along with a Staff Information sheet (see Appendix D. Staff Information Sheet), and these were included on the home page under the heading 'Informed Consent'. An online 'OU Live' video-conferencing room was included, to host the Tricky Topics workshop. The OU Live interface, a standard part of the OU VLE at the time, meant that the workshop participants including tutors in their scattered locations, the module team and the project team members, did not have to travel to a centralised location as had previously been the case in f2f Tricky Topics workshops.

An anonymised screen copy of the developed site for Module S is shown in Figure 19.

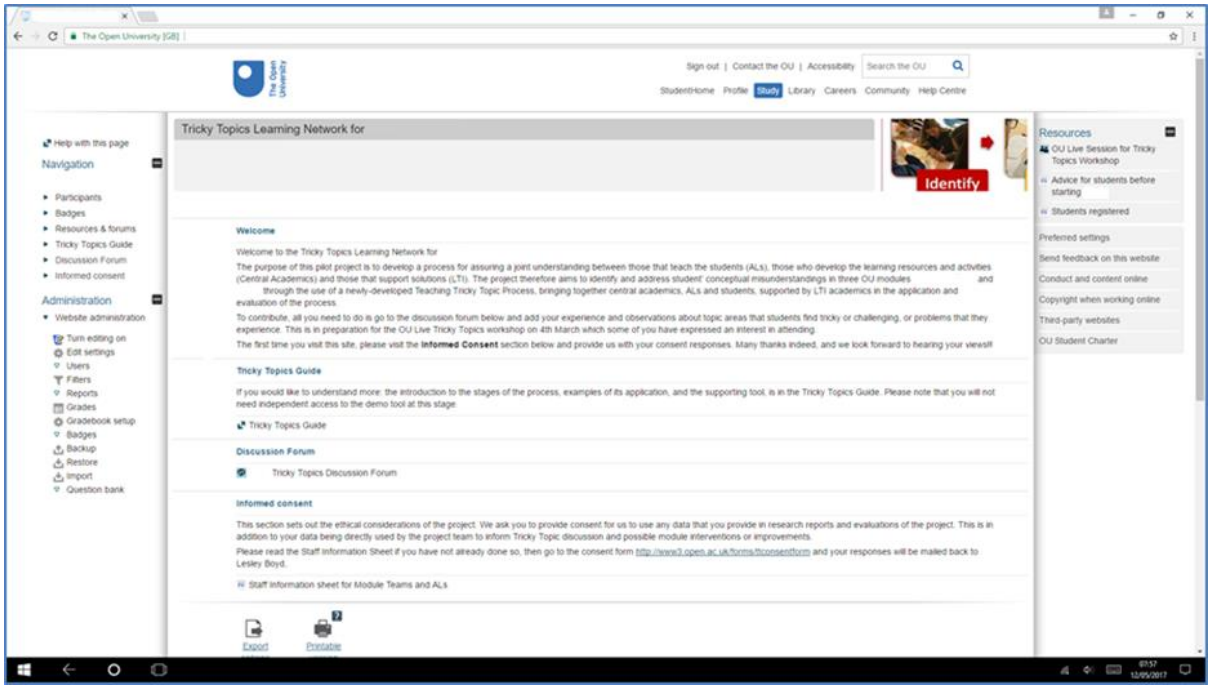

Figure 19. Screen copy of the Module S learning network home page

The discussion forum was described to participants as shown in Box C:

> This is the forum for discussing views and building joint understanding about Tricky Topics prior to the face-to-face or OU Live Tricky Topics workshops. Please conform to general good housekeeping rules - for example start a new thread for a new topic area, or add to an existing thread to contribute to an existing topic. You may contribute as little or often as you wish before we close the discussion prior to the workshops. You may upload examples of problem areas, or refer directly to the module materials if you would like to highlight a particular aspect.
>
> In order to assist with data analysis, please do not use this forum to discuss other aspects not related to Tricky Topics. Thank You for contributing!!

Box C. Module S Phase 1 discussion forum description

4.7.3 Participants

These three VLE sites were therefore developed as the dedicated interaction 'space' for the participants in each module to interact. Participants were as follows:

Module S: 2 Module Team members, 7 tutors,

2 staff tutors, one of whom was also the Module Chair.

Module H: 1 Module Team Chair, 5 tutors

Module M: Approximately 20 tutors, but as will be identified, this module opted for a face-to-face workshop and later withdrew from the project.

4.7.3 Data collection for Phase 1

After the Module S site had been set up, the discussion forum was jointly prepared by two members of the module team. A ''Welcome to Module S Tricky Topics' message was posted and the invitation made to tutors to add their experience and observations about topic areas that students find tricky or challenging, or problems that they were experiencing. The module team started three discussion threads as shown in Box D, and encouraged the tutors to start new threads if they wished. The forum was open for two weeks only, immediately prior to the Tricky Topics workshop.

Preparation for Module S

Please post here your thoughts on how well prepared you feel our students are to study Module S, in particular are there particular areas of chemistry they are deficient in, which lead to difficulties when working through the module materials.

General Chemical Concepts

Please post here your thoughts on areas of chemistry where students struggle, and why you feel this is the case.

Topics linked to Module S Materials

Please post here on areas of Module S which you feel have proved to be stumbling blocks for students and why.

Box D. Module S Phase 1 discussion forum starter threads

Further resources were also loaded into the site by the module team, including recent feedback from exam markers, advice given to students before starting Module S, and a graph of students registered over the time period of the three previous presentations.

The Module M site was developed in an identical fashion, with a similar welcome message being placed in the forum by the Module Chair. In this case however the Chair chose not to facilitate the discussion any further, and to leave the tutors to generate their own threads. There were also no other supporting resources or information included.

As the discussion developed, it was monitored by the researcher and the module team, and replies were added to discussion entries if appropriate. After the discussion forums had run, the Tricky Topics workshops were conducted by a Tricky Topics specialist. The Module S workshop was run online in a video-conferencing room in the learning network, whilst the Module M team opted for a weekend face-to-face workshop run at the OU campus in Milton Keynes.

4.7.4 Completing *content* for Phase 1

The discussion forums and the Tricky Topics workshops were a component of the *constructing issues* stage of the first action research cycle, which formed Phase 1. For Module S, the only module to proceed further, this was followed by *planning action* and *taking action* in the first cycle. Interventions were collaboratively planned as a result of the discussions, and then designed and implemented by selected tutors. This was followed by a whole-project evaluation stage for each of the three modules, run by the TTT project team leaders.

4.7.5 Data analysis for Phase 1 – *process*

Grounded theory analysis was used to analyse the learning network interactions. The first task was to anonymise and assign *open codes* to the data within the discussion forum.

The analysis was achieved by exporting the discussion forum data into word processing documents, using a standard export function within the VLE. This produced a series of word processing files, one for each thread of the discussion. The next task was to anonymise the data and assign participant identifiers for each participant. They were initially identified in terms of job role and a number, e.g. AL1 (Associate Lecturer 1, MT2 (Module Team member 2) ST1 (Staff Tutor 1) etc. The word processing files were imported into qualitative analysis software (NVivo 11/12).

Then *open codes* were assigned to segments of text. These open codes assigned a conceptual label to a specific text segment. In the coding process, it was apparent that each text segment could be labelled by more than one open code, and many had several codes assigned. Each text segment was compared to the next possible candidate for that code, to test whether it represented the same or a different concept, using the process of *constant comparison.* At the end of the first pass of open coding, the qualitative analysis software was used to provide a report of the excerpts for each code, which formed the *evidence* for that code.

The next stage was to group the codes together into *categories*, which are instances of codes connected by some relationship, and then to consider how these categories relate to one another. This is an essential step in theorising. In the account of her own journey, Urquhart (2013, pp. 42-44) recounted her productive use of *semantic relationships* provided by (Spradley, 1979) for initial ideas on how codes can relate. These are illustrated in Box E:

- Is a kind of
- Is a part of / a place in
- Is a way to
- Is used for
- Is a reason for, is a stage of
- Is a result/cause of, is a place for
- Is a characteristic of

Box E. Spradley's (1979) semantic relationships, quoted by Urquhart (2013,p.43)

Open codes were therefore grouped together using semantic relationships, which provided some useful support to start to identify categories. The coding families provided by Glaser, and the Strauss and Corbin paradigm, were also available to provide possible ideas. These could be used as 'jumping off points to think about relationships in data' (Urquhart, 2013, pp. 26-28).

The objective of the discussion forum was to construct issues, as the first stage of the action research cycle. It was also the first part of the process or mechanism of organisational learning required to achieve practical improvement outcomes. The different open codes were therefore mapped against the *constructing issues* stage, by using Spradley's (1979) relationships, to form initial categories. Initially, this was done using the tried and tested method of arranging and re-arranging a series of coloured sticky notes on a large sheet of paper. Each sticky note represented a different open code. They could then be experimentally grouped together by considering their similarities, and what possible relationships may be inherent in the data. Identified semantic relationships were then used to draw an *integrative diagram* of the type illustrated by (Urquhart, 2013, p.115). These diagrams are a useful analytical device to visualise and integrate relationships between categories. They can act as a form of visual and diagrammatic grounded theory 'memoing' (Birks and Mills, 2015, p.179). Each code or category is represented by a box, and the boxes are arranged on the page, with a diagrammatic representation of the relationships between them.

Once the categories were identified, the first integrative diagram was drawn in PowerPoint. A key aim of the research was to produce a conceptual framework that resonated with practitioners, and would be understandable and applicable by them. Another key aim was for shared ownership of the entire research process. To this end, and in order to share the collaborative results of the discussion, the workshop and the analysis process amongst all participants and interested stakeholders, I produced a summary document (see Appendix F. Phase 1 Progress notes for Module S tutors and module team).

The document explained the project progress so far and included a picture of the initial integrative diagram. It was loaded into the learning network website, and also circulated to tutors and the module team via email and the tutors' dedicated online forum.

Also, in an attempt to share the research process, the drawing of the integrative diagram was converted into an interactive Excel spreadsheet. The spreadsheet accurately recreated the diagram, with open codes represented by boxes, and the relationships between the codes represented by horizontal and vertical lines. For each box representing an open code, a further 'sheet' in the spreadsheet was included, listing the excerpts or segments of coded data that were included in that code. The spreadsheet user could click on a link in the corner of each code box, to take them to the evidence for each code. Any participant who was interested could navigate around the spreadsheet to explore how the codes were built up and what data was supporting each one. They could also see the overall picture of how the codes were relating together, at the *constructing issues* stage. The interactive spreadsheet was also explained for participants with an accompanying narrated PowerPoint presentation and loaded into the learning network.

For reference this interactive spreadsheet for the Phase 1 constructing issues stage is illustrated in Figure 20. However, the findings of the coding, integrative diagram production and the interactive spreadsheet production are all described in the Findings chapter.

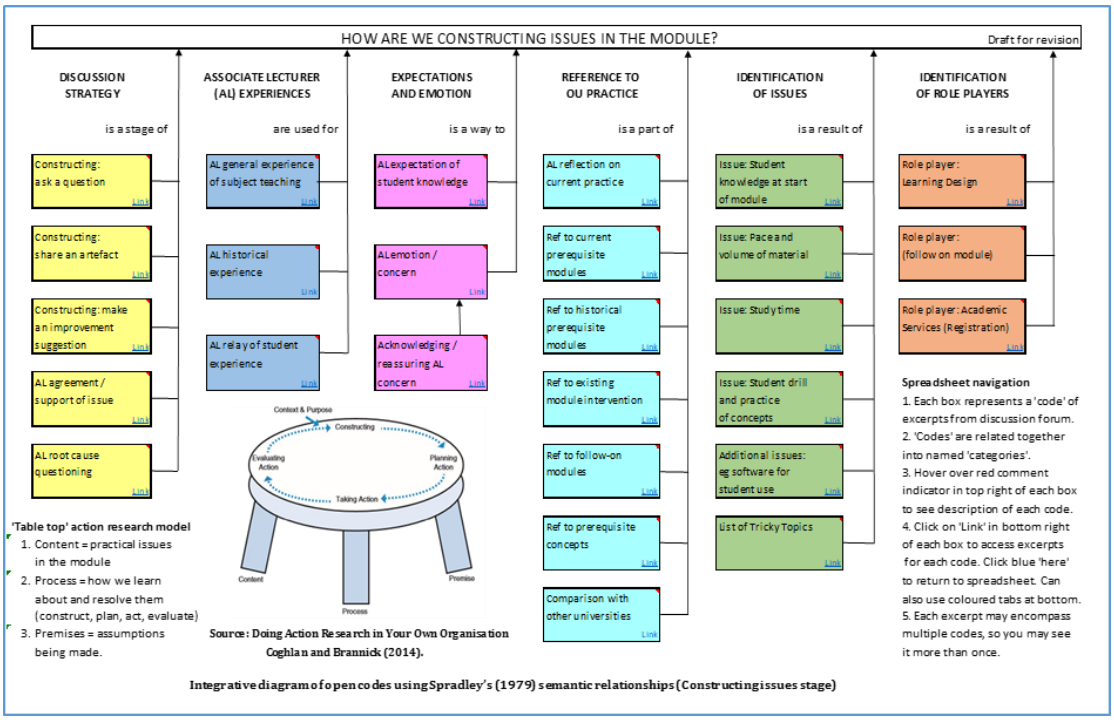

Figure 20. Integrative diagram of open codes at *constructing issues* stage for Module S Source: (Boyd, 2019)

4.7.6 Inception and ethical approval for Phase 2 - *content*

Module S was particularly successful and the only one to progress to Phase 2. The tutors successfully identified a series of conceptual Tricky Topics. They also identified a series of i*ssues* and challenges they felt were facing students in addition to the list of Tricky Topics. These issues are explained further in Findings and summarised here as:

a) Student knowledge at start of module
b) Pace and volume of material
c) Study time
d) Student drill and practice of concepts
e) Additional issues: e.g. software for study use

The second cycle was therefore planned, based on the analysis from the first cycle, and to further explore the tutor concerns about *pace and volume of material*. The Senior Manager for Learning and Teaching within the STEM faculty, with responsibility for learning design, had previously overseen the production of a series of learning design analytics visualisations for Module S. These visualisations arose from ongoing research work conducted at the OU Institute of Educational Technology by Nguyen (2020), which continued an ongoing research direction exploring the connection between learning analytics and learning design.

Two practical implications of this work identified by Nguyen (2020) were a) to consider 'mapping' and visualising the study hours designed into a particular distance learning design at a weekly level, and b) to combine these learning design visualisations with analytics of student behaviour, to understand the temporal nature of study behaviour with reference to the learning design (Nguyen, 2020, p.166).

Visualisations of this nature produced for Module S were underscoring the feedback from the module tutors in Phase 1, regarding the challenging pace and volume of material for students. They were affording an opportunity to 'close the loop' identified by Nguyen (2020, p.169) by circling the findings back to the Module S tutors for their collaborative reflection.

The Senior Manager for Learning and Teaching thus became an active sponsor of the idea to integrate the data output of the learning design analytics visualisations, with the qualitative feedback of the tutors, and to run a second phase of the learning network. I as researcher took the initiative to propose funding for a dedicated internal operational project, in conjunction with the Module Chair of Module S. The proposal was approved by the STEM scholarship centre and therefore myself and the Module Chair co-led the second project (Phase 2). Along with the Senior Manager for Learning and Teaching, we were able to act as a cohesive team.

This approach ensured that implementation of the methodology, project timescales, plus communication with project participants and interested stakeholders could be directly controlled by myself and the Module Chair. My proposal secured funding for the continued participation of tutors, who are paid on contract for teaching, and separately for each additional activity they are involved in. The proposal acceptance also meant the project had institutional approval as a credible and recognised internal operational project in its own right.

In Phase 2 we planned to hold a further online workshop, and to share the three learning design visualisations with the tutors and the module team. The planned course of action was to discuss the visualisations in the online workshop and to ask tutors if they could suggest any revisions to their teaching practice as a result of additional insights generated in the discussion.

The three visualisations were as follows:

1. **Expected Student Activity against Activity Type: a Learning Design 'mapping' grid.**

   Figure 21 shows the OU Activity Types Classification Framework (Conole, 2013) which has been adopted by the OU in order to improve design and evaluation practice in teaching and learning. Distance learning modules can be 'mapped' or 'coded' using this framework, against the weekly time that a student is expected (using OU student workload guidance norms) to spend engaged in each of the Activity Types. The framework is an adopted guideline for all OU new learning design and can also be applied to previously produced modules, as in this case.

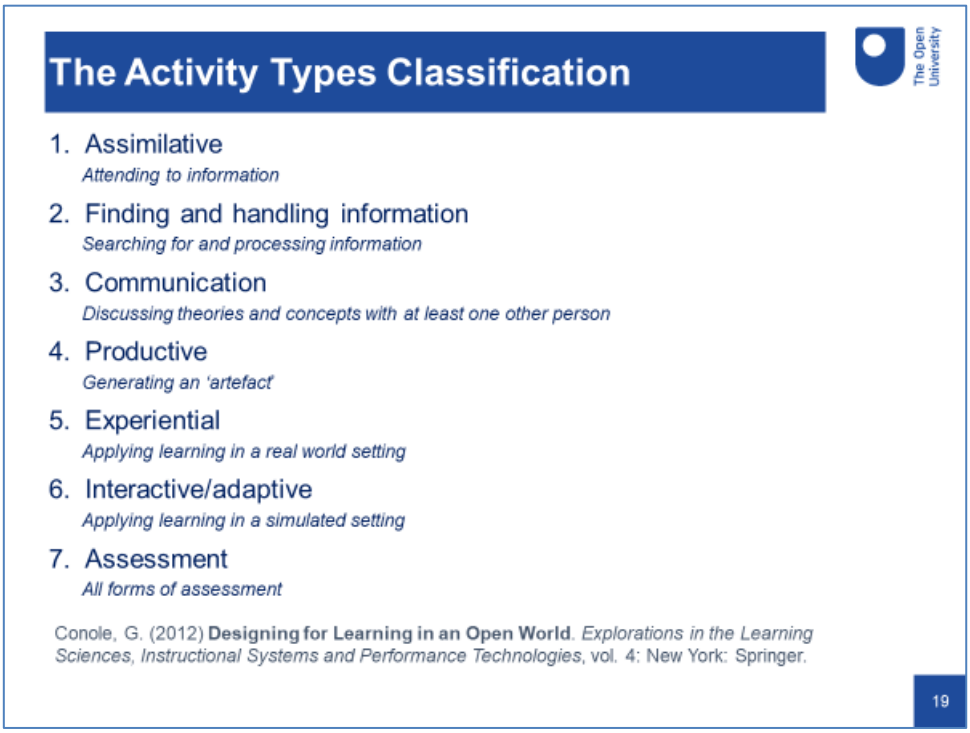

Figure 21. The OU Activity Types Classification Framework (Conole, 2013).

Visualisation 1 is shown in Figure 22, as an extract of the learning design mapping data for the initial weeks of Module S. The horizontal bars in the last three columns represent total study hours, mapped from all the different activity types designed for that week. If this horizontal bar exceeds 20 hours, it will appear in red, which indicates an 'overloading' of that particular week. The mapping data for Module S underscored the qualitative feedback from tutors, in that several blocks were overloaded and fell significantly outside of institutional guidance, especially in the second half of the module. The quantitative data was underscoring the feedback from tutors that the pace and volume of study material was an important issue for students. Thus the learning design mapping was an important artefact to share with the tutors.

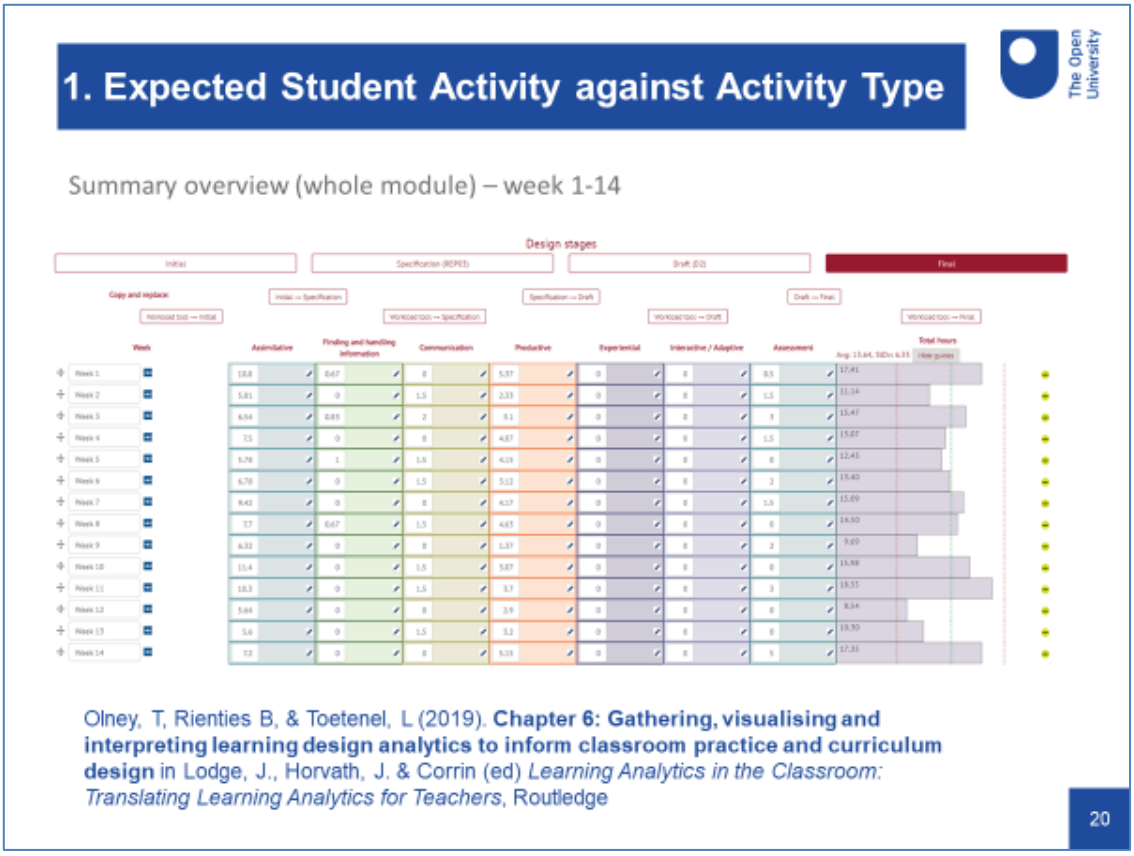

Figure 22. Extract from the Expected Student Activity against Activity Type visualisation (Learning Design 'mapping')

2. **Expected Student Workload against Advised**

OU module teams are required to advise students (in the module Study Planner on the VLE) of the amount of time they expect students to spend on different activities. The second visualisation takes the mapped workload and compares it against this advice. This visualisation forms a comparator between the weekly hours that are actually designed in the module, and the advice given to students. It is illustrated in Figure 23.

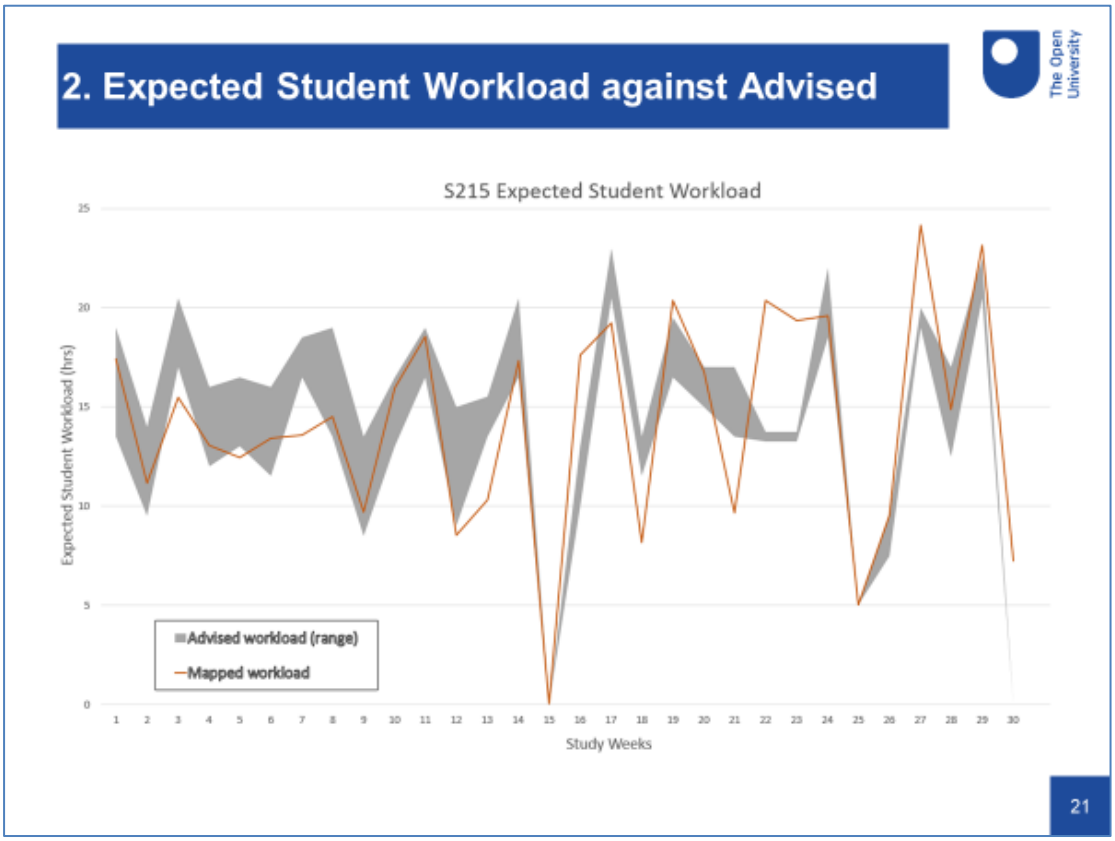

Figure 23. Expected Student Workload against Advised visualisation

Visualisation 2 illustrates that for the first half of the module, the mapped student workload falls mostly within the advice given to students (despite it being unevenly distributed). However, in the second half of the module there is a disconnect between the mapped and advised workload and the uneven distribution between weeks is increased. Several weeks of the module contained more student workload than was appropriate and exceeded current OU guidelines (in excess of 20 hours).

3. **Expected Student Workload by Activity Type against VLE Engagement**

The third visualisation is illustrated in Figure 24.

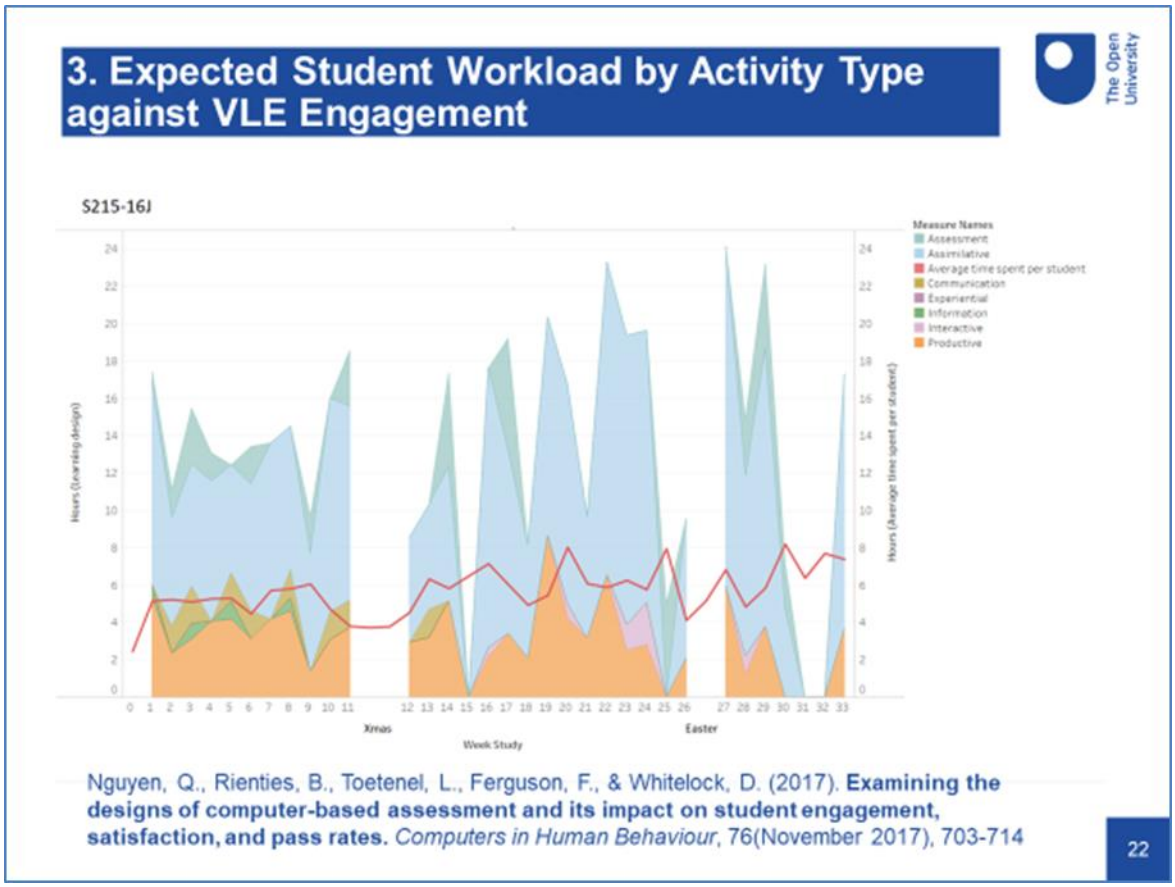

Figure 24. Expected Student Workload by Activity Type against VLE Engagement

In this visualisation, the expected student workload by activity type from Visualisation 1 was plotted in a stacked graph formation, for each week, against a red line of average hours of VLE engagement per student. The plot indicated that average VLE engagement was significantly below the expected student workload, and did not exceed 8 hours in any one week. As Module S is an online only as opposed to a blended module, with no printed study materials, the expectation is that VLE engagement might be much higher, and could feasibly be related to expressed concerns about pace and volume of material. Several tutors suggested students were choosing to download and print resources.

All of these three visualisations were therefore important visual interpretations of learning design analytics to share with tutors, to seek their feedback on questions raised by the visualisations, and seek their ideas for teaching improvements or adjustments. Learning design and VLE engagement statistics are centrally produced, separate from module teams and very distanced from remote module tutors. Therefore this progression of the learning network to Phase 2 was an innovative example of drawing together the various disparate and geographically separated practitioners involved in the delivery of Module S, in order to have an equitable and participatory discussion about whether or not these analytics helped to throw any light on their identified issues, or assisted them in making teaching improvements or adjustments. It formed a unique opportunity at the OU for tutors to be engaged in collaborative research using this data. It was also pursuing a "red and hot" issue (Roth, Shani and Leary, 2007) which was generating interest, buy-in, interest and allocation of time and resources.

The three visualisations were loaded into the Module S learning network site, along with an update of progress so far on the home page. This time an online briefing workshop was planned before, rather than after the discussion forum, so that the three visualisations could be explained and discussed before potential improvements or adjustments could be considered in the forum. An online Adobe Connect room was included to host the briefing.

The second discussion forum was included with an explanation of its function, in a similar fashion to Phase 1. The discussion forum was equivalent to the *constructing issues* stage of the action research cycle in Phase 2, building on the output of the previous cycle. It was described to participants as shown in Box F:

This is the forum for discussions about your experience of the visualisations, whether you perceive them to be useful and relevant, and what *actionable insights* you may be able suggest, in the light of the expressed concerns about pace and volume of material, and student workload.

The first three introductory questions will focus on your reactions to Tom's presentation. Then we will post further questions about what actions might possibly be taken for this and subsequent presentations.

Feel free to post further new threads if you wish, bearing in mind we will move on to possible actions in a few days, after first discussing the issues. All the questions are posed jointly by the project team. Thanks for all your contributions and thoughts!

Box F. Module S Phase 2 discussion forum description

The Senior Manager Learning and Teaching prepared discussion forum starter threads, in a similar manner to Phase 1. These are shown in Box G:

Q1. First impressions

What are your first impressions of visualisations 1, 2 & 3?

Q2. Comparison with your own experience

To what extent, and in which areas, do the visualisations match or differ with your experience of teaching Module S?

Q3. New insights

Have you learnt anything new about Module S from these visualisations? If so, what?

Box G. Module S Phase 2 discussion forum starter threads

As this was a second phase of the project and the participants could have changed from the first phase, the online consent form was revised and updated, along with a Project Summary sheet, (see Appendix F. Phase 1 Progress notes for Module S tutors and module team) and both were loaded into the site. Participants were requested to provide informed consent specifically for Phase 2.

4.7.7 Data collection for Phase 2 – online briefing session and discussion forums

The online briefing session was run on 30th October 2018 and 11 participants attended, which included two members from the module team, the Senior Manager Learning and Teaching as facilitator, 7 tutors, and myself.

The discussion forum was run for almost two weeks immediately after the briefing. Towards the end of the discussion period, I produced a 'Draft issues raised from the Module S live briefing session and learning network discussion' document, and shared it in the discussion forum. The purpose of this document was to pull together and summarise all the issues which had been raised thus far, and allow participants to suggest any changes or make any additions. A meeting of the project team was then held to discuss the issues raised and decide on the next actions.

4.7.8 Phase 2 planning and taking action

The project meeting after the discussion forum fed into the *planning action* stage of Phase 2. A series of four key follow up actions were planned, which are described in the Findings 6.2 Planning of four key actions. These follow up actions embraced either identifying more data to answer questions and issues raised by participants, or the direct planning of interventions. Progress on the follow up actions was project managed by myself and developed over the following months. This formed the *taking action* stage of Phase 2. As the progress unfolded, I kept an 'Issues and possible actions' document, which I periodically updated and shared with the project team, so that progress could be tracked and reviewed at any given time. This document is also described in the Phase 2 Findings chapter. The progress was emergent and unpredicted, and the project team had to find a way through a complex series of issues which had been identified and developed from Phase 1. The *planning* and *taking action* took place via project meetings and associated follow up activities, as opposed to within the learning network.

4.7.9 Further emergent data collection for Phase 2

After the additional data had been identified and follow up activities completed, it was decided - as an emergent and previously unanticipated activity within the confines of this project – to seek the views of *students* on the identified issues. Thus far the research had collected and integrated views from disparate *practitioners* involved in the delivery of Module S, including tutors, staff tutors, the module team and the Senior Manager Learning and Teaching. However the complexity and richness of the issues identified, in conjunction with the questions that were being raised, meant that it was vital to seek the views of students to ascertain their own feedback on their learning experience in Module S. Student views in the OU are routinely collected via an institutional Student Experience on a Module (SEAM) survey, after the module has completed. There are also a wide variety of initiatives to work with students as partners in different ways. In this project we decided to make use of the Real Time Student Feedback (RTSF) facility, which is an online questionnaire tool within the VLE. It can be tailored to ask particular targeted questions to students on their live module websites, by appearing as an activity within the Study Planner. It can also be configured to provide tailored automated responses to students based on their responses to questions. RTSF therefore provides for specific and targeted questions which can be posed during a module delivery, as opposed to after it has ended. It is then possible to offer additional and targeted interventions to students to enhance their learning experience whilst they are studying the module.

An RTSF questionnaire was therefore prepared by myself, shared amongst the project team and the central Learning Design unit for comment, and submitted for ethics approval. In the OU all planned RTSFs must be submitted to the Student Research Project Panel (SRPP) for approval, as direct questions are being asked of students in their live module learning environments. The RTSF questions were specifically tailored around the identified issues.

SRPP approval was achieved and the online questionnaire was set up by the Module S Curriculum Manager, who has responsibility for managing the live module website. It was made live for the last two weeks of the Study Planner. The approved questionnaire template which was submitted to SRPP is provided in Appendix G.

The final question in the questionnaire asked whether students would be interested in helping further by providing more detailed feedback on an individual basis, or joining in an online follow up session after sitting their examination. An Amazon voucher was offered as a thank you for their time, which was restricted to one hour.

The results from the RTSF questions were used to prepare a PowerPoint presentation, and to formulate discussion starter questions for the online student follow up session. These starter questions are indicated in Box H.

The session was chaired by the Module Chair. The Senior Manager Learning and Teaching, and an interested volunteer tutor invited by myself also attended. Five students volunteered to attend this session. It was therefore a collaborative online event with representation from all the stakeholder groups playing a part in the module delivery.

The questionnaire results, questionnaire free text responses and additional feedback points from the follow up session were all then combined in a single summary document which was circulated to stakeholders via email, in the dedicated tutor forum and in the learning network site. This document is described in the Phase 2 findings 6.8 Emergent tasks and developments carried out in Phase 2B.

1. **Did you feel your chemistry background was adequate to prepare you for studying Module S – do we assume too much?**
2. **Where did you find the pressure points were, and where does the module start to get challenging?**
3. **Did you find it challenging to factor in study time for completing assignments? How useful or accurate did you find the advice on study time?**
4. **Did you use any particular strategies if you felt under pressure to complete all the material in time?**
5. **How did you use tutorials in your study, and could we be providing recorded materials in any alternative formats (e.g. MP4 audios)?**
6. **Did you find the content of the Block 9 & 10 Signposting materials useful? How might we improve them, or could you suggest a more useful alternative?**
7. **If you used the print on demand service, what was your experience?**
8. **Anything else you would like to discuss?**

Box H. Module S discussion starter questions for online student follow up session

A further RTSF was conducted as an emergent development in the following year, which is also described in the Phase 2 findings 6.8 Emergent tasks and developments carried out in Phase 2B.

4.7.10 Data analysis for Phase 2 – *process*

In the last coding stage, a process of *theoretical coding* was followed to integrate and refine the emerging conceptual framework. Theoretical coding is the GTM procedure of relating together all the identified categories to form the draft conceptual framework. Finally, the emergent theory was related and compared back to the others in the literature in the GTM procedure known as *theoretical integration.*

4.7.11 Overall evaluation of the entire process and dissemination

The entire process was evaluated via a reflective evaluation questionnaire sent to participants at the end of the project, which is shown in Appendix L. Also sent at the same time were:

- Final project progress report (see Appendix K)
- Previous project update report, as a reminder of previous progress (see Appendix I).
- A 'plain English' poster which provided a personal and chatty account of the research.

In a further emergent or un-anticipated development, the combined feedback from the tutors. module team and students was used as a key backbone of the evidence for module interventions and adjustments in the Mid Life Review, which was carried out in July 2019. A Mid Life Review is a component of the institutionalised quality enhancement (QE) procedure at the OU.

At the end of the project, a final report was produced for the eSTEeM scholarship centre, which included an evaluation and reflection between myself and the Module chair, as project co-leaders. The final report was included on the dedicated project page on the eSTEeM website, and in the Scholarship Exchange, which is an institutional repository for the sharing of projects.

4.7.12 Managing project risks

This section identifies five project-related risks that were identified, along with the actions taken to mitigate them.

a) **Confidentiality and security**. Since the research concerned improvement outcomes relating to OU internal practice, the technology platform had to be confidential and secure. Using a VLE website, with the normal OU log in procedure, was the most secure option, as opposed to an external, 'open' or social networking platform.

b) **Sufficient readiness for action.** The participants had to be engaged by a galvanising *object* (purpose, or what is being aimed for), which would inspire action in the face of competing operational priorities. Also of vital importance was securing sponsorship from relevant management stakeholders and project participants, such that a level of 'buy-in' was achieved in order to justify, and provide resource for, time to be spent. The action taken was to secure internal project funding from the eSTEeM scholarship centre. Ultimately however this risk played out differently for the three chosen modules. Two of them were indeed affected by competing and complex operational priorities. Only Module S was sufficiently galvanised for action, in the face of identified and pressing issues for both their students and tutors, which helped to maintain momentum.

c) **Temporal elements involved in realising practical improvement outcomes**, and how long these can take to become apparent. Insider action research projects need to pass along an evolution process in which individual and organisational learning gradually unfolds, and improvements or benefits may only be recognised by stakeholders after a period of years. It takes time for individuals to learn how to engage in a problem, time for them to come together and learn how to problem-solve collaboratively, time for any proposed solutions to be implemented, and time for them

to be evaluated. This risk could be managed to a certain extent by reporting and sharing results promptly, to secure early gains, and establish the momentum of the project and engagement of the participants.

d) **Challenges associated with insider action research.** In their discussion of the dynamics of developing new organisational learning capabilities (Coghlan and Shani, 2008, p.2) identify three challenges for insider action research relating to '*preunderstanding, role duality and organisational politics*'. These authors point out that 'existing capabilities are deeply embedded in organizations' routines, culture and frameworks' (Coghlan and Shani, 2008, p.2). They emphasise that:

> *an effort to develop new capabilities requires a deep level insight, inquiry and understanding of the organization, its dynamics, culture and evolution. The insider action research can serve as a catalyst for the development of new capabilities, yet the challenges for triggering and facilitating such an effort are many.*
>
> (Coghlan and Shani, 2008, p.3)

Amongst these identified challenges are firstly *preunderstanding*, which is the capability to inquire into something that is close and familiar. The proximity to day-to-day practice resonates with the warning of 'severe tensions' asserted by Hammersley (2004, p.165). The mitigating approach that I took to manage this risk was to operate as the facilitator of the task of learning to inquire collaboratively, which required the development of new *capabilities* for the module team. I effectively operated as an "insider-outsider". I was researching in my own organisation, with a deep familiarity for OU dynamics, culture, and distance learning practice, and also familiarity as an OU distance learning student myself. However I was separated and distinct from teaching and learning

design and delivery practice within OU modules, especially within the STEM faculty and within the design and delivery of chemistry teaching, which formed the successful research context.

The second identified challenge by Coghlan and Shani (2008) is *role duality.* Role duality means navigating the organisational member role and the action researcher role, and the inherent tensions between them. Coghlan and Shani (2008, p.4) identify that 'the outcome for working with role duality is the effective utilization and understanding of the insider action research role as a learning mechanism and development of new organisational capabilities'. Role duality is thus another unique challenge for this type of research. The mitigating approach that I took to manage this risk was to continually negotiate the balance and tensions in my role with my important stakeholders – primarily with my PhD supervisory team and with my eSTEeM project co-leader, as the project unfolded. This aspect of negotiating the tensions between the daily practice of the delivery of Module S, and my research role, became a regular feature of discussion between my project co-leader and myself. It was not my role, expertise or responsibility to intervene in teaching practice decisions, but to facilitate the process that enabled the development of collaborative inquiry capabilities within the module team.

The third identified challenge in the dynamics of developing new organisational learning capabilities is *organisational politics.* The outcome for working with organizational politics is building learning mechanisms that are effective politically (Coghlan and Shani, 2008, p.4). The task here is to 'survive and thrive' (Coghlan and Shani, 2008, p.5) within the organisational politics and crossing of multiple research and practice boundaries. This is a fundamental challenge for an insider action researcher as different types of specialist researchers with more traditional or conventional approaches may be very sceptical, see for example the warnings issued by Hammersley (2004).

The mitigating approach taken to manage this risk was to continually communicate, share and disseminate – with my supervisory team, my eSTEeM project co-leader, my own research department, the eSTEeM scholarship centre, the OU Learning Design unit and wider afield in external conferences. I also presented the project at a STEM teaching practice conference with a contributing tutor from Module S. All of these communication and dissemination activities helped me to gauge the political acceptance of the research.

e) **Challenges in an unfolding, emergent research project.** The research work was carried out *prehensively, from within* and *in-the-flow* of unfolding and successive module deliveries and not predicted or predictable at the outset. There was a therefore a risk in involving practitioners and stakeholders in an untested experimental process which might or might not yield improvements to teaching, learning and the student experience. This is related to risks associated with the temporal elements involved in realising practical improvement outcomes, as identified above. The actions taken to mitigate this risk were also related, by reporting and sharing results promptly to secure any early gains. It was then possible to build the momentum of the project and engagement of the participants, within the unfolding process. If the project could not gain 'a foothold', the experimental process would not command the required support of stakeholders. It was also the task of myself as facilitator to then maintain momentum and focus on the unfolding process in conjunction with the Module Chair.

4.8 Summary of methodology and approach

At the conclusion of this methodology chapter, Figure 25 summarises the research path, progression, and journey that have been set out thus far, using the framework adapted from Isaksson *et al* (2020). The research work, flowing from the research focus and research questions, was to simultaneously facilitate and conceptualise an organisational learning process using the affordances of a collaborative learning network. This would identify *what* and *whether* any practical improvement outcomes could be achieved (RQ1), and if so *how* could the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment (RQ2). Finally, the factors enabling or constraining the achievement of practical improvement could be identified in this context (RQ3).

As Figure 25 shows, the next stage in the research journey is to set out the practical and conceptual Findings against the research questions, and to mirror the research design which has been explained in this Chapter. Chapters 5 and 6 now deal with Findings for Phase 1 and 2.

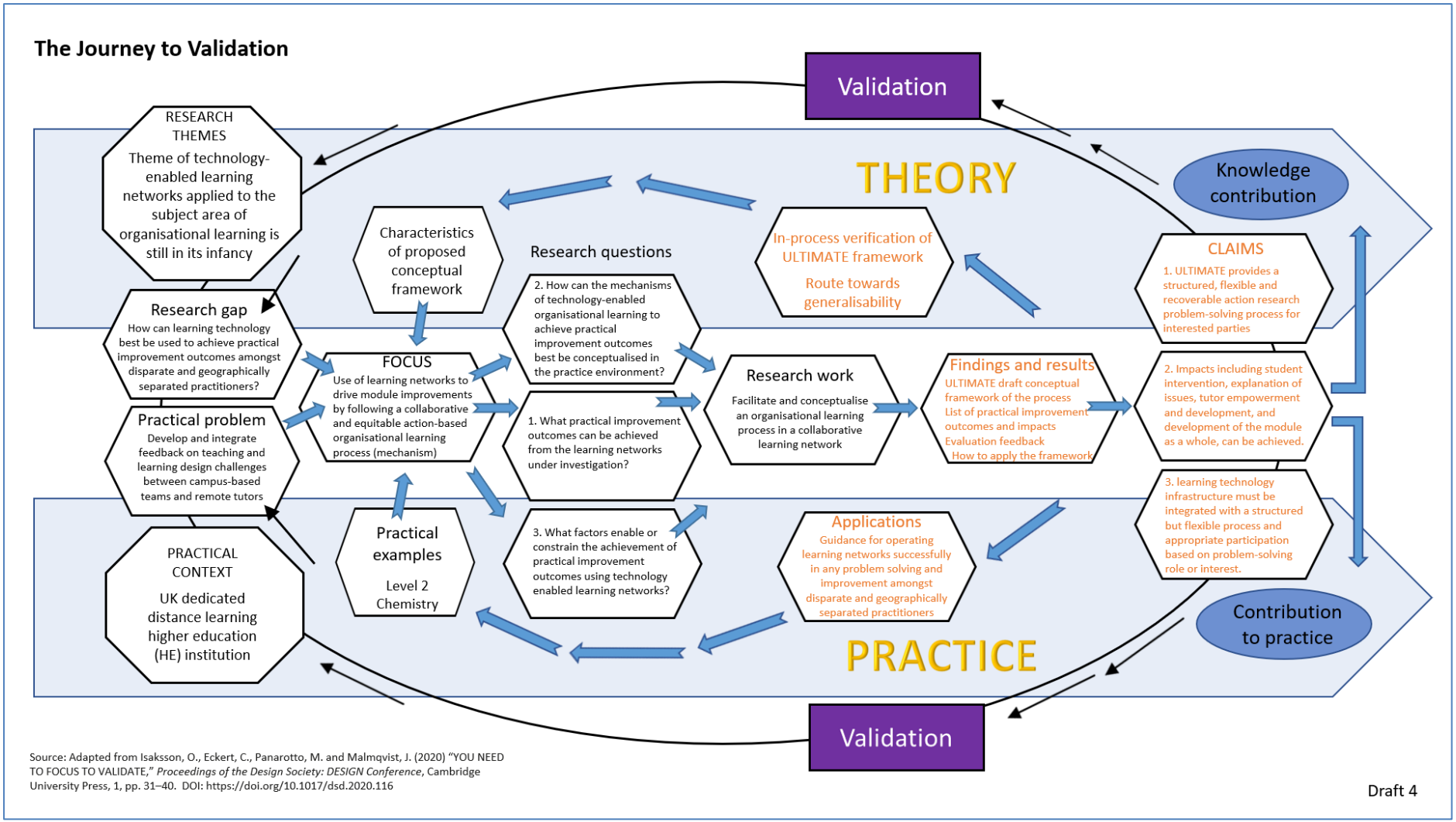

Figure 25. Methodology: the research work in the research journey

Chapter 5: Findings Phase 1

5.1 Introduction and general structure of Findings

Chapters 5 and 6 set out the research findings against the research design, the research questions, and the unfolding process of action research cycles and GTM conceptualisation.

The research questions were:

1. *What practical improvement outcomes can be achieved from the collaborative technology-enabled learning networks under investigation?*
2. *How can the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment?*
3. *What factors enable or constrain the achievement of practical improvement outcomes using collaborative technology-enabled learning networks?*

The detail of the findings will be presented according to the following structure, to mirror the research design presented in Chapter 4: Research methodology and shown schematically in Figure 17. The structure is divided into progress in answering the research questions, across the *content* (action research tasks) and *process* (GTM analysis) parts of the project, in each of Phase 1, and Phase 2A and 2B.

Chapter 4: Research methodology described the research design as a synchronisation of the content and process parts, within an unfolding and emergent process, which was not predicted or predictable at the outset. The writing up of action research projects can present dilemmas in traditional doctoral contexts where 'texts are usually supposed to report results rather than show processes' (McNiff, 2014, p.90). Chapter 4: Research methodology indicated that both action research and GTM are approaches which guide an unfolding, iterative and emergent process. It is therefore important to re-emphasise that the findings are an account of this unfolding process.

The findings mirror the research design, and the integration of the two different parts whereby the GTM analysis underpinned the unfolding action research cycles.

As the research design and corresponding findings are quite complex, the findings of each project phase will be described in two separate Chapters. In addition, and in recognition of the nature of Findings as an unfolding process and arising from quite an unusual research design, there will be an introductory overview embracing the entirety of the Findings for both Phase 1 and Phase 2. This overview will sensitise the reader to the broad shape of the journey ahead.

In this Chapter, the findings of the action research cycle for three modules for Phase 1 will be explained, followed by the findings of the GTM data analysis and conceptualisation activities.

In Chapter 6: Findings Phase 2, for Module S only, the findings of the action research cycles and the GTM data analysis for Module S for Phase 2A and 2B will be set out. This will be followed by the final findings for Phase 2 and the integration and explanation of the ULTIMATE framework.

The findings will then be summarised and drawn together to consider to what extent the research questions were answered, and the unfolding 'story' of the data and its analysis.

The structure of the findings, and how they contribute towards answering the research questions, is represented in diagrammatic form in Figure 26 below.

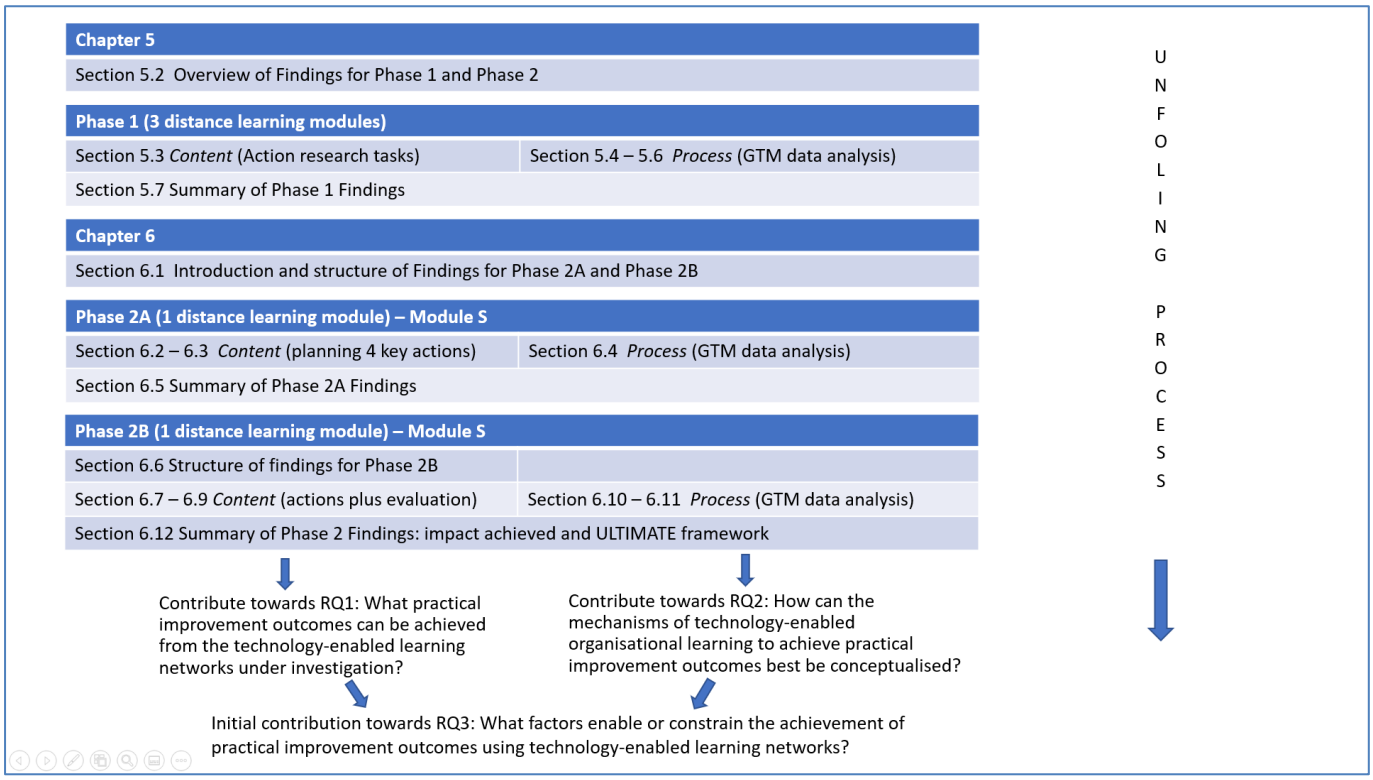

Figure 26. Diagrammatic representation of structure of findings

To facilitate understanding of the unfolding process, the description of each phase will start with a table which mirrors the research design presented in Figure 17. A tabular grid form will map the contributions towards answering the research questions across the content and process aspects, highlighting the essential reflection at each point.

5.2 Introductory overview of Findings

By embracing an action-oriented and theory building combined approach, this research project has been able to achieve measurable *impact* by achieving a series of practical improvement outcomes. In Phase 1, a complex series of issues were collaboratively constructed from the contributions and insights of each of the participants. Of these issues, *pace and volume of material* became a key driver for a second action research cycle. As a result, a 'signposting' intervention was designed by a tutor to assist students who were challenged by the pace and volume of material, and feeling under time pressure. This intervention was implemented on the live module website, and evaluated positively by students as being helpful. The intervention was

supported by a series of student alerts on the live module Study Planner, which were able to provide an increasingly nuanced level of practical and emotional support to students.

The action research cycles combined with the qualitative analysis have been able to support the collaborative and equitable identification of issues, whilst integrating feedback on these issues amongst tutors, the module team, and students. This formed an unfolding pathway of collaborative learning about the complex, interrelated and somewhat intractable issues which the module team and faculty management had been facing. The integrated feedback was incorporated into normal institutional management processes by forming a key backbone of the evidence for future interventions in the management review of the module halfway through its presentation life, called a Mid Life Review.

Module S was particularly successful in working through the action research cycles. Although a discussion and workshop took place for each of the three modules, only Module S took action to produce an intervention and move to Phase 2. Experiences with the other two modules fed into enabling and constraining factors and the answer to RQ3.

The research has also conceptualised the ULTIMATE framework, produced as a result of the unfolding GTM process of *iterative conceptualisation* (Urquhart, 2013). The framework is usable and understandable by practitioners, which means that it could be implemented without the need for a specialist researcher. However it is also composed of concepts which have been abstracted in a rigorous manner. Concepts or codes have been allocated to data excerpts, the codes grouped together into categories and the categories related together. Finally, the GTM processes of *theoretical coding* and *theoretical integration* have been used to form the ULTIMATE framework and reflect it back comparatively with the three existing frameworks identified in the literature. The result forms the rigorously derived elements of a new theory.

As part of the journey of iterative conceptualisation, a series of *integrative diagrams* (Urquhart, 2013) were produced, which gave a clear picture of the unfolding analytical path and which stimulated thinking about relationships between categories. The integrative diagrams were converted to interactive spreadsheets in which the qualitative evidence could be directly retrieved for each open code. These interactive devices formed an innovative way to share the evidence for the analysis, to organise it in an understandable way for practitioners, and to underpin the collaborative learning process. The integrative diagrams also took the first analytical steps – from the outset - to identify the components of a successful learning network.

The *iterative conceptualisation* process means that the theory can be extended beyond its original bounded context (Urquhart, 2019) to other Higher Education and wider contexts. This extension could be achieved by further *theoretical sampling* to continue verifying the categories and relationships and to ascertain if any further open codes or categories become apparent.

Whilst acknowledging different merits of the three existing frameworks in the literature, putting these aside and using GTM has enabled the development of a provisional conceptual framework which would not have been derived, had any of the other frameworks been applied.

Having painted an introductory picture, the Findings will now proceed to the detail of Phase 1.

5.3 Findings of Phase 1 – *content*

In Phase 1, learning network discussions and participatory workshops were run for three OU modules under the umbrella of a recognised and internally funded scholarship project, of the which I was a part. However, only one of the modules progressed after the workshop to take further action. Each one of these modules will be described in turn in this section.

There were also some tensions in Phase 1 between the scholarship project and the PhD research project. There was an emerging tension between the more 'traditional' research

approach and values of the scholarship project leaders, and the participatory action research approach and values of myself as researcher. This took some time to work through. There was also an explicit expectation that the module teams should be able to run and 'own' their respective projects and that the project leaders would be available in a supportive but not facilitating or driving capacity. As this research will demonstrate, the role of an action research facilitator is a skilled specialism in itself. While researching equitably *with* and not *on* the participants, the action research facilitator has to integrate within the values and context of the practice environment whilst also being a supportive driver and enabler of the next stages in the emergent and previously unpredictable process. This requires prior skill and experience and is not something that many PhD students could successfully approach. It also became equally clear that even the Module Team who were most engaged and successful, did not possess the awareness and experience to bring the project together and facilitate its progress by themselves. It required experience and integration of several aspects of research and practice such as qualitative analysis, design and ethical approval of student questionnaires, plus the vision and dedicated time and attention from a facilitator, to drive this first experimental project through. For this reason, I proposed and secured funding for Phase 2, for a dedicated operational internal project, and co-led this project with the Module Chair of Module S.

The explanatory table that maps the contributions towards answering the research questions across the *content* and *process* aspects for Phase 1, is shown in Figure 27.

As outlined in the introduction to the findings, a key message from this table for Phase 1 was that although the Module S participants were very engaged and did produce an innovative intervention in the form of a series of four Tricky Topics videos, there was a question about whether the identification of Tricky Topics got to the 'heart' or the 'root cause' of the complex challenges facing the module. A series of five additional issues were identified, and one - *pace and volume of material* - became a key driver for the second action research cycle in Phase 2.

A further key message is that only one of the three modules progressed successfully to Phase 2, which fed into some useful conclusions for enabling and constraining factors in answer to RQ3. However by the end of Phase 1, a first analytical step had been made towards conceptualising the components of an effective technology-enabled learning network, and how those components could be related together at the *constructing issues* stage (Boyd, 2019).

Phase 1 - 3 distance learning modules						
	Section 5.3 *Content* (Action Research tasks)			Section 5.4 – 5.6 *Process* (GTM data analysis)		
	AR tasks carried out	Progress to achieving PIO	*Content* reflection	Progress with conceptualisation	Key message from conceptualisation	*Process* reflection
RQ1. What practical improvement outcomes can be achieved from the technology-enabled learning networks under investigation?	1. Discussion forum 2. TT workshop 3. Fed back summarised issues to MT and tutors via email, tutors dedicated forum and also LN site	**Module S:** tutors planned and recorded TT videos, loaded on live module site **Module M:** no further action, withdrew from project **Module H:** no further action	Issues facing Module S were much more complex than just Tricky Topics. Tutors questioned the 'root cause' of challenges for students.	Analysed Module S discussion forum. Series of five issues facing module were constructed, each with its own set of associated evidence. This was in addition to a list of 26 identified Tricky Topics.	The LN site provides a place for: • planned discussions • tutors to utilise their wide teaching and learning, and subject experience • tutors to express emotion and concern re students • tutors to reflect on current and past practice in the university • to identify issues • to identify relevant further roleplayers	Complex responses across discussion threads required the qualitative analysis to 'tease the issues out'. They were *emergent*.
RQ2. How can the mechanisms of technology-enabled organisational learning to achieve PIOs best be conceptualised?	Interactive spreadsheet with narrated PowerPoint to share results of analysis process on LN	Analysis highlights *pace and volume of material* as a key issue for driving next AR cycle.	Project team but not tutors interested in analysis detail. Engagement lacking on LN after forum.	Open codes related into categories, and categories related together. Integrative diagram & interactive spreadsheet produced for *constructing issues.*	Integrative diagram and its categories make a first step towards conceptualising the components of an effective learning network, and how the components might relate together.	Combination of qualitative analysis and coding of researcher, and the contributions and insights of each of the participants, led to collaborative construction of the issues.
RQ3. What factors enable or constrain achievement of PIOs?	Constraining factors: • Need to have module team buy-in and enthusiasm. Issues need to be 'red and hot', or inspire action. • Terms of reference between the action research and any operational project need to be very clear. Enabling factors: Reasonably small, tight knit module? Tutors used to working remotely with each other?					

Figure 27. Structure and key findings for *Content* and *Process* against RQs for Phase 1

Module S

The Module S discussion forum ran as planned. 7 out of a total of 11 ALs participated in the discussion, and a total of 41 contributions were made within 7 discussion threads. A wide variety of insightful feedback was recorded. Tutors possess detailed insight into student challenges and many have long-standing experience and expertise not just in the module in question, but in other related modules, how the modules have historically related to one another at the OU, and in general experience of chemistry teaching. They drew on all of these aspects in the discussion forum. The tutors were very engaged, identified a detailed range of 26 Tricky Topics and provided useful feedback to the module team.

The Tricky Topics workshop ran for 4 hours, including a coffee break, and was recorded. The prior learning network discussion enabled the tutors to discuss topics, provide examples, and corroborate and verify their understanding of student conceptual difficulties with each other. Progressing on from discussions in the learning network, the tutors decided on two fundamental Tricky Topics, which both concerned essential student prerequisite knowledge before commencing the module.

Two groups collaboratively completed respective Tricky Topic structure charts, which is a standard task in the workshop. These structure charts are illustrated as follows.

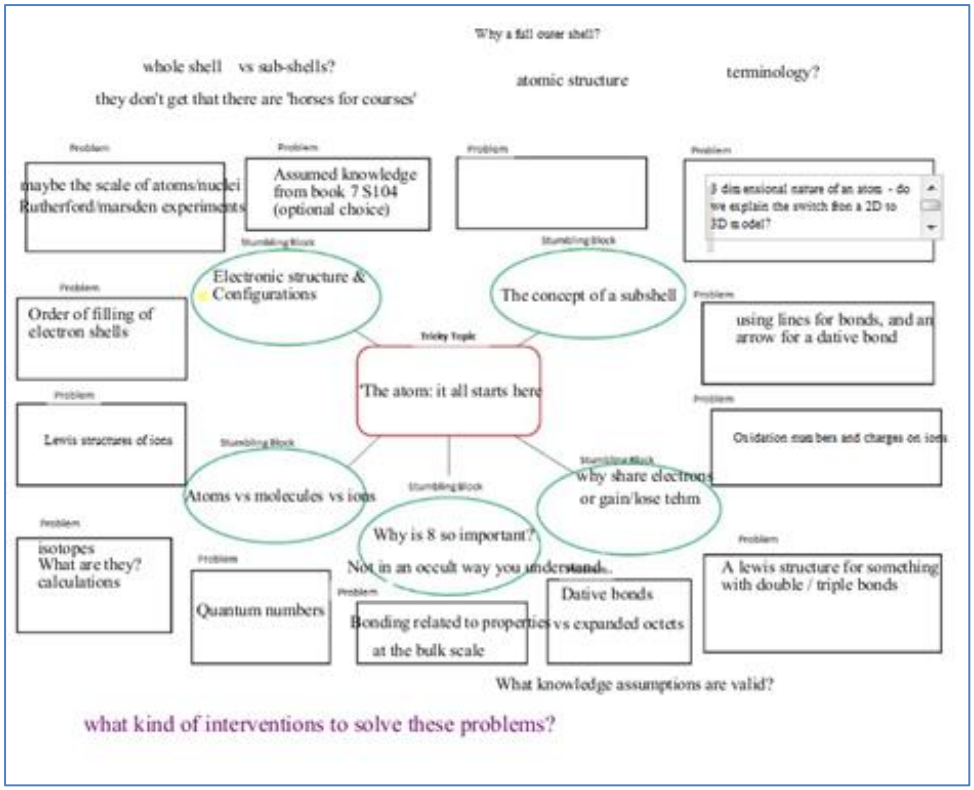

Figure 28. Screen copy of Module S Tricky Topic structure chart: The Atom

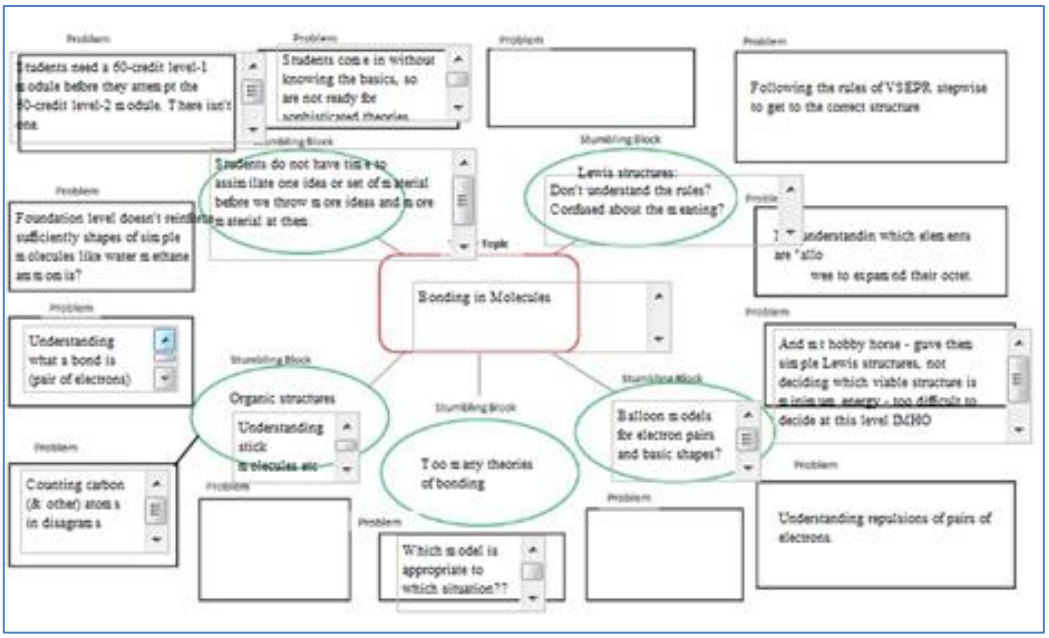

Figure 29. Screen copy of Module S Tricky Topic structure chart: Bonding

Therefore an important practical conclusion from the learning network and workshop discussions was that one of the fundamental issues that tutors were facing was a lack of students' required pre-requisite knowledge for Module S, a Level 2 (university Year 2) module. One of the tutors put forward a suggestion, and others agreed, that they were interested in helping to produce some short introductory videos to assist students with basic pre-requisite concepts which were identified in the Tricky Topic structure charts, including atomic structure, electron configuration and bonding in molecules. These videos were recorded in the OU Open STEM lab, and featured an innovative approach of two tutors discussing with each other about the particular conceptual difficulty that the students were facing, and possible ways to deal with it. This approach was in contrast to a more traditional 'chalk and talk' or 'talking heads' approach to delivering essential pre-requisite study material, which is not covered by the module itself. A total of four innovative videos were produced in this way. They were implemented on the module website for the 17J (October 2017) presentation and have remained in use since. They have also been shared in other chemistry-related modules and the conversional approach has been emulated elsewhere, for example in Mathematics.

The conception, design and implementation of these videos by tutors was a key facet of joint ownership in a collaborative and equitable improvement process, and in the development and implementation of solutions. Informal feedback from students was later substantiated by further evaluation feedback in Phase 2, which has underscored that the videos were proving useful to students and represented the achievement of a *practical improvement outcome.* This will be further discussed in the overall evaluation in Section 6.9 Evaluation of the entire process or mechanism.

Also, as a result of the conclusion about lack of students' required pre-requisite knowledge, some amendments were implemented for the 'Are You Ready For' quiz by the module team. The 'Are You Ready For' (AYRF) quizzes are a standard feature of OU practice which appear on

most module specification web pages. Prospective students considering enrolment on the module are strongly recommended to complete these quizzes to assess whether they consider themselves 'ready' to study the module and have the required knowledge to succeed. As the OU does not require entrance qualifications to most qualifications, the AYRF quizzes are an important aid for students to self-assess their preparedness.

A key finding of the Phase 1 analysis and open coding of the learning network interactions was that the tutors identified a series of issues and student challenges in addition to the list of conceptual Tricky Topics.

The issues were very much richer and more complex than the identification of Tricky Topics, which was the original intention and the request from the primer questions. The analysis of the discussion between tutors, staff tutors and the module team yielded a series of five additional issues. The complex responses to the starter questions across the different threads required the analysis to 'tease them out' and bring them to the forefront, each with its own set of associated evidence. It was therefore a combination of the specialist qualitative analysis and coding of myself as researcher, and the contributions and insights of each of the participants, which led to the collaborative construction of the issues.

The full list of issues was:

a) Student knowledge at start of module

b) Pace and volume of material

c) Study time

d) Student drill and practice of concepts

e) Additional issues: e.g. software for study use

A summary diagram of the action research cycle for Module S in Phase 1, is shown in Figure 30. This diagram illustrates the entire cycle, from *constructing issues* through to *planning action* which was initiated by the tutors and module team together, *taking action* in implementing the Tricky Topics videos on the live module website, and *evaluating action*. Evaluation in this phase was undertaken by Phase 1 project leaders and formed secondary data for this thesis. A semi-structured interview was held with each Module Chair and one participating tutor. A Phase 1 Evaluation Report was also produced collaboratively by the entire Phase 1 project team including myself, and co-ordinated by the project leaders.

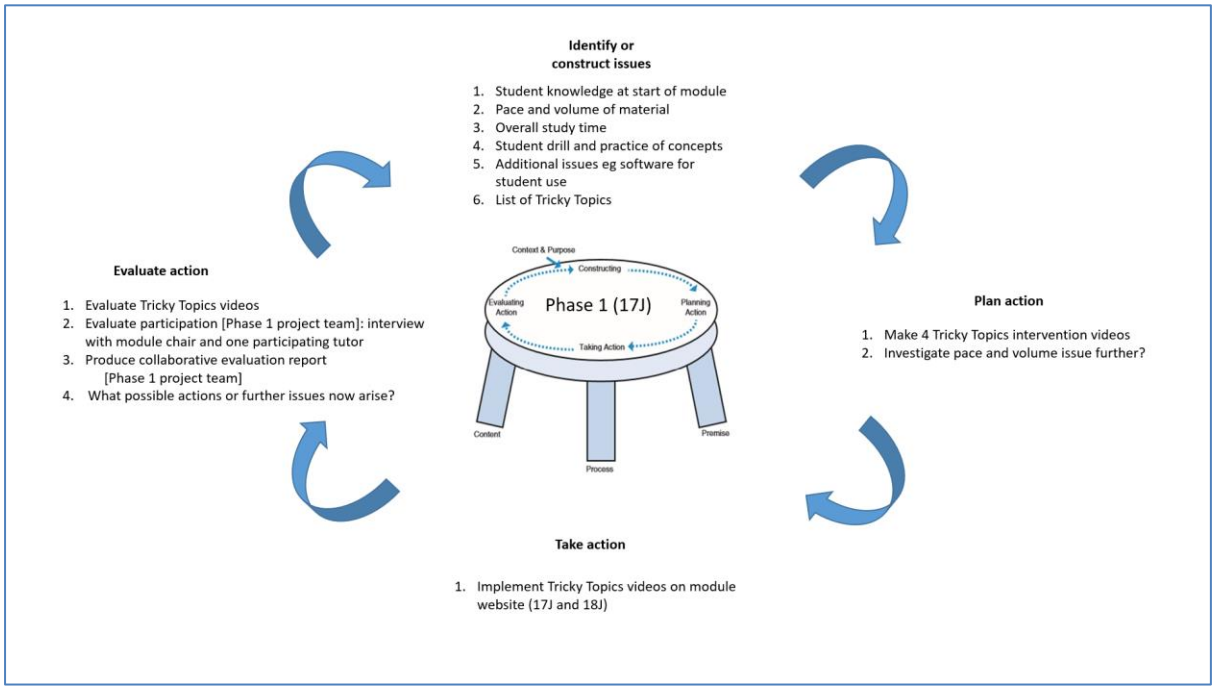

Figure 30. Summary diagram of the action research cycle for Module S Phase 1

Having identified the key aspects of the action research cycle for Module S, the *content* Findings will now turn to Module M and Module H.

Module M

Module M elected to have a face-to-face Tricky Topics workshop. The learning network discussion continued until the workshop which was held on the OU campus. This workshop was also successful in identifying a series of Tricky Topics, primed by the learning network discussion, including several issues concerning pre-requisite knowledge. However, this module team also reported experiencing more pressing module management issues, and no other discussions took place regarding possible interventions. In addition, participant engagement with the online consent form system was not at all comprehensive. This meant it was not appropriate to use the data for analysis and further research work, and no findings were recorded for this research work.

A short period after the workshop, the module team withdrew from the TTT project in its entirety. In an evaluation interview carried out by one of the project leaders, the chair of Module M reported a lack of engagement in the Module Team with the idea of capturing tutor feedback electronically. It became apparent at a later date that the module team did not inform their tutors of their withdrawal from the project. Therefore expectations were understandably raised amongst tutors, and no follow up was provided as to the consequences or any proposed interventions or actions as a result of their participation. This was an ethical issue tied up with ownership of the project that I was very keen to avoid in Phase 2.

Module H

The learning network discussion was delayed and eventually took place in February 2018 and an online workshop in March 2018. In a similar manner to Module M, the 'buy-in' and participation in the discussion and workshop was patchy and characterised by a lack of engagement from the Module Team, due to other pressing operational priorities. Two tutors attended the workshop, plus the Module Chair. Despite these low numbers, the workshop was very productive. The prior learning network discussions were summarised by the Tricky Topics workshop facilitator, and did serve well to prepare the workshop discussion. In a similar way to Module S, the tutors responded with a variety of teaching and learning issues which were very much richer than the direct identification of conceptual Tricky Topics. Several tutors questioned the applicability of the Tricky Topics concept at Masters level, observing that it was down to students at this level to make sense of and clarify conceptual issues for themselves. However, an interesting series of challenging issues were identified, including the following:

a) Work of particular thought leaders in the study materials, e.g. Sfard and Engestrom
b) Lack of familiarity with the social constructivist pedagogy used in the module
c) Timing of student posting in forums
d) Building trust in forums
e) Collaboration or lack of it – a perceived problematic shortage of collaborative activities
f) Encouraging students to talk about their own contexts
g) Standard of writing and assisting students to develop Masters level writing skill
h) Interpreting the formative and particularly the summative assessment questions.

The tutors went on in the workshop to choose 'collaboration' as the issue that they wanted to concentrate on. They completed an interesting Tricky Topics structure chart including stumbling blocks and associated problems around student collaboration in the module, plus a set of their suggested solutions. The list of discussion topics and the completed structure chart for Module H is shown in Appendix E.

Tricky Topics identified from the workshop and the completed structure chart were presented to the Module H rewrite production team meeting by myself in May 2018. The final internal report for the funded Phase 1 project, produced by the project leaders, observed that the combined tutor feedback had an influence on the authoring and content creation for the rewritten module. The report stated that the feedback was very helpful in determining which aspects of the course may need a particular emphasis, and could be used to prioritise specific topics for future course re-designs.

Therefore despite the module team not implementing any interventions in the final presentation of Module H, some potential use of the feedback could be identified.

However all of these combined issues led to the decision to continue the PhD research project with only Module S, and restrict the data analysis to that learning network.

5.4 Findings of data analysis for Phase 1 – *process*

This section will set out the findings of the GTM data analysis activities for Phase 1. The findings of *open coding*, grouping codes into *categories*, mapping these categories against the *constructing issues* stage, and the production of the first *integrative diagram* will be described. Finally the interactive spreadsheet will be introduced. The section will conclude with a reflection of the *process* findings and how the GTM analysis underpinned the action research cycle in Phase 1.

The categories and their associated open codes found in Phase 1 are listed in Table 8 below.

Categories and their associated open codes found in Phase 1		
	Category	Open codes
1.	**Discussion strategy** making any type of initiation or response within a discussion thread, which builds the discussion or contributes towards constructing issues	Constructing: ask a question Constructing: share an artefact Constructing: make an improvement suggestion Tutor agreement / support of issue Tutor root cause questioning
2.	**Tutor experiences** a tutor referring to or using their professional experience of learning and teaching	Tutor general experience of chemistry teaching Tutor historical experience Tutor relay of student experience
3.	**Expectations and emotion** a participant expressing an expectation or emotion regarding students or the study material	Tutor expectation of student knowledge Tutor emotion / concern Acknowledging / reassuring tutor concern
4.	**Reference to university practice** a participant referring to the way that things are currently or historically carried out or dealt with at the university	Tutor reflection on current practice Reference to current prerequisite modules Reference to historical prerequisite modules Reference to existing module intervention Reference to follow-on modules Reference to prerequisite concepts Comparison with other universities
5.	**Identification of issues** an analysed result of the discussion that represents a collaboratively constructed issue or challenge confronting the module	Issue: student knowledge at start of module Issue: pace and volume of material Issue: study time Issue: student drill and practice of concepts Issue: software for student use List of Tricky Topics
6.	**Identification of role players** a reference to additional role players within the discussion, or implicated in the identified issue	Role player: Learning Design Role player: follow on module Role player: Academic Services (registration)

Table 8. Categories and their associated open codes found in Phase 1

The open codes conceptualised various different aspects of the rich and complex feedback provided by the tutors in their interactions with each other, and in response to the questions or artefacts provided by the module team. In responding to the starter questions, they frequently referred to other aspects of student challenges and experiences that were not directly related to answering the questions or identifying Tricky Topics. All of these aspects were embedded within the complex unfolding discussion. The task of the analysis was to tease out all of these aspects, how they were being articulated, and how the elements in the discussion were supporting the *constructing issues* stage. Each of the categories and open codes listed in Table 8 represents an aspect of this discussion. The categories, their associated codes and example data excerpts to illustrate the codes, will now be described in turn.

Category 1: Discussion strategy

This category refers to all the different strategies that were employed in the discussion, to make any type of initiation or response within a discussion thread, which builds the discussion or contributes towards *constructing issues*. The different types of discussion strategy that were identified are exemplified in its constituent open codes, as shown in Table 9.

Constitution of discussion strategy category		
	Category	Open codes
1.	**Discussion strategy** any type of initiation or response within a discussion thread	**Constructing: ask a question** Asking starter questions by a facilitator at the beginning of the discussion to get it going, or asking a question within the discussion that prompts reflection or contributes towards issue construction **Constructing: share an artefact** Sharing an artefact or resource as supporting data **Constructing: make an improvement suggestion** Suggesting something which might improve an aspect under discussion **Tutor agreement / support of issue** Indicating agreement or support of a particular aspect which has been identified by a fellow participant **Tutor root cause questioning** Questioning whether the stated discussion objective (e.g. to identify Tricky Topics) is appropriate in getting to the 'root cause' of the issues or challenges in the module, or a questioning exploration of possible root causes

Table 9. Constitution of discussion strategy category

Firstly, there was a type of discussion strategy that asked a question. This question could be framed in the form of an invitation to contribute responses, such as the 'starter' questions posed by the module team at the beginning of each thread. The question could also be framed by tutors in terms of a reflection on a particular aspect, or on current university practice, which might stimulate debate or assist with further construction of issues.

Secondly, there was a discussion strategy which shared an artefact or resource as supporting data. Artefacts could be either shared by the module team to prime the discussion, or could be contributed by tutors. In the Module S case, the module team shared recent exam markers feedback, plus the advice given to students about to start Module S which was prepared for Student Support Teams. One tutor shared a website link from the Royal Society of Chemistry about research the RSC had done regarding student misconceptions in chemistry. Thirdly, there was a type of discussion strategy in which a tutor made a constructive suggestion which might improve an aspect under discussion. Fourthly, tutors would often agree and lend support to the suggestions or insights of others. They would then frequently build on the suggestion or add their own additional insight, using the standard affordance of technology-enabled discussion forums, in the process of constructing views collaboratively. Finally, some distinctive reflective questions appeared during or towards the end of the discussion forum. One tutor questioned whether the identification of Tricky Topics was addressing the entirety of the problem. Another questioned back to the rest of the group about assumptions regarding student competence and knowledge at point of entry. These questions were looking beyond the direct identification of Tricky Topics towards the potential 'root causes' of issues and challenges in the module. These root cause questions could also signal a need to involve other role players, or different types of practitioners, in the unfolding process.

Table 10 illustrates some example excerpts from the data for each open code in the discussion strategy category, to illustrate how each code was built up. In line with the primary aim of this research a) to produce a new theoretical framework which can be readily understood and applied by practitioners, and b) to seek practical improvement outcomes precipitated by the collaborative insights and actions of the participants, it is not appropriate to place the emphasis on extensive qualitative *description* of each instance of the code within these findings. The aims, the research questions, and the methodology all articulate the necessary precedence of *conceptualisation* over *description*. This reflects the importance of clarity of purpose as a key

condition that fosters quality research (Corbin and Strauss, 2015) and highlighted in the methodology. The primary aim to produce a substantive theory, is balanced with the secondary aim of facilitating the action research cycles and acting as an agent for change. Extensive or 'thick description' of the qualitative data as suggested by Tracy (2010) does not contribute towards answering the research questions, or achieving the aims of the research. Therefore illustrative examples only are provided in the table of excerpts for open codes in each category. In addition, although the participants were originally allocated anonymous identifiers, such as AL1, MT1 etc for analysis purposes, these unique identifiers were removed when reporting the findings. In keeping with the shared ethical values and the Pragmatic approach, all instances of participant contributions and insights on practice were regarded as equally valuable. It was not necessary to identify their source, or to provide a sufficiently credible distribution of contributions as required in an interpretivist analysis.

All of this contributed towards conceptualising the unfolding process in a manner which can be easily interpreted by knowledgeable disparate practitioners, such as module teams, tutors, staff tutors and learning designers. Table 10 thus shows illustrative examples of each of the different types of discussion strategy that were apparent in the Module S discussion.

The findings for this category therefore illustrated how a variety of discussion strategies were employed in the process of *constructing issues*. These were recognisable strategies used in normal discussion and therefore could be analysed by other practitioners in the future without the need for specialist research or analysis skills. The standard affordances of the discussion forum tool in the learning network site were used, i.e. multiple discussion threads, replies, and the ability to attach artefacts or resources to forum posts. All of the strategies were embedded within a complex unfolding discussion, and it was the task of the analysis to identify them and how they were supporting the *constructing issues* stage. They are reported in a tabular format to aid understanding and contribute towards proposed guidelines to support future learning network facilitators, sensitising them to possible types of discussion strategy.

Example data excerpts for open codes in discussion strategy category	
Open codes	Example excerpts
Constructing: ask a question Asking a 'starter' question by a facilitator at the beginning of the discussion to get it going, or asking a question within the discussion that prompts reflection or contributes towards issue construction	AL: 'This can be pared back to some real fundamentals in Chemistry such as: Familiarity with atoms, molecules etc and how they are put together. Do students think in molecular terms? How meaningful to students are concepts such as density, temperature, pressure, liquids, solids, gases and solutions etc? For the physical chemistry, additional concepts like energy, heat, EM radiation, entropy etc become important'. AL: 'If we cannot expect students to start Module S at the same level as students from the conventional universities, it seems unreasonable to expect them to finish at the corresponding level. Are we simply having to stretch students too far and too fast, as others have said, for them to be able to assimilate and process the material?'
Constructing: share an artefact Sharing an artefact or resource as supporting data	MT: 'I have posted the advice to students about to start Module S which was prepared for SSTs under resources on this site'. MT: 'Exam markers feedback. Enclosed files give information on exam answers'. AL: 'Research done by others. This link to some resources produced by the RSC [Royal Society of Chemistry] may be of interest. It gives some insight into several topics: [link provided]'.
Constructing: make an improvement suggestion Suggesting something which might improve an aspect under discussion	AL: 'Part of the problem is the inability to draw a correct Lewis diagram. They get very little practice of this in [historical precursor module], and in the exam this is often quite poor, so maybe we have to prepare students with more practice on Lewis diagrams. We tend to assume they can do these at the start of Module S'.
Tutor agreement / support of issue Indicating agreement or support of a particular aspect which has been identified by a fellow participant	AL: 'I agree with those who have said or implied that knowing their way round the periodic table is a key skill that isn't good enough [.....]'.
Tutor root cause questioning Questioning whether the stated discussion objective (e.g. to identify Tricky Topics) is appropriate in getting to the 'root cause' of the issues or challenges in the module, or a questioning exploration of possible root causes	AL: 'I know full well that these are topics that are covered at school, but do we assume too much about students' general competence at the point of entry to OU study?' AL: 'Having come late to this party, I've posted some thoughts on various threads. However, the more I think, the more I come to suspect that the problem with Module S may not be susceptible to solution by extra teaching effort on a few cherry-picked topics'.

Table 10. Example data excerpts for open codes in discussion category

Category 2: Tutor experiences

The second category refers to all the different ways that tutors referred to or utilised their professional experience of learning and teaching in the discussion. There were three different ways that they did this. Firstly, they could deploy their general knowledge and experience of chemistry teaching in general. Many tutors have long experience, not just at the OU but at many other institutions. Secondly, they could refer to their historical experience of teaching at the OU, and how things used to be in the past, to add to the discussion about the present situation. Thirdly, they could relay an aspect of their knowledge of student experiences, or an aspect of their interactions with students. In Phase 1 of the project, there were no plans in place to seek the views of students directly, so the tutors' relay of student experiences was an important aspect. The open codes associated with the tutor experiences category are shown in Table 11.

Constitution of tutor experiences category		
	Category	Open codes
2.	**Tutor experiences** a tutor referring to or using their professional experience of learning and teaching	**Tutor general experience of chemistry teaching** A tutor using their knowledge and experience of teaching chemistry in general to add to the issue under discussion **Tutor historical experience** A tutor using their historical experience of teaching at the OU to add to the discussion **Tutor relay of student experience** A tutor recounting their knowledge of student experiences (in contrast to direct feedback from students)

Table 11. Constitution of tutor experiences category

Table 12 overleaf shows illustrative examples of each of the different ways that tutors referred to or utilised their professional experience of learning and teaching in the Module S discussion.

Example data excerpts for open codes in tutor experiences category	
Open codes	Example excerpts
Tutor general experience of chemistry teaching A tutor using their knowledge and experience of teaching chemistry in general to add to the issue under discussion	AL: 'Science (including chemistry) is inherently difficult and the level of preparedness definitely varies enormously for different students and for all sorts of reasons'.
Tutor historical experience A tutor using their historical experience of teaching at the OU to add to the discussion	AL: 'Looking back, with no evidence to back this up apart from experience, I think that preparation has improved overall, in recent years. I am not sure what has helped but I know that the MT have added a number of support mechanisms. Maths is not the immediate issue that it was [some still struggle] and many can make good progress in the early parts of the course'.
Tutor relay of student experience An AL recounting their knowledge of student experiences (in contrast to direct feedback from students)	AL: 'Just in the last week or so I have had three queries from different students regarding structural terms in organic chemistry such as primary, secondary, tertiary quaternary and how these relate to carbocation structures. Some are struggling with terms such as tertiary carbocation because they aren't clear that the site of positive charge is tertiary. There is a temptation to think that any carbocation with say, a tertiary branched chain is a tertiary carbocation regardless of where the cation sits'.

Table 12. Example data excerpts for open codes in tutor experiences category

The findings for this category illustrate that in Phase 1, the tutors had three different ways of utilising their experience of learning and teaching to contribute towards *constructing issues*. Tutors are often highly experienced with many years of learning and teaching in their subject, at both the OU and other institutions. They are also a vital source of feedback on student experience where there is no specific data from students themselves. The discussion allowed them to 'take a step back' and utilise their long experience reflectively, in conjunction with other tutors and the module team.

Category 3: Expectations and emotion

The third category refers to instances where the tutors expressed an expectation, emotion or concern regarding the students, their learning experience, or the module materials. As Module S is a Level 2 (Year 2) university course, and the topic of student prerequisite knowledge was a prominent one, the tutors sometimes referred to their expectations regarding what the knowledge the students should currently possess. Tutors frequently expressed emotion and concern regarding particular aspects or on students' behalf. This often reflected their level of engagement and caring about the situation under discussion, and their empathy towards the student experience. In one instance emotion was used in a negative manner when the tutor felt blamed for a particular situation by the university, and this necessitated an acknowledgment and reassurance of the tutor concern by the module team.

The open codes associated with the expectations and emotion category are shown in Table 13.

Constitution of expectations and emotion category		
	Category	Open codes
3.	**Expectations and emotion** a participant expressing an expectation, emotion or concern regarding students or the study material	**Tutor expectation of student knowledge** A tutor expressing an expectation of knowledge that students should currently possess, especially prerequisite knowledge **Tutor emotion / concern** A tutor expressing emotion or concern about issues or challenges, to add weight to the discussion **Acknowledging / reassuring tutor concern** An acknowledgement of concern and expression of reassurance, usually by the Module Team

Table 13. Constitution of expectations and emotion category

Table 14 shows illustrative examples of each of the different ways that expectations, emotion and concern were expressed in the Module S discussion.

Example data excerpts for open codes in expectations and emotion category	
Open codes	Example excerpts
Tutor expectation of student knowledge A tutor expressing an expectation of knowledge that students should currently possess; especially prerequisite knowledge	AL: 'I would have expected L2 students to know some of the more common symbols!'
Tutor emotion / concern An AL expressing emotion or concern about issues or challenges, to add weight to the discussion	AL: 'As [AL] comments - the pace of the module and the volume of material is an issue for all my students, regardless of academic ability and non-study commitments. This is a real shame as students are putting themselves under significant stress to try and keep up with the pace of the module, often at the expense of their other modules, and from what I am hearing from my students is that there is no real time to absorb the material; this is such a shame and should not be how learning is approached'.
Acknowledging / reassuring tutor concern An acknowledgement of concern and expression of reassurance, usually by the Module Team	MT: 'I don't know anyone who blames the tutors for retention problems. The satisfaction scores for tutors are very high. However because you know the students better than we do, the OU sees you as people who are best placed to rescue students'.

Table 14. Example data excerpts for open codes in expectations and emotion category

The findings for this category are that there were instances when expectations and emotions were expressed. Emotion was a naturally occurring part of the discussion and frequently involved the tutor expressing empathy and concern for the student or their experience. Emotion was often used to add weight to the issues under discussion.

Category 4: Reference to university practice

The fourth category refers to all the different ways that participants could refer to university practice, or "the way that things are done around here". The first way was for a tutor to reflect on current teaching practice, either in their own tutoring work, within the module, or across the OU as a whole. The second way was to make a reference to current feeder or prerequisite modules, which are on the recommended qualification pathway. These are usually at the preceding level, i.e. Level 1 for a Level 2 module. Using their historical experience, participants would also refer thirdly to historical feeder or prerequisite modules which are no longer in presentation, reflecting on the comparison between the historical and current situation. Fourthly, participants could refer to a current module intervention that has already been made and reflect on its consequences or the student experience of it. Fifthly, participants could make a reference to a current follow-on module, or some aspect of how the student might progress forward on the qualification pathway. A sixth way was to refer to essential prerequisite concepts for the module, and how these played out in practice, or the assumptions that are made surrounding prerequisite concepts. Finally the seventh way was to make a comparison of OU practice to that in other universities, based on the teaching experience of the tutor in other institutions.

The open codes associated with the reference to university practice category are shown in Table 15.

Constitution of 'reference to university practice' category		
	Category	Open codes
4.	**Reference to university practice** a participant referring to the way that things are currently or historically carried out or dealt with at the university	**Tutor reflection on current practice** A reflection on current teaching practice either individually, in the module or OU wide **Reference to current prerequisite modules** A reference to current feeder or prerequisite modules in the qualification pathway **Reference to historical prerequisite modules** A reference to historical feeder or prerequisite modules which are no longer in presentation **Reference to existing module intervention** A reference to a module intervention that has already been made and is in practice **Reference to follow-on modules** A reference to current follow-on modules in the qualification pathway **Reference to prerequisite concepts** A reference to essential conceptual prerequisite concepts for this module, and how this plays out in practice, or the assumptions that are made **Comparison with other universities** A comparison of OU practice to that in other universities.

Table 15. Constitution of reference to university practice category

Table 16 shows illustrative examples of each of the different ways that reference to tutor, module or university-wide practice was made in the Module S discussion.

The findings for this category are that there was a series of different reflective ways of referring to university practice, each of which contributed towards the complexity of *constructing issues*. These different aspects could be broken down into practice in the module and how it fits in with existing and prior qualification pathways, current module interventions, how prerequisite concepts play out in practice, and comparison with practice in other universities.

Example data excerpts for open codes in 'reference to university practice' category	
Open codes	Example excerpts
Tutor reflection on current practice A reflection on current teaching practice either individually, in the module or OU wide	AL: 'We assume they can do balancing chemical reactions and are confident in mole calculations, so understand their relevance in thermodynamics. They have not had enough practice; only a very able student can pick out n=c xV, n = m/M as key concepts from [historical prerequisite module] unless they have been specifically directed to that'.
Reference to current prerequisite modules A reference to current feeder or prerequisite modules	AL: '[New prerequisite module] does not use terms such as isomerism or isomers which again is not doing us any favours for Module S.
Reference to historical prerequisite modules A reference to historical feeder or prerequisite modules which are no longer being delivered	AL: 'But one area of deficiency that always arose from [historical prerequisite module] was the concept of the mole and calculating with moles and concentrations. This was covered very briefly in book 4 and the students didn't really have much opportunity to grasp this'.
Reference to existing module intervention A reference to a module intervention that has already been made and is in practice	AL: 'The few in my group that attended the pre-module chem-clinics did say these helped'.
Reference to follow-on modules A reference to current follow-on modules	AL: 'One way would be to link this into [current follow-on module] tutors and ask how much students retain from Module S/what they are finding students are lacking?'
Reference to prerequisite concepts A reference to essential conceptual prerequisite concepts for this module, and how this plays out in practice, or the assumptions that are made	AL: 'There seem to be some common errors in the basics of presenting and balancing chemical equations and general handling of data when performing calculations - even a couple of my stronger students struggled with these'.
Comparison with other universities A comparison of OU practice to that in other universities	AL: 'If we cannot expect students to start Module S at the same level as students from the conventional universities, it seems unreasonable to expect them to finish at the corresponding level. Are we simply having to stretch students too far and too fast, as others have said, for them to be able to assimilate and process the material?'

Table 16. Example data excerpts for open codes in reference to university practice category

Category 5: Identification of issues

The fifth category refers to the culmination or results of the *constructing issues* stage – that of identifying issues or challenges that are confronting the module. The detailed nature of the issues has been described in the findings from the Phase 1 action research cycle in 5.3 Findings of Phase 1 – *content*. This section focusses on the emerging conceptualisation of the process. Therefore in a similar format to the preceding categories, the open codes associated with the identification of issues category are shown in Table 17.

Constitution of identification of issues category		
	Category	Open codes
5.	**Identification of issues** an analysed result of the discussion that represents a collaboratively constructed issue or challenge confronting the module	**Issue: student knowledge at start of module** Level of knowledge or preparedness of students **Issue: pace and volume of material** Perceptions of the pace of progression and how much study material students are required to assimilate **Issue: study time** The number of hours per week a student devotes to studying this module **Issue: student drill and practice of concepts** How much opportunity is provided to students for consolidation of concepts and practice of skills **Issue: software for student use** Issues around supplied software, e.g. graph plotters **List of Tricky Topics** List of conceptual Tricky Topics that were identified

Table 17. Constitution of identification of issues category

An illustrative example of each of the different issues is shown Table 18.

Example data excerpts for open codes in identification of issues category	
Open codes	Example excerpts
Issue: student knowledge at start of module Level of knowledge or preparedness of students	AL: 'There seem to be some common errors in the basics of presenting and balancing chemical equations and general handling of data when performing calculations - even a couple of my stronger students struggled with these'.
Issue: pace and volume of material Perceptions of the pace of progression and how much study material students are required to assimilate	AL: 'Main concern appears to be the pace of the course and the volume of material….but it is level 2!'
Issue: overall study time The number of hours per week a student devotes to studying this module	AL: 'I'm afraid that the fundamental lack of preparation is not chemical. It's just a matter of time & expectations about time'.
Issue: student drill and practice of concepts How much opportunity is provided to students for consolidation of concepts and practice of skills	AL: 'We assume they can do balancing chemical reactions and are confident in mole calculations, so understand their relevance in thermodynamics. They have not had enough practice; [….].
Issue: software for student use Issues around supplied software, e.g. graph plotters	AL: 'The software is very definitely a problem. Students hate, struggle for hours with, and ultimately avoid if at all possible [….].
List of Tricky Topics List of conceptual Tricky Topics that were identified	AL: 'Moles, concentrations, rearranging equations, units. Sometimes even chemical symbols - Fl for fluorine is common and I had three instances of Zn for zirconium in the last TMA! [Tutor marked assignment]. I could understand them not being sure of the symbol for zirconium, but they should have known what Zn stood for?'

Table 18. Example data excerpts for open codes in identification of issues category

The findings of this category indicate the results of the constructing issues stage of the action research cycle. This was a key point where the analysis was underpinning progress in the first stage of the AR cycle, to support the collaborative construction of issues in a learning network environment. It was the combination of the qualitative analysis of the complex responses across the discussion threads, and the contributions and insights of each of the discussion participants, that led to the effective construction of issues. A series of five additional issues facing the module were identified, in addition to a list of 26 conceptual Tricky Topics.

In a module facing challenging and interrelated complex issues, this construction and effective identification, along with associated evidence, was an important first step in the organisational learning process.

Category 6: Identification of role players

The sixth category referred to the identification of different role players who were identified in the discussion, or who could be implicated in the identified issue, process of *constructing issues,* or *planning action.* At this point of open coding, the identified role players were all internal to the university operation, and the codes relate to this particular empirical context.

The open codes associated with the identification of role players category in Phase 1 are shown in Table 19.

Constitution of identification of role players category		
	Category	Open codes
6.	**Identification of role players** a reference to additional role players within the discussion, or implicated in the identified issue	**Role player: Learning Design** Learning Design is the centralised, campus based unit in the OU that supports and encourages good practice in learning design activities. **Role player: follow on module** The module that follows Module S in the qualification pathway. **Role player: Academic Services (registration)** The centralised unit responsible for the registration of students onto modules and qualifications.

Table 19. Constitution of identification of role players category

Table 20 shows illustrative examples of how each of the different references to additional role players was made or inferred in the Module S discussion.

Example data excerpts for open codes in identification of role players category	
Open codes	Example excerpts
Role player: Learning Design	AL: 'Having more opportunities to practice the material is needed. Students seem to simply be locating material to answer the TMAs as opposed to learning the material and using the TMAs to test their knowledge and understanding'.
Role player: follow on module	AL: 'One way would be to link this into [follow-on module] tutors and ask how much students retain from Module S/what they are finding students are lacking?'
Role player: Academic Services (registration)	AL: 'I know full well that these are topics that are covered at school, but do we assume too much about students' general competence at the point of entry to OU study?'

Table 20. Example data excerpts for open codes in identification of role players category

The findings of this category illustrate that there were a series of additional role players across the university who might be implicated in further work. All of the identified issues concerned learning design challenges, the evidence for which could usefully be fed back to the centralised OU Learning Design unit. They might be used to help build up a picture of similar or contrasting issues in other modules, and to inform and integrate with OU institutionalised Learning Design practice. There were some direct references in Phase 1 to the follow-on module in the qualification pathway, but not directly to the prerequisite modules at this point, which were being rewritten. There was also a reference to the centralised unit responsible for the registration of students onto modules and qualifications.

5.5 Relating the categories together and production of the first integrative diagram

The categories and their associated open codes were mapped against the *constructing issues* stage, by using Spradley's (1979) relationships, to produce first *integrative diagram*.
This is illustrated in Figure 31. The diagram illustrates the categories, how they are constituted, and how they can relate together, in a single page.

Referring to Figure 31, the integrative diagram also makes a first analytical step towards conceptualising the mechanisms of an effective learning network. It visualises how the components relate and work together (Boyd, 2019), at the *constructing issues* stage:

1. makes the collaborative thinking in the construction of issues visible and explicit, using a range of discussion strategies and supporting artefacts
2. provides a platform for disparate and geographically separated participants to use their professional teaching experience and historical experience of the institution, and for their experiences of student challenges to be made visible and explicit
3. provides a place for expectations, emotion and concern to be expressed, to add weight to issues under construction
4. provides a place for participants to refer to current or historical practice as part of a systematic and structured process, and to make this visible and explicit to all
5. provides a repository to log and identify issues
6. provides a way to identify additional role players associated with the problem area.

These findings illustrate how the first steps in the GTM process of *iterative conceptualisation* can yield an initial set of elements or components of an effective learning network. These elements clearly provide steps towards proposed guidance for facilitators of technology-enabled organisational learning networks, which is an additional future aim of the research.

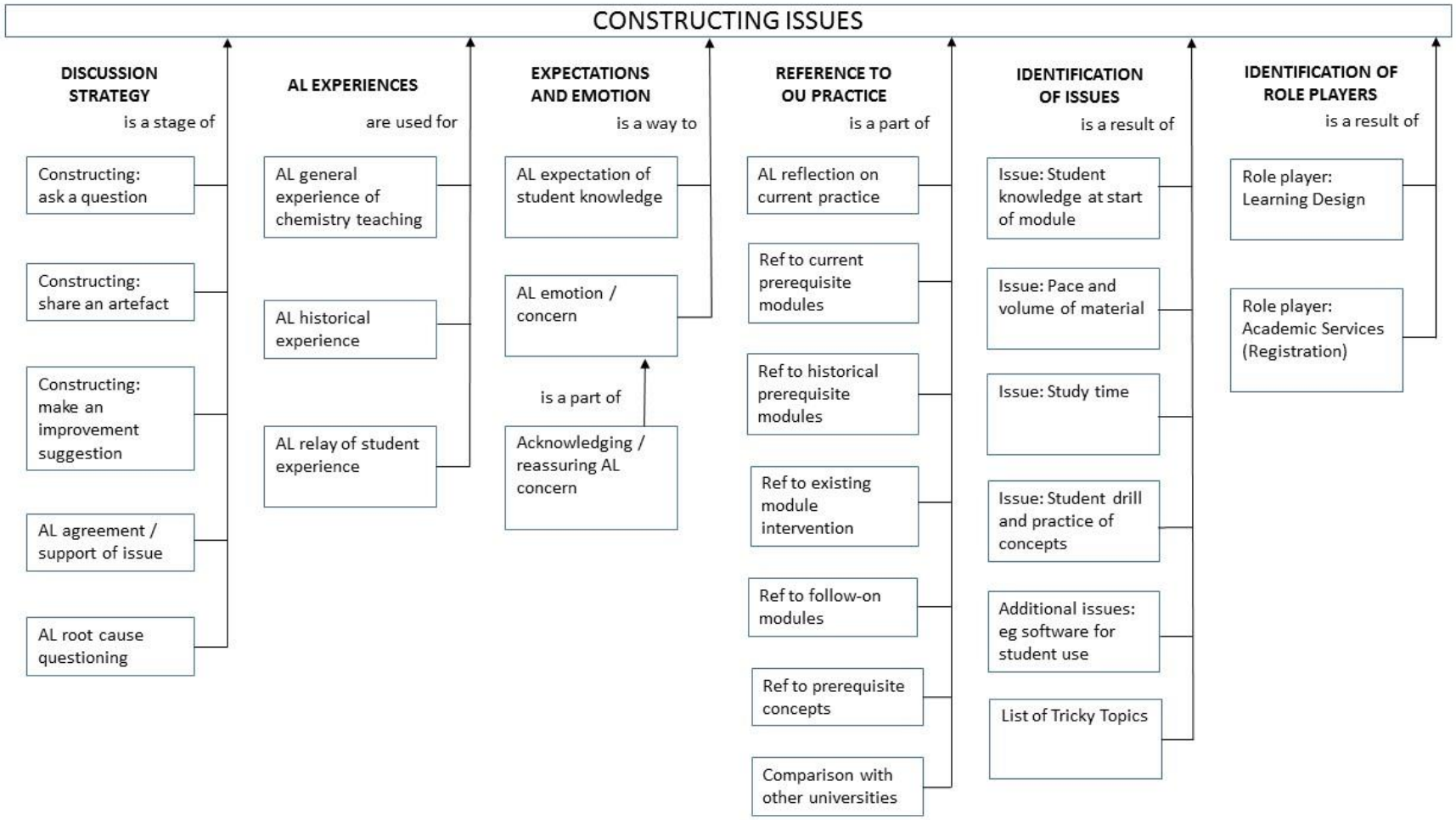

Figure 31. First integrative diagram of open codes using Spradley's (1979) semantic relationships (Constructing issues stage for Module S)

5.6 Production and sharing of the interactive spreadsheet

The integrative diagram was then reproduced as an interactive spreadsheet, to share the analytical process. This spreadsheet is shown in Figure 32. A picture of the table top action research model was included to remind participants about the action research cycle that was being followed, and the fact that constructing issues was a first stage of this cycle. Some notes about how to navigate the spreadsheet were included at the right-hand side, along with an accompanying narrated PowerPoint presentation to explain it directly to tutors and anyone else interested. This PowerPoint narration provided a personal explanation of the aims and organisation of the spreadsheet. It included the ideas of 'codes' and how these were related together into named 'categories', then the categories themselves related together to form the integrative diagram. Each open code was represented by a coloured box. Each of the categories was displayed in a different colour, to support the idea of open codes with a similarity being grouped together to form categories. A red 'comment indicator' in the top right-hand corner of each code box provided a description of each code. The evidence or excerpts for each code could be accessed by clicking on the year identifier links (17J or 18J), or the word 'Link', shown in each code box. This would access a dedicated separate sheet in the spreadsheet showing the evidence for that code. Thus, any interested participant or stakeholder could view and access the analysed evidence in a single navigable artefact; whilst also learning more about the grounded theory analysis process.

The spreadsheet was shared and discussed with members of the project team and with a representative from the central Learning Design unit. The spreadsheet and PowerPoint presentation were loaded into the learning network site with an invitation to view and to ask questions. Whilst the project team, the Learning Design unit and fellow academics at dissemination presentations were all very interested in the spreadsheet and its functionality, no responses were received on the learning network site. The reason for this was unclear but could suggest that the tutors had little awareness or time to be involved in the detail of the analysis process, despite the aspirations of myself as researcher. Since they were paid only for the contracted additional work of contributing to the discussions and workshop, this would be a most understandable explanation.

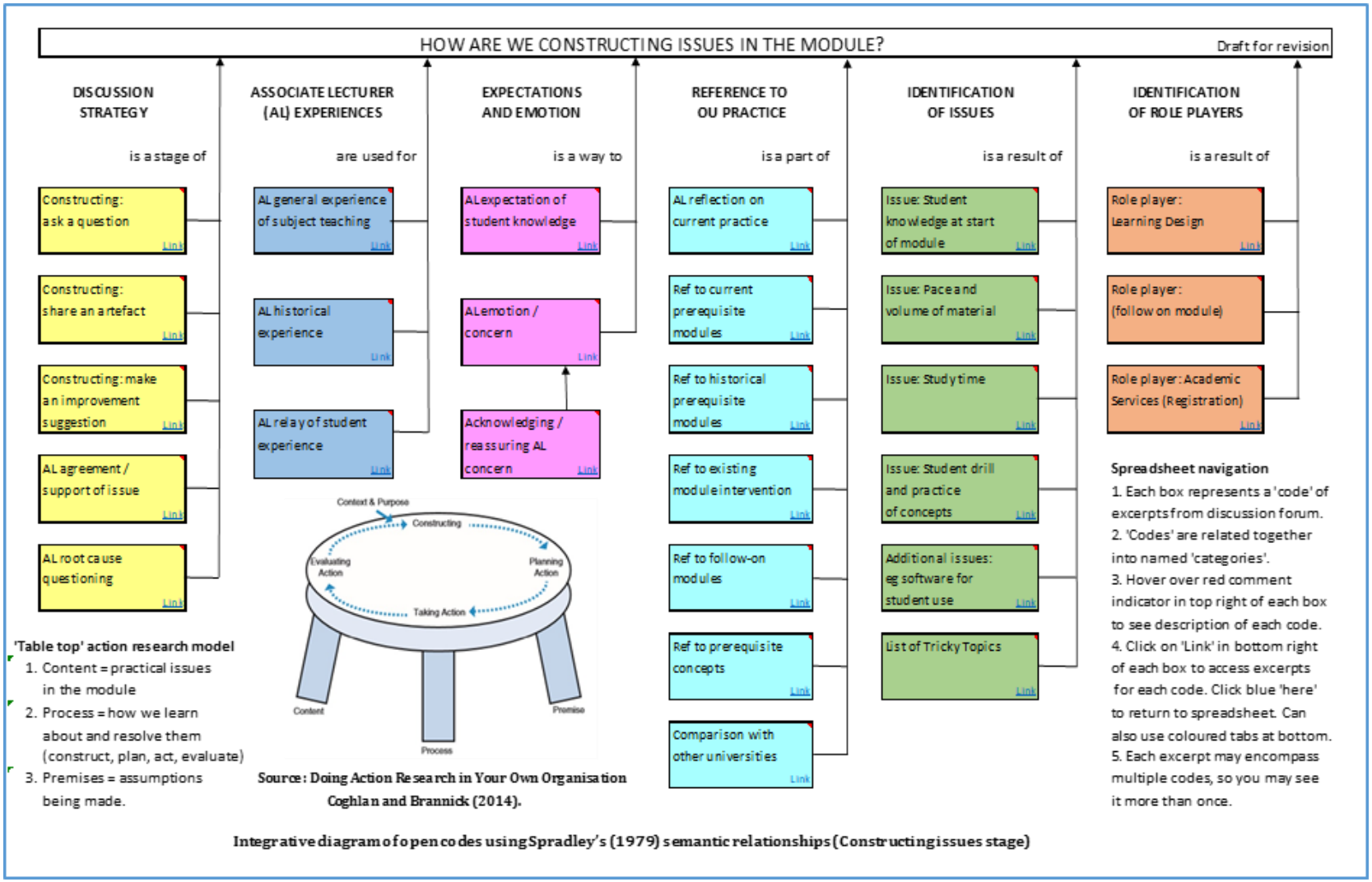

Figure 32. Interactive spreadsheet of open codes at the constructing issues stage for Module S

5.7 Summary of Phase 1 Findings

Referring back to Figure 17 for a diagrammatic methodological overview, the first action research cycle was completed in Phase 1 for three modules. The participants in the discussion and workshops for each of the modules successfully identified a series of Tricky Topics. One module then withdrew from the internal scholarship project, whilst the data for another proved useful in providing feedback data for its successor module that was currently being rewritten. In the third module, Module S, the tutors went on to plan and record a series of four Tricky Topic intervention videos, which were implemented on the live module website.

The contributions and insights of the Module S participants combined with the qualitative analysis of the researcher, led to the collaborative construction of five additional issues. These were complex and challenging issues that were confronting the module, beyond the identification of Tricky Topics. Although the module had been facing them for some time, they had not been previously rigorously identified, and had been somewhat intractable. *Pace and volume of material* was highlighted as a key issue facing Module S for driving the next action research cycle in Phase 2.

A series of open codes and categories were identified and integrated together into the first *integrative diagram*. This makes a first step towards conceptualising the components of an effective learning network, and how the components might relate together.

Module teams required capability to undertake a learning network project. This required acknowledgment of an issue or problem area which could inspire action; and buy-in and enthusiasm from the module team. Module S satisfied both of these conditions. The module was reasonably small and tight knit, and the tutors were used to working remotely with one another and knew each other well. These aspects could all be considered *enabling factors*.

Chapter 6: Findings Phase 2

6.1 Introduction and structure of Findings in Phase 2A and 2B

As introduced in the methodology, and described in the preceding Findings Chapter, Module S was particularly successful and the only one to progress to Phase 2. *Pace and volume of material* was highlighted as a key issue facing the module. This issue drove the next action research cycle. The action research tasks in the second cycle were therefore connected to and driven by the analysis from the first.

Phase 2A was characterised by the discussions of the tutors and module team regarding the learning design analytics visualisations, the analysis of the discussions to identify a series of additional issues, and the subsequent planning of four actions at module level.

To structure these findings, an explanatory table is shown in Figure 33. This mirrors the research design presented in Figure 17b in Section 4.7 **Research design**. Figure 33 maps the contributions towards answering the research questions across the *content* and *process* aspects for Phase 2A.

Phase 2A covers as far as *planning action* and sharing the updated interactive spreadsheet with the project team. Phase 2B covers from *taking actions* through to evaluating the entire process and the draft of the conceptual framework.

Phase 2A – 1 distance learning module: Module S						
	Section 6.2 – 6.3 Content (Action Research tasks)			Section 6.4 Process (GTM data analysis)		
	AR tasks carried out	Progress to achieving PIO	Content reflection	Progress with conceptualisation	Key message from conceptualisation	Process reflection
RQ1. What practical improvement outcomes can be achieved from the technology-enabled learning networks under investigation?	1. Liaised with STEM Learning Design (LD) Snr Mgr re Module S *pace and volume of material* issue. 2. Snr Mgr provided three LD analytics visualisations. 3. Online workshop run by Snr Mgr to interpret & discuss visualisations 4. Discussion forum 5. Fed back summarised issues to MT and tutors.	Planned four key actions: 1. Signposts intervention 2. Find out more re study choices before module 3. Find out more online / offline behaviour 4. Clarify and resolve issues re use of OUA	Issues are very complex and interdependent: been historically difficult to resolve. Issues have presented as students falling behind, withdrawal and retention challenges. Process so far integrates insights but student voice is missing.	Analysed discussion forum. List of issues facing module has now been expanded to 12. Issues moved to the beginning of *planning action* stage in the updated spreadsheet: issues drive action.	The updated interactive spreadsheet provides rigorous longitudinal evidence for the constructed issues and for the planning of specific actions.	Although the initial aspiration was that tutors might find ways to adjust their teaching practice as a result of the discussion, there was a lack of agency in taking individual action. Issues required action at the project level; managed as an unfolding offline process.
RQ2. How can the mechanisms of technology-enabled organisational learning to achieve PIOs best be conceptualised?	Updated interactive spreadsheet shared with Project Team.	Planning action is well evidenced.	Project Team engaged with spreadsheet although complex. Not shared with tutors.	Updated categories in integrative diagram for *planning action* stage, to show how evidence supports the unfolding process.	Spreadsheet now holds longitudinal evidence on issues for two years. Organises the evidence well but appears complex.	Planning and taking action on the issues at project level took place in the real world, not online.
RQ3. Enabling or constraining factors?	Constraining factors: Researcher can be disconnected from participants. Unfolding process can appear fragmented. Enabling factors: Can use learning technology affordances to visualise supporting data, discuss, and represent well evidenced issues.					

Figure 33. Structure and key findings for *Content* and *Process* against RQs for Phase 2A

6.2 Planning of four key actions

The online workshop for Phase 2 and the subsequent discussion forum ran as planned. Although there was a significant amount of discussion both during the workshop and in the forum around the visualisations, there were no immediately identifiable interventions. Tutors effectively articulated some additional questions plus barriers to their own individual agency in taking improvement actions or changes to teaching practice. The original aspiration from the Senior Manager Learning and Teaching was to identify changes to teaching practice which could be implemented at an individual level, but the actual outcome of the discussion illustrated that action at a module or project level would be required.

The discussion forums were analysed as in Phase 1. Once again the contributions and insights of the Module S participants combined with the qualitative analysis of the researcher, led to the collaborative construction of six additional issues, to combine with those identified in Phase 1.

The discussions therefore yielded a series of issues for further investigation and possible action. The issues in their entirety were very complex and interdependent, and had been historically challenging to identify, tease apart or resolve. The complete list of issues is shown in Box I.

As described in the methodology, a series of four key follow up actions were then planned, in a series of project team meetings that I facilitated. The actions were derived from an appraisal of the issues and a joint project team consideration of firstly, what might achieve most in terms of direct benefit to students, and secondly, in finding out more information where questions had been raised in the discussions.

Issues identified in Phase 1

a) **Student knowledge at start of module**
Level of knowledge or preparedness of students and how this is changing

b) **Pace and volume of material**
Perceptions of the pace of progression and how much study material students are required to assimilate

c) **Overall study time spent**
The number of hours per week a student devotes to studying this module

d) **Student drill and practice of concepts**
How much opportunity is provided to students for consolidation of concepts and practice of skills

e) **Additional issues: eg software for study use**
Issues around supplied software, eg graph plotters

f) **List of Tricky Topics**
The list of conceptually challenging issues that students faced, as identified by tutors

Additional issues identified in Phase 2

g) **Study behaviour online vs offline**
Questions arising from low VLE engagement in an online only course – how are students studying? Possible to study the module completely offline and get a distinction. Do students use other readily accessible online resources, such as Kahn Academy?

h) **Keeping to study timetable**
Workload imbalance between the first half and the second half of the module, including overloaded blocks, means that some students have difficulty keeping up

i) **Tracking download of module resources**
Which downloadable resources provided in the module materials do students actually use?

j) **Communication in tutor group forums**
Communication falls away between December and February, as a common pattern across presentations

k) **Use of OU Analyse when student studies offline**
Feedback from tutors that as OU Analyse only works if students are actively studying via the VLE, the analytics seem contradictory when students are studying offline

l) **Assignments**
The increased time taken for marking assignments due to, for example, lack of prerequisite knowledge. Also for students who did poorly, not being able to quantify which interactive exercises they might have missed that would have helped them.

Box I. Complete list of issues in Phase 1 and Phase 2 for Module S

To succinctly illustrate progress around the more complex Phase 2 action research cycle, Figure 34 represents the progress after *constructing issues* (identifying the 12 issues), and *planning action* (planning the 4 actions), which comprised Phase 2A.

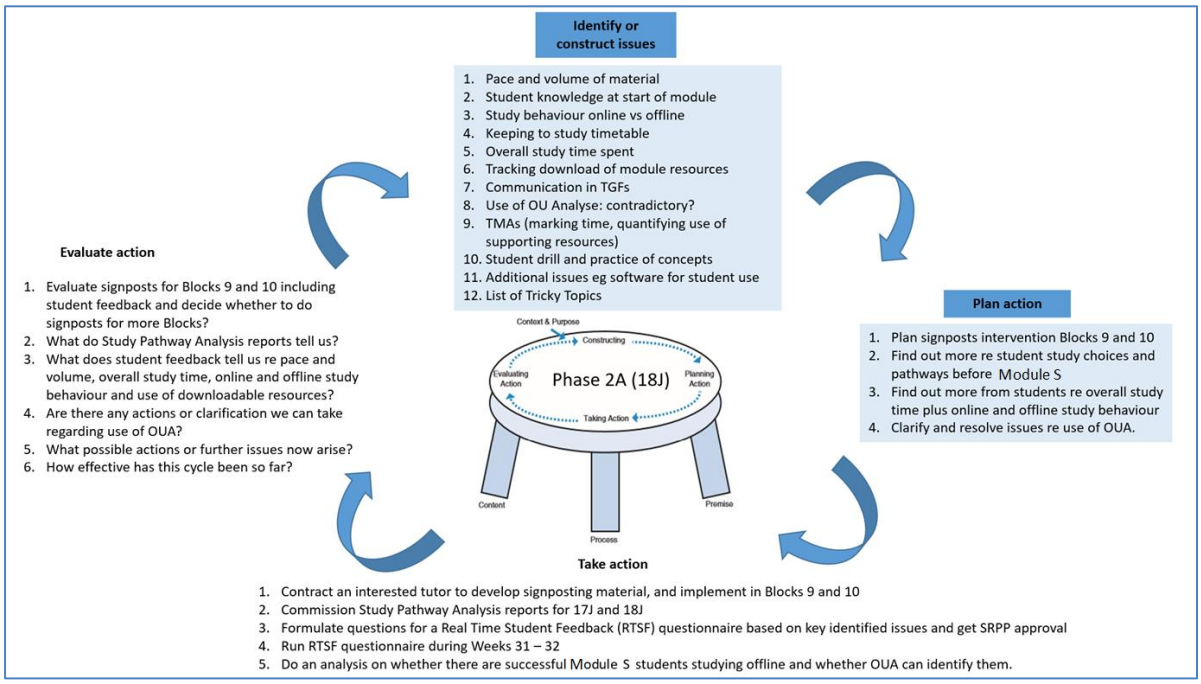

Figure 34. Summary diagram of the action research cycle for Module S *constructing issues* and *planning action* in Phase 2A.

As Figure 34 illustrates, the planned actions were:

1. Plan and implement a 'signposting' intervention
2. Find out more about student study choices before the module
3. Find out more about the online and offline learning behaviour of students
4. Clarify and resolve issues regarding the use of OU Analyse

Each of these actions will now be described in turn.

1. Plan and implement a 'signposting' intervention

This idea for this intervention arose from the *pace and volume of material* and *keeping to study timetable* issues. The collaborative discussions built up the picture that some students were already starting to fall behind by December, from an October start. One tutor expressed the opinion that 'perhaps 25% of my tutor group are behind by December'. The workload imbalance between the first half and the second half of the module, as evidenced by the tutor feedback and the learning design mapping data, meant that this situation then became exacerbated in each presentation, as the module progressed. The conclusion in the discussions was that in the second half of the module, most students were behind the study timetable. In this situation, the recommended guidelines for study time fell away. The tutors reported that they put an emphasis on working with each individual student to identify the most efficient path to get through the amount of material they had to cover.

The proposed 'signposting' materials formed an intervention at module level to help cope with this scenario, and to help support tutors working with individual students. The signposts were proposed as a trial for two module Blocks – Blocks 9 and 10 – that were identified as particularly challenging for students. These Blocks were agreed 'pressure-points'.

The materials were proposed to signpost the most efficient way to help students navigate through Blocks, especially if they were feeling pressed for time. They were designed to break down the study content into:

i. pre-requisite knowledge and conceptual understanding required to study the Block
ii. key points regularly examined
iii. material that is crucial to learning but not directly tested
iv. material written for interest only.

An illustrative example of signposting is shown in Figure 35.

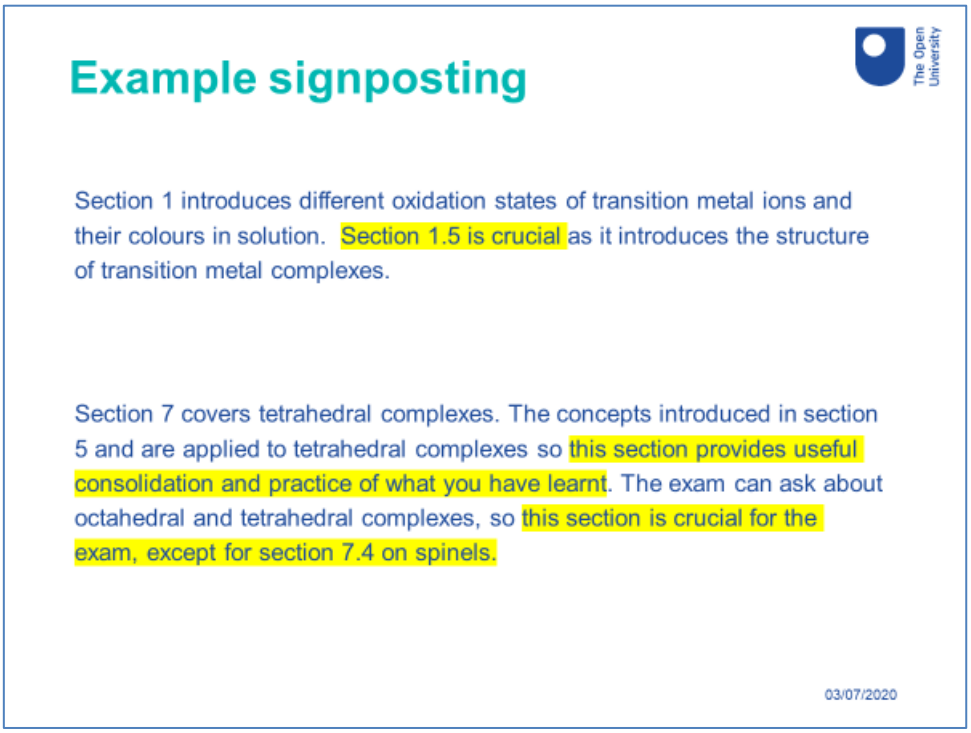

Figure 35. Illustrative example of signposting

For the initial trial, the signposts were designed as separate free-standing documents, without being integrated into the module materials. The feedback from tutors and from the Learning Design centralised unit was that it would be more preferable to integrate the signposts into the module materials after the trial was complete. This process requires 'editing' resource and financial justification within an institutional module editing process, which is usually carried out between presentations of the module. In addition, the module team were reluctant to integrate the signposts in the event that the assessment strategy changed, which it did in fact do.

An interested tutor was contracted using project funding, to produce the signposts for the first two Blocks, and to review them with the module team.

2. Find out more about student study choices before the module

This requirement arose from the *student knowledge at start of module* and *Tricky Topics* issues. One tutor summed up the situation by saying 'I do know that a number of students are arriving woefully unprepared and it is getting worse, year on year'. A prominent aspect of the collaborative discussions concerned the level of preparedness provided by the two prerequisite modules in the qualification pathway, at Level 1. These modules had recently been completely re-designed and re-written. As they were new, tutors were not completely familiar with these modules although they had significant experience amassed over many years, of the historical prerequisite modules. There were also some reservations expressed in the module team about the chemistry content in the new modules. Further evidence of the issue was identified in Phase 1, in that several of the Tricky Topics that tutors reported as being challenging for students, concerned essential prerequisite knowledge down to GCSE level.

The issue was therefore characterised by an increasing number of students registering on the module but not being sufficiently prepared, or having sufficient prerequisite knowledge, for Level 2 study. The tutors were doing their best to try to fill this gap. However, the issue was thus far identified by the anecdotal feedback from tutors and the module team, and not supported by any structured data on the actual level of knowledge and previous study path of Module S students.

Therefore, in discussion with the project team, I decided to commission two Study Pathway Analysis reports, for the current and the previous presentations of Module S. These reports were produced by a STEM 'Data Wrangler', which is an internal OU description for a person who is able to query, interpret and report on the array of data held by the OU but that is not readily accessible in a standardised format.

In discussion with the STEM Data Wrangler, these reports were designed to list all the module codes and presentation identifiers (e.g. Module T 18J, that were previously studied, for the current year and previous year Module S cohorts. The report would list out all the unique study pathways studied by students, and how many students had studied each pathway. In the OU, students can register module by module and may study these over a period of several years.

The aim of the reports was therefore to identify the level of preparedness of the current and previous cohorts, in terms of their prior OU study. They were also designed to identify the proportion of the current and previous cohorts who were taking up the newly introduced qualification pathway. They would not of course embrace previous study with other institutions.

3. Find out more about the online and offline learning behaviour of students

The third planned action arose from the issue regarding *study behaviour online vs offline*. The requirement was to find out more about how students studied whether online using the VLE or 'offline' using module downloadable resources, or other easily accessible resources such as YouTube or the Khan Academy. As highlighted in the methodology, the third analytics visualisation indicated that average VLE engagement was significantly below the expected student workload. The discussions highlighted that there was little current understanding into how students were actually studying, what study resources they were using both within and external to the module materials, and how many hours on average they were studying the module per week. It was therefore planned to seek the views of students directly on these aspects via a Real Time Student Feedback (RTSF) questionnaire, and subsequent online student feedback follow up session. Embracing the direct voice of students was an emergent but critical progression in the unfolding process.

4. Clarify and resolve issues regarding the use of OU Analyse

The final planned action arose from the *Use of OU Analyse* issue. Feedback from tutors was that as OU Analyse only 'works' if students are actively studying via the VLE, the analytics seem contradictory when students are studying offline. OU Analyse would reportedly sometimes forecast a failure as the student had not been interacting with the VLE, even though the student was very able and heading for a distinction. Given the collective conclusion that many students were probably studying offline, this was agreed to be an important observation.

This issue was also felt amongst the project team to merit clarification as it was affecting individual and collective perceptions amongst tutors about the utility of OU Analyse and learning analytics in general. It was planned that the Senior Manager Learning and Teaching would undertake an analysis of VLE behaviour data in the institutional OU Analyse analytics 'dashboard', to identify whether there were a significant number of successful Module S students who were studying 'offline', where 'offline' was identified using parameters agreed with the module team.

6.3 Summary of planned actions

This section has described four key actions that were planned as a result of identifying the issues raised in the learning network discussions. Tutors articulated barriers to their own individual agency in taking improvement actions and these were planned collaboratively by the project team at module level.

6.4 Updating the codes, categories and integrative diagram

Grounded theory techniques were again used to analyse the learning network interactions for Phase 2, by assigning *open codes* to the data within the discussion forum. However, this analysis was built on that from Phase 1, starting from the Phase 1 integrative diagram. The *constant comparison* technique was again used in assigning open codes, so each segment of data was compared to see if it represented the same or a different concept, or open code, to the codes in Phase 1. Thus, the second action research cycle was used as a comparator to the first.

In Phase 1, the tutors planned and recorded the Tricky Topics videos without the need for further supporting analysis, as a Tricky Topics intervention was the declared and predicted intention of the first project. However, in Phase 2, the analysis supported the continuation of the unfolding and emergent process, through the action research stages.

In Phase 1, the analysis supported the mechanisms by which *constructing issues* took place. In Phase 2, the analysis of *constructing issues* was expanded to include *planning action,* and to embrace the entirety of the issues raised in both phases. The integrative diagram and interactive spreadsheet were therefore also updated to embrace the longitudinal data for both phases. Thus, all the evidence for the open codes, categories and relationships, as far as the *planning action* stage of Phase 2, was completely represented and organised in a single navigable artefact. This was assessed by myself as being preferable to having multiple integrative diagrams or spreadsheets spread across both phases and successive stages of the action research cycle. They would run the risk of being too numerous, overwhelming, or disjointed for other participants to look at or assimilate.

6.4.1 Updating of existing categories

Systematic open coding and *constant comparison* enabled either the population of existing open codes with new data for Phase 2, or the identification of new codes. Twelve new open codes were identified across four of the existing categories, as illustrated in Table 21.

Updated categories and their associated open codes found in Phase 2		
	Existing category	New open codes, in addition to existing codes
1.	**Discussion strategy** making any type of initiation or response within a discussion thread, which builds the discussion or contributes towards constructing issues	Identify issue or observation re artefact Update an artefact
2.	**Tutor experiences** a tutor referring to or using their professional experience of learning and teaching	Tutor individual action Tutor barrier to individual action
3.	**Expectations and emotion** a participant expressing an expectation or emotion regarding students or the study material	[No data coded to this category in Phase 2]
4.	**Reference to university practice** a participant referring to the way that things are currently or historically carried out or dealt with at the university	[No new codes in this category for Phase 2]
5.	**Identification of issues** an analysed result of the discussion that represents a collaboratively constructed issue or challenge confronting the module	Issue: study behaviour online vs offline Issue: keeping to study timetable Issue: track download of module resources Issue: communication in tutor group forums Issue: use of OU Analyse Issue: tutor marked assignments
6.	**Identification of role players** a reference to additional role players within the discussion, or implicated in the identified issue	Role player: recommended prerequisite modules in the qualification pathway

Table 21. Updated categories and their associated open codes found in Phase 2

Category 1: Discussion strategy

In Phase 2, there was a much greater use of artefacts and data to focus and support the learning network discussion. These included the three learning design analytics visualisations referred to in the methodology, and the summary of draft issues produced after the workshop and discussion, then shared with participants. Therefore, two new codes were identified referring to when an issue or observation was identified with regard to an artefact, or where an artefact was updated or corrected as a result of the discussion. Table 22 shows illustrative examples of each of the two additional types of *discussion strategy* that were apparent in Phase 2.

Example data excerpts for open codes in updated discussion strategy category	
Open codes	Example excerpts
Identify issue or observation re artefact An issue or observation regarding a particular artefact or resource being shared in the discussion	AL: ' I am definitely surprised by how low the red line suggests the online study is. I can see you might print out the TMA [Tutor Marked Assignment] but even whilst you are doing it I would have expected students to be referring to the study materials. Perhaps we should be telling them to do that. I did not realise so many students were studying offline. Is it possible to know how many download the ebooks?'
Update an artefact The update of an artefact or resource as a result of the discussion	LD: 'Hi [AL]. Thanks for that info. I'll update the student workload visualisation to reflect Q2 in TMA05. I've just been reflecting with my colleague who also participated in the mapping process about how useful this forum discussion has been to clarify some of these questions!'

Table 22. Example data excerpts for open codes in updated discussion strategy category

The additional findings from this category in Phase 2 are that discussion and exchange of ideas and insights around learning design analytics visualisations formed a key component in *constructing issues*, and in the identification of possible areas for *planning action.* Tutors were able to relate their *tutor experiences* to the visualisations and then to pose questions which helped towards issue construction, in conjunction with the module team.

This collaborative construction, relating supporting analytics data to the tutors' teaching experience and practice, was a key component of the *mechanism* to construct issues. It was facilitated amongst the geographically separated, central and remote module team and tutors, and enabled by the standard affordances of the discussion forum in the learning network site.

Category 2: Tutor experiences

As previously explained, the original aspiration from the Senior Manager Learning and Teaching was to identify changes to teaching practice which could be implemented by tutors at an individual level, but the actual outcome of the discussion illustrated that action at a module or project level would be required. In the *tutor experiences* category, two new codes were identified in Phase 2, referring to individual action that a tutor was already taking to try to assist particular students, and also barriers to further individual action articulated by tutors.

Table 23 shows illustrative examples of each of the two additional types of *tutor experiences* that were apparent in Phase 2.

Example data excerpts for open codes in updated tutor experiences category	
Open codes	Example excerpts
Tutor individual action	AL: 'My experience is that perhaps 25% of my group are behind to some extent by the start of December - just after thermodynamics. The change of order that put materials before kinetics in December has helped. But by the end of the kinetics block these students are still behind - we then work on strategies to find an efficient path through to the end of the course'. AL: 'I am trying to guide students more than I used, to prevent them being too far behind. So a one-off extension or a few days will not matter but once they are asking for more than a week and fall behind further I start advising them what is essential, to go quickly through some parts or even miss them out. Before I do this I try to find out exactly where they have got to and I do warn them that everything is examined. But if they don't get to the exam then they have failed anyway'.
Tutor barrier to individual action	AL: 'The point is, that until I know exactly what the background of a student is, I'm not really in a position to propose a plan for remedial action. I do know that a number of students are arriving woefully unprepared and it is getting worse, year on year'.

Table 23. Example data excerpts for open codes in updated tutor experiences category

The additional findings from this category are that tutors were able to articulate their own individual actions taken to support students, and barriers to further individual action, which led to the conclusion that a module level action was required. The signposting intervention, as explained in 6.2 Planning of four key actions earlier in this Chapter, was the resulting planned action at module level.

Category 3: Expectations and emotion

There was no additional data coded to this category in Phase 2. One reason for this could be because the focus of the discussion was on learning design analytics visualisations and their inferences, as opposed to the conceptually challenging issues confronting students in Phase 1.

Category 4: Reference to university practice

Whilst no new open codes were identified for this category in Phase 2, several excerpts were coded to the existing codes. Table 24 shows some illustrative examples of the additional data. The additional findings from this category primarily reflected the contextual development that during this second action research cycle, the new prerequisite Level 1 modules became available to students. This reference to practice within the new prerequisite modules contributed towards the further construction of the *student knowledge at start of module* issue. It also became the basis for the planning of the action 'Find out more about student study choices before the module', as described in 6.2 Planning of four key actions.

Example data excerpts for open codes in updated reference to university practice category	
Open codes	Example excerpts
Tutor reflection on current practice A reflection on current teaching practice either individually, in the module or OU wide	AL: 'However, in the interests of keeping up the TMA average, I have often advised students to move on to the next section. I did it only this week ago - a student asked for an extension on the first TMA - I granted it but advised them that it was only a month before the next one and the earlier ones counted for half as much as the later ones, so best to submit ASAP and get the feedback'.
Reference to current prerequisite modules A reference to current feeder or prerequisite modules	MT: 'The chemistry content of [new prerequisite modules] should prepare them OK, problem is I believe they don't have to study all the chemistry in [new prerequisite module] .... so, there could well be deficiencies. Although you'd think (hope?!) that if they planned on embarking on level 2 chemistry they would have'.
Reference to existing module intervention A reference to a module intervention that has already been made and is in practice	MT: 'Actually... just for info we've added some [new prerequisite modules] links in the AYRF [Are You Ready For quiz] - short videos on formulae, basic equation balancing, functional groups...'.

Table 24. Example data excerpts for open codes in updated reference to university practice category

Category 5: Identification of issues

As described in 6.2 Planning of four key actions, six additional issues were identified in Phase 2. These arose from the collaborative discussion between the module team and tutors, relating learning design analytics visualisations, with *tutor experiences* and practice, and referring to module-wide practice both in Module S and the new prerequisite Level 1 modules.

The additional findings from this category are that the list of issues facing the module was expanded to 12. The issues required action at the module or project level rather than by individual tutors. As noted previously, the issues were very complex and interdependent, making them historically challenging to identify and tease apart. The rigorous qualitative analysis of the collaborative discussion, using the *constant comparison* technique over two successive action research cycles, meant that they could be effectively identified, well-evidenced and used as a basis for *planning action.*

An illustrative example of the additional issues is shown in Table 25, again without embracing the entirety of each issue which was explained in 6.2 Planning of four key actions.

Example data excerpts for open codes in updated identification of issues category	
Open codes	Example excerpts
Issue: study behaviour online vs offline Students' balance of their 'online' & 'offline' study time in an online only module. Use of other readily accessible online resources.	AL: 'The low level of the red line for an online only course does perhaps indicate for many students that the module site is not the place where a significant proportion of their studying occurs. Which raises the question are we making the most of the technology? Is the module site largely an online text book?
Issue: keeping to study timetable Students keeping up with published Study Planner (weekly timetable)	AL: 'I also agree about your observation re December. I think a lot of students convince themselves that they will catch up during the break. But of course Christmas kicks in, and they don't'.
Issue: track download of module resources Students' use of supporting downloadable module resources	MT: 'Some students do study via the pdfs which means they miss out the interactive parts, but they can also study on an iPAD using the epub 3 version which has many of the interactive items embedded, or via other e-versions which do not'.
Issue: communication in tutor group forums Levels of communication in tutor group forums during the presentation	AL: 'I think that is right, [AL]. When we make specific requests they seem to, mostly, comply with these, but left to their own devices students generally prefer other ways of communicating'.
Issue: use of OU Analyse Tutors' perceptions of contradictory feedback in OU Analyse if student is studying offline	AL: 'So from memory, for my 17J cohort, the analytics were contradictory to what was happening simply because some of the students were studying offline; my strongest students and those that were in regular communication with me were highlighted as not engaging with the module and at risk of failing - they scored the highest marks and/or did not request extensions'.
Issue: tutor marked assignments	AL: 'I have definitely had a few students who I've had no contact with all year, apart from TMAs - usually top grades, who go on to do well in the exam. More likely I have students who submit TMAs, do poorly or miss out parts of questions, which leads me to think that they have missed some of the interactive exercises that would have helped them - I can't quantify the number or %'.

Table 25. Example data excerpts for open codes in updated identification of issues category

Category 6: Identification of role players

In Phase 2 a new role player was identified in this category, as the new recommended prerequisite modules in the qualification pathway became available to students. There were also excerpts coded to the existing open codes for the Learning Design and follow on module role players. Table 26 shows illustrative examples of the additional data coded.

Example data excerpts for open codes in updated identification of role players category	
Open codes	Example excerpts
Role player: recommended prerequisite modules in the qualification pathway	MT: 'The chemistry content of [new prerequisite modules] should prepare them OK, problem is I believe they don't have to study all the chemistry in [new prerequisite module] .... so, there could well be deficiencies. Although you'd think (hope?!) that if they planned on embarking on level 2 chemistry they would have'.
Role player: Learning Design	LD: 'I agree with you about vis 3. It would suggest that students are spending far less time online than we would expect according to the learning design'.
Role player: follow on module	

Table 26. Example data excerpts for open codes in updated identification of role players category

6.4.2 Identification of new categories

In addition, two new categories were identified. The constitution of these new categories is illustrated in Table 27. They concerned the use of supporting data artefacts to support the discussion, and the planning of actions. As previously explained, the planning of actions took place within project team communications and meetings away from the learning network. Key questions that had been posed during the discussions and which were helping to drive each planned action, were summarised by myself and included as data in the *plan actions* category.

Table 27 shows the constitution of the two new categories.

New categories and their associated open codes found in Phase 2		
	New category	New open codes
7.	**Supporting data and tools** References to artefacts, data, or resources which are used to support the discussion	Learning Design workload mapping Mapped workload vs advised by MT Mapped workload vs average VLE usage per week Summary of draft issues raised Study Pathway Analysis 17J and 18J Study Pathway Analysis 17J and 18J by study level Analysis of offline study using OU Analyse Informal feedback from students at Residential School
8.	**Plan actions**	Plan and evaluate signposts intervention Find out more re study choices before Module S Find out more re online vs offline study Clarify and resolve issues re use of OU Analyse

Table 27. New categories and their associated open codes found in Phase 2

Category 7: Supporting data and tools

This new category was comprised of references to and discussion about each of the artefacts that were used to support the Phase 2 discussion.

Table 28 shows illustrative examples of the data coded to this category.

Example data excerpts for open codes in supporting data and tools category	
Open codes	Example excerpts
Learning Design workload mapping	LD: 'Some interesting questions posed here, [AL]. Vis 1 and Vis 3 both suggest that the online content of the module is made up mostly of assimilative and productive content which would mirror an online text book'.
Mapped workload vs advised by module team	LD: 'It's really difficult to get a picture of whether students are actually following this advice or not'.
Mapped workload vs average VLE usage per week	AL: 'I was surprised by how few hours are spent on the VLE. I would have expected more hours and for it to vary, much more, by topic. It suggests to me that we [okay I] don't really understand how my students are studying ie online/offline. For those who pass with ease then it's fine, for those who struggle then I can't appreciate which areas are causing issues'.
Summary of draft issues raised	Summary: 'Students who are registering on Module S completely unprepared for a L2 chemistry course. At the risk of repeating this issue this year, especially from experience of TMA01, we really have to address the problems associated with lack of previous knowledge'.

Table 28. Example data excerpts for open codes in supporting data and tools category

Category 8: Plan actions

Table 29 shows collaboratively posed questions included as data in the plan actions category.

Data as questions driving the plan actions category	
Actions	Driving questions
Plan and evaluate signposts intervention	1. How do students react to the signposts being trialled for Blocks 9 and 10?
Find out more re study choices before Module S	1. How many Module S students are registering without completing Level 1 chemistry? 2. What is motivating student study choices before Module S (refers to Study Pathway Analysis 17J and 18J)? 3. How many students are following the recommended [prerequisite module 1]+[prerequisite module 2] pathway (refers to Study Pathway Analysis 17J and 18J)? 4. Are students choosing the chemistry assessment options in [prerequisite module 2]? 5. How well prepared do students feel to study Module S?
Find out more re online vs offline study	1. Why is VLE engagement so low, especially for an online only module? 2. How do students study online vs offline, and what resources do they download? 3. Is the module site largely an online text book? 4. How many hours are students actually studying per week? 5. Do students use notes of key topics rather than reading through lengthy online materials? 6. Are students using freely available online resources for 'nuts and bolts' chemistry? 7. How do students revise?
Clarify and resolve issues re use of OU Analyse	1. Are there a significant number of successful students who are studying offline on Module S? 2. Can OU Analyse be used to identify them?

Table 29. Questions driving the *plan actions* category

6.4.3 Production of the second integrative diagram

The updated and new categories were related together once more using Spradley's (1979) semantic relationships, to produce a second integrative diagram.

The excerpts for each existing and new code were converted into the Phase 2 interactive spreadsheet, which was updated to embrace all the longitudinal data across both phases, in a single artefact. The full interactive spreadsheet is illustrated in Figure 36a and Figure 36b.

It had been a personal aspiration that the interactive spreadsheet be shared throughout, with participants including the module team and tutors, to illustrate the details of the unfolding research and analytical process in the spirit of 'researching with' participants. However, the experience in Phase 1 had been that participants did not engage with the interactive spreadsheet in the learning network, despite my producing an accompanying narrated PowerPoint presentation to explain it directly to tutors. In Phase 2 the interactive spreadsheet was therefore only shared with the project team and in dissemination presentations. The project team engaged with the interactive spreadsheet despite it appearing somewhat complex. It formed a second intermediary in the analytical path towards *theoretical coding* and the production of the ULTIMATE framework. It also communicated the rigour of the analysis to the project team and interested stakeholders.

Figure 36. Integrative diagram and interactive spreadsheet for *planning action*: Phase 2A

therefore appears as Figure 36a and 36b across the following two pages. It is split across the two pages for clarity.

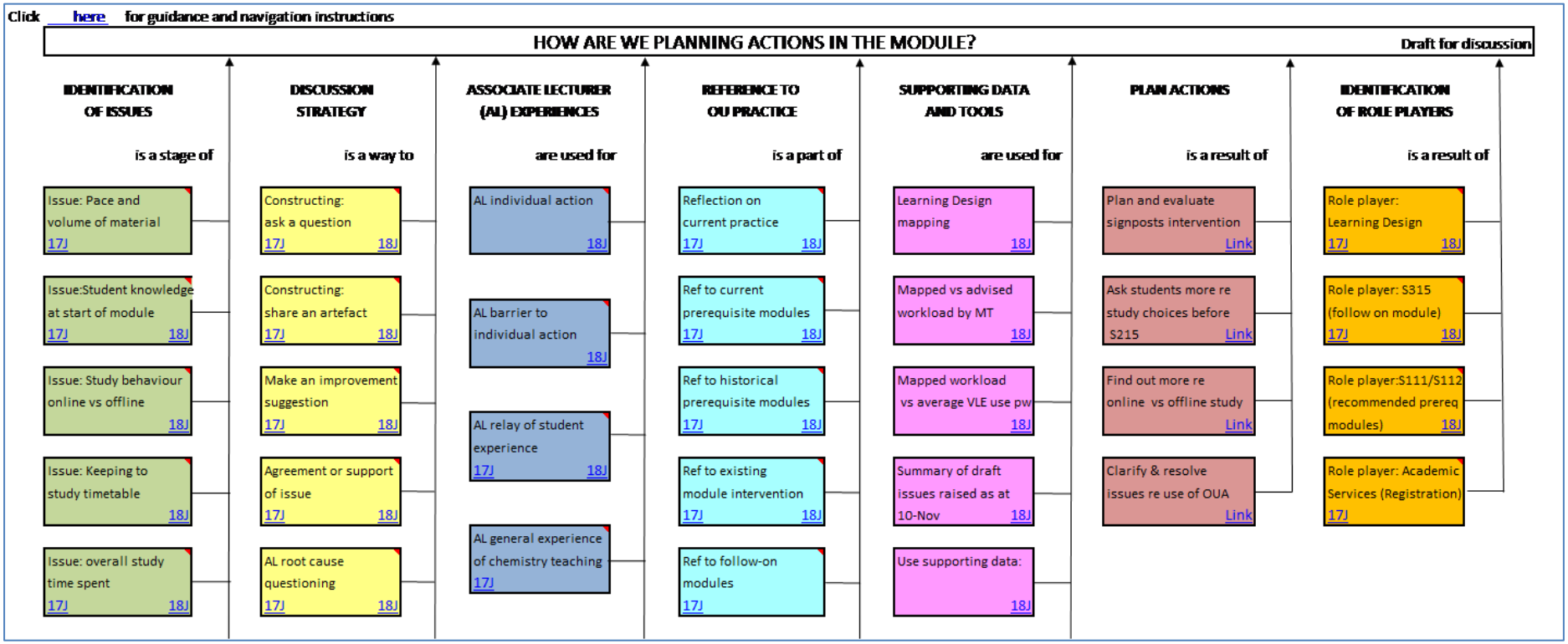

Figure 36a. Integrative diagram and interactive spreadsheet for *planning action*: Phase 2A

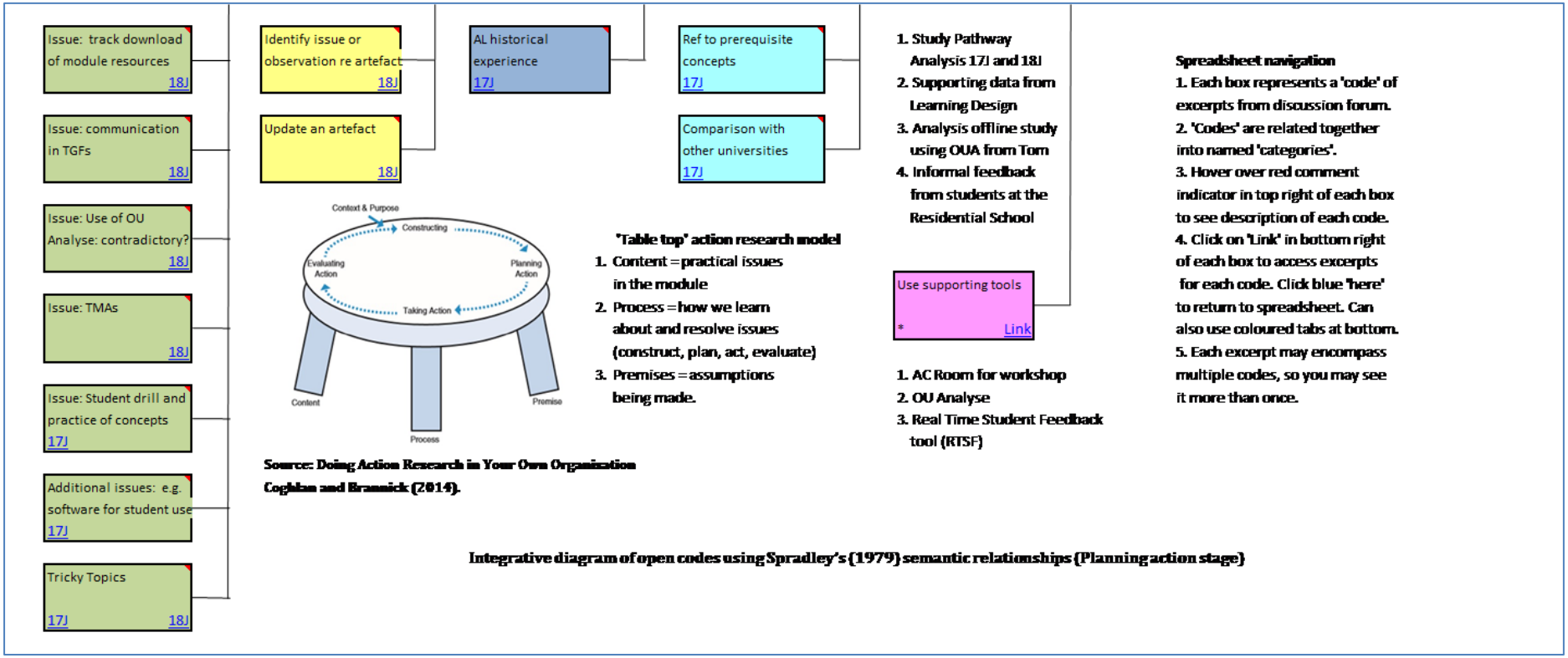

Figure 36b. Integrative diagram and interactive spreadsheet for *planning action*: Phase 2A (continued)

6.5 Summary of Phase 2A Findings

The second action research cycle was focussed on *pace and volume of material* in Module S, as the key driving issue identified in the analysis from the first. This qualitative analysis of tutor and module team feedback underscored the quantitative learning design workload mapping data produced for the Senior Manager for Learning and Teaching. The intersection of these two different types of data produced the required organisational interest, buy-in, and allocation of time and resources, to pursue a 'red and hot' issue (Roth, Shani and Leary, 2007). The dedicated Phase 2 eSTEeM funded project provided organisational credibility and infrastructure support to the project.

The online workshop was facilitated by the Senior Manager for Learning and Teaching and the subsequent online discussion was held between the tutors and the module team. This was combined with the qualitative analysis of myself as researcher, to collaboratively construct six further issues confronting the module, in addition to those identified in Phase 1.

The collaborative construction, relating supporting analytics data to the tutors' teaching experience and practice, was a key component of the *mechanism* to construct issues. It was facilitated amongst the geographically separated, central and remote module team and tutors, and enabled by the standard affordances of the discussion forum in the learning network site.

The issues in their entirety were very complex and interdependent, and had been historically challenging to rigorously identify, tease apart or resolve. They had presented as students falling behind with the study timetable, and withdrawal, retention and deferral challenges.

A series of four key follow up actions were planned, which were:

1. Plan and implement a 'signposting' intervention
2. Find out more about student study choices before the module
3. Find out more about the online and offline learning behaviour of students
4. Clarify and resolve issues regarding the use of OU Analyse

The updated interactive spreadsheet provided rigorous longitudinal evidence over two action research cycles for the constructed issues, and for the justification of the planned actions. It appeared somewhat complex. However, it reflected the complexity of the identified issues and the route towards *planning action*. Its systematic organisation afforded by the rigorous GTM analysis process, combined with its representation in an understandable spreadsheet format, meant that it effectively underpinned the qualitative analysis process.

Although the initial aspiration from the Senior Manager for Learning and Teaching was that tutors might find ways to adjust their teaching practice after the Phase 2A discussion, there was a lack of agency for tutors to take individual action. Issues required action at the project or module level. The planned actions were managed by myself, within the project team as an unfolding offline activity. The entire process had successfully integrated the feedback and insights from the tutors and module team in constructing issues and planning action. Although not planned for at the beginning of the project, it was notable that the direct voice of feedback from students was missing.

6.6 Structure of Findings of Phase 2B

This final phase was characterised by:

1. implementation and evaluation of the four planned actions
2. integration of the direct student voice regarding the specific identified issues and the implemented actions
3. resultant provision of practical and emotional support to students in the live module presentation regarding *pace and volume of material*
4. the use of *theoretical coding* to produce the ULTIMATE framework
5. evaluation of the entire process.

As per structure in the previous two sections, the explanatory table which mirrors the research design presented in Figure 17c, is shown in Figure 37. Once again, the structure in this table maps the contributions towards answering the research questions across the *content* and *process* aspects for Phase 2B.

Phase 2B covers from implementation of the four planned actions through to evaluating the entire process and producing the ULTIMATE framework.

Phase 2B – 1 distance learning module: Module S						
	Section 6.7 – 6.9 Content (Action Research tasks)			Section 6.10 – 6.11 Process (GTM data analysis)		
	AR tasks carried out	Progress to achieving PIO	Content reflection	Progress with conceptualisation	Key message from conceptualisation	Process reflection
RQ1. What practical improvement outcomes can be achieved from the technology-enabled learning networks under investigation?	1. Implemented trial signposts intervention. 2. Commissioned Study Pathway Analysis reports. 3. Planned tailored RTSF questions based on issues. 4. Snr Mgr Learning Design produced report re issues using OU Analyse. 5. Implemented tailored RTSF questionnaire at module end. 6. Ran online student feedback follow up session. 7. Documented and shared RTSF and follow up responses. 8. Ran RTSFs in following year to highlight signposts and evaluate their usefulness. 9. Evaluated entire process or improvement mechanism.	Overall PIOs achieved: 1. TT videos designed by tutor, implemented and evaluated 2. Signposting designed by tutor, implemented & evaluated 3. *Prehensive* process established for Integration of feedback and improvement action 4. Provision of data for issues e.g. on student preparedness 5. Evidence for future planning in module Mid Life Review 6. Tutors a crucial part of the team and design of solutions 7. Targeted support for students within their current presentation 8. Helped to inform possible signposting intervention for precursor module 9. Development of the module and team as a whole; benefits from integrated *organisational learning* and problem-solving through collaborative inquiry.	Vital student feedback from RTSFs & online follow up session. Signposts positively evaluated by students as being useful. Student issue locating the signposts – then highlighted on Study Planner using tailored RTSF intro & questions. By running successive RTSFs, an increasingly nuanced level of targeted practical and emotional help could be given to those students requiring it, in conjunction with tutors.	*Theoretical coding* and integration of the ULTIMATE framework. Selection of core category as ULTIMATE learning: Using Learning Technology in Making Action-based Transformative Enhancements Key relationships between categories were maintained from previous integrative diagrams, with two key adaptions: 1. 'adds weight to' relationship as a theoretical code, for the expectations and emotion category 2. 'integrates into' relationship as a theoretical code for the participant experiences categories.	ULTIMATE learning is a high level concept that characterises the type of technology-enabled organisational learning that unfolded. The core category reflects the *strong-process,* performative, and *prehensive* perspective from which the research was undertaken. The core category integrates a number of sub-categories, represented both diagrammatically and as a series of written propositions in *a high-level storyline.*	Tutors welcomed and understood that they were part of a collaborative and equitable process. Tutors appreciated being a closer part of the team, being listened to, and being part of formulating and implementing solutions to help students. *Theoretical sampling* and *constant comparison* mean that ULIMATE could be systematically extended beyond its original bounded context or scope, to other Higher Education and/or wider contexts.
RQ2. How can the mechanisms best be conceptualised?	Shared conceptual framework with stakeholders, check for resonance.	ULTIMATE framework 'made sense' and resonated with Module Chair, PhD supervisors and eSTEeM scholarship centre	Could ULTIMATE be used by practitioners or researchers elsewhere *in practice*?	*Theoretical coding* to produce ULTIMATE conceptual framework. ULTIMATE then evaluated and verified against ten desirable quality criteria or requirements, which were critically derived in the systematic comparison with the three comparator frameworks. Then *theoretical integration* illuminates the theory contribution.		
RQ3. Enabling or constraining factors	Constraining factors: 1. lack of 'felt need for change' ('red and hot' issue). 2. lack of sustained focus on the unfolding problem-solving process. 3. inability to cross the liminal space. 4. reluctance to depart from the familiar online habitus of participants. 5. lack of political acceptance of the learning mechanism of collaborative inquiry. Enabling factors: A successful ULTIMATE learning network will consist of learning technology infrastructure, integrated with this structured but flexible collaborative action research process, and with engaged individual participation based on problem-solving role or interest. This will enhance organisational learning *capabilities*.					

Figure 37. Structure and key findings for *Content* and *Process* against RQs for Phase 2B

6.7 Implementation and evaluation of the four planned actions

Referring to Figure 37 as the overview for Phase 2B, the listed set of action research tasks concerned the implementation and evaluation of the four planned actions.

Figure 38 also completes the summary of progress around the more complex Phase 2 action research cycle, completing the *take action* and *evaluate action* stages.

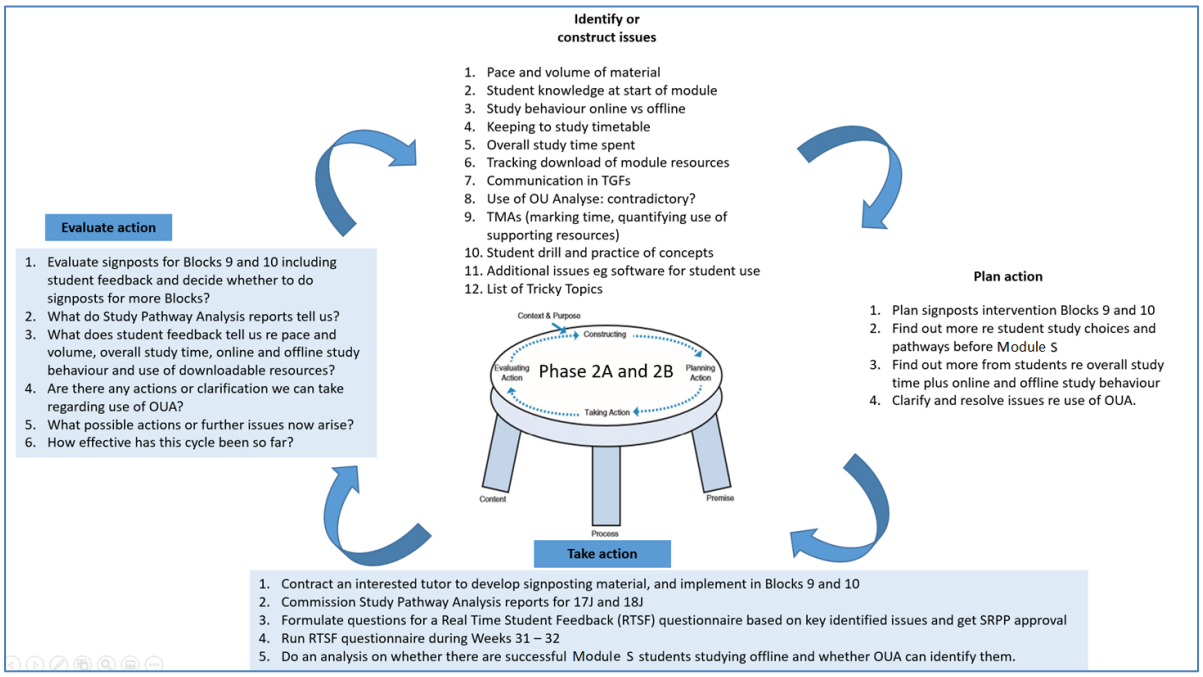

Figure 38. Summary diagram of the action research cycle for Module S *take action and evaluate action* in Phase 2B.

The results of the four planned actions are listed below. There were two more emergent and unpredicted developments, which are described in the following 6.8 Emergent tasks and developments carried out in Phase 2B.

1. The trial signposting materials for Blocks 9 and 10 were implemented within the currently running presentation as separate free-standing documents. They were highlighted to the students in the respective Block discussion forums and in a prominent item in the News area of the module VLE.

2. The Study Pathway Analysis reports indicated an extremely scattered picture of previous study pathways before Module S, taken by students over many years. Amongst a total of 160 students in the October 2018 presentation (18J), there were 71 unique pathways of module choices before Module S. Often these pathways were studied over many years. Only 32% of students (51/160) in this presentation took the new recommended study pathway for the qualification. However, the new Level 1 prerequisite modules had only been released in the previous year.

   The conclusion from these reports was that picture regarding the *student knowledge at start of module* issue was extremely complex, with much scattered and chronologically spread out previous study by students. The issue could not be attributed in entirety to student performance in the new prerequisite modules.

3. The RTSF (Real Time Student Feedback) questionnaire, specifically tailored around the identified issues, yielded rich student responses as identified in Appendix H. 18 students responded, which was an acceptable response rate for the size of the cohort (approximately 160).

   Combined with the student feedback follow up session, there were several very pertinent aspects of student feedback for each identified issue. A summary of the responses for both the RTSF and the follow up session is shown in Box J, whilst the full results are shown in Appendix H.

The RTSF was conducted at the end of the module. Question 6 revealed the students' experience of the trial signposting materials, which was that only a third (6/18) of students reported that they used them. Some students found the signposting 'fantastic', helping to reduce workload. Others were confused as to their purpose, didn't find them, or expressed a wish for less content instead. This direct student feedback on the implementation of this intervention drove another set of RTSFs in the following year to highlight the signposts more efficiently to students and explain and evaluate their usefulness. This additional, emergent, action research task will be described below.

4. The Senior Manager Learning and Teaching undertook an analysis of VLE behaviour data in the institutional analytics 'dashboard' [OU Analyse], to identify whether there were a significant number of successful Module S students who were studying 'offline', where 'offline' was identified using parameters agreed with the module team.

   The analysis indicated that of the top 40 students (top 25%, out of 160 at the time), only 6 students were identified as studying 'offline', using agreed parameters. The analysis therefore inconclusive but more questions were posed for further work if the project team agreed it was required.

1. **Did you feel your chemistry background was adequate to prepare you for studying Module S – do we assume too much?**

This was the first time that most students (16/18) had attempted Module S. Nearly all (15/18) reported that they completed the Are You Ready For (AYRF) quiz before the start. Those who had passed the recommended prerequisite Level 1 modules reported that they did not give adequate preparation for Module S, with a large jump from Level 1 to Level 2.

2. **Where did you find the pressure points were, and where does the module start to get challenging?**

Almost two thirds (11/18) students found the module to be paced rather fast and would have liked more time to consolidate concepts. One third (6/18) found it to be paced about right, and one student found they had more than sufficient time. Students identified specific pressure points, especially in the workload pace in the second half of the module. Students were putting in a range of study hours per week from 8-20 hrs.

3. **Did you find it challenging to factor in study time for completing assignments? How useful or accurate did you find the advice on study time?**

This question was included to further explore the RTSF free text feedback. All students agreed that it was challenging in the follow up session, especially with proximity of assignments in conjunction with a heavier workload pace towards the end of the module.

4. **Did you use any particular strategies if you felt under pressure to complete all the material in time?**

This question was aimed at understanding how students divided their study time – between online, offline using module downloadable resources, and offline using other generally available resources. A wide variety of online and offline study patterns were reported. A reported strategy if under pressure was to work from the assignment and then go back to other materials in the Block if time, which constituted the student 'signposting themselves'.

5. **How did you use tutorials in your study, and could we be providing recorded materials in any alternative formats (e.g. MP4 audios)?**

There were requests to have more engaging videos, podcasts or MP4s, and feedback on use of other resources e.g. YouTube videos, and regular tutorial recordings. There was praise for the recorded revision tutorials, the Block summaries and Specimen Examination Paper.

6. **Did you find the content of the Block 9 & 10 Signposting materials useful? How might we improve them, or could you suggest a more useful alternative?**

A mixture of feedback was received, with only a third (6/18) of students reporting that they used them. Some students found the signposting materials 'fantastic' and helping to reduce workload. Others were confused as to their purpose, didn't find them, or expressed a wish for less content instead.

7. **If you used the print on demand service, what was your experience?**

This question was again included to explore RTSF free text feedback. There were some issues reported with the formatting of pages and printing of formulas.

8. **Anything else you would like to discuss**

There were two further improvement suggestions, and a universal agreement in the student feedback follow up session that despite the module being hard, all the students enjoyed it!

Box J. Summary of responses to RTSF and student follow up session

6.8 Emergent tasks and developments carried out in Phase 2B

This section describes two emergent and unpredicted developments from the project which illustrated both the achievement of improvement *impact* and a more nuanced and supportive approach to students.

1. As the feedback showed, the students were not necessarily finding the signposting materials, even when they were advertised in the appropriate Block forums and in a News item on the module home page. For operational reasons, it was not yet embedded in the module materials. Students were also sometimes confused about the purpose of signposting. However, there was sufficient positive feedback from students to merit a further trial in the following year with additional supporting measures. Two more RTSFs were therefore designed by myself, in conjunction with the Module Chair, to further support the signposting intervention in the next presentation of Module S.

   The first of these RTSFs was planned Before Block 8, which started at the beginning of December and had been identified by students in the previous year as a 'pressure point'. The approved questionnaire shown in Appendix J was implemented in the live module website. This meant that it showed up prominently in the Study Planner and was easily visible to students. The RTSF contained a single question, to highlight the signposting materials for Block 8. The invitation text in the questionnaire (see Appendix J) indicated to students that the module team were aware of student concerns over pace and volume of material, that it was frequently experienced by Module S students and therefore that they were not alone in their perceptions. If the student indicated that they were finding the pace rather fast, they were pointed to three different sources of assistance, including the signposting materials, speaking to their tutor, and discussing their concerns with module 'Study Buddies', who are previously completed volunteer Module S students who can empathise and encourage students that an end is in sight.

In this way they were offered additional emotional and practical support, both in the acknowledgement of the issue, and possible sources of help. The RTSF therefore aimed to provide a more nuanced response, and to acknowledge student concerns *during* as opposed to *at the end of* a presentation. It therefore provided 'real-time' in-presentation support to the current cohort. The results of this single question, at the beginning of December, are shown in Table 30.

Results from 19J RTSF before Block 8	
69%	(27/39) - felt paced rather fast; would like more time to consolidate
26%	(10/39) - felt paced about right; had enough time
5%	(2/39) - felt they had more than sufficient time

Table 30. Results of the single question RTSF before Block 8 Module S 19J

These results indicate that a larger proportion (69%, 27/39) felt the pace to be rather fast at this point in the module, than at the end of the previous year (61%, 11/18).

Another RTSF was run just before Block 10, to further highlight the Block 10 signposting materials, and to evaluate students' perceptions of their usefulness in Blocks 8 and 9. The aim was once again to acknowledge students concerns and how they might be feeling, to support the current cohort during the presentation, encourage them that an end was in sight, and to evaluate the signposts from the students' point of view. The questionnaire design was refined with three separate questions specifically relating to signposting. These questions identified whether students had both found and read the signposting materials, and if so, did they find them useful. These aspects were not sufficiently discriminated in the previous end of module questionnaire, and it was not possible to discern whether a student responded that they did not find them helpful because they had not found or read them. There were 25 responses overall.

The results are shown in Table 31. Of those students who saw and read the signposts, they rated their usefulness on a scale of 1 to 5.

Question	Scale 1 (not very helpful) to 5 (very helpful)
How helpful did you find the signposting materials for Block 8? (N=21)	Average rank 4.0
How helpful did you find the signposting materials for Block 9? (N=20)	Average rank 3.8

Table 31. Results of the RTSF before Block 10 Module S 19J

The results showed that the students perceived the signposts to be somewhat more helpful in the second presentation than the first. This could reflect the additional prominence and introduction that they were given at an earlier stage in the module, as an intervention designed to support an acknowledged concern. Perceived usefulness was further illustrated in the additional free text responses as shown in Table 32.

Example free text responses from 19J RTSF before Block 10
'I found the Signposting for Block 8 very helpful but missed the ones for Block 9 as I was behind schedule and trying to catch up. They would be much more helpful posted in the Study Guide for the block'.
'I found the signposting material very useful, especially because I was falling behind in December. I didn't see the material until I was already partially through block 8 - probably my own fault for not reading the forum more frequently. Perhaps the signposting material could be highlighted a bit earlier, in an email from our tutors? Thanks!'
'Easy to read. Clear and concise. I think it's useful as a guide by showing which areas to cover when revising for exams and tmas'.
'Only suggestion would be that similar signposts be made available for the organic topics too!'
'Great idea and I felt I should have made more use of them! I probably studied these blocks in the same way I did the others, and then used the signposting materials retrospectively to make sure I had grasped the most important parts, rather than in advance to prioritise certain areas.'

Table 32. Example free text responses to the RTSF before Block 10 Module S 19J

These RTSF results indicated that the additional support in acknowledging students' concerns in a prominent manner, then flagging up the signposting materials intervention amongst other sources of support, appeared to be useful to those students who saw and read the signposts. It would be preferable for them to be integrated into the module materials for easier visibility if the operational constraints and assessment strategy issues could be overcome.

There were two other additional free text responses in this RTSF regarding the perceived jump in level from the new prerequisite module in the qualification pathway, to Module S. All the relevant data and feedback was then shared with the prerequisite module team, to further provide evidence for any prerequisite module interventions.

2. In an additional emergent and unpredicted development, the combined feedback from tutors and students was used by the Module Chair as a backbone of the evidence for future module interventions and development, in the module Mid-Life Review. This is an institutional quality enhancement procedure to summarise changes proposed by the module team in the light of available data, feedback and monitoring information. It normally happens halfway through the presentation life of a module, which is 4 years. Additional signposting materials were also proposed for all Blocks.

   The utilisation of the project feedback within an institutional quality enhancement procedure provided further evidence of its *impact*. It demonstrated acceptance of the value of the integrated tutor, student and module team feedback for further planning purposes and for illuminating key module challenges.

6.9 Evaluation of the entire process or mechanism

The entire process was evaluated with Module S at the end of Phase 2, in July 2020. Tutors were asked via email to reflect on their participation in the project and to consider their reflections at three separate levels: reflections on their personal involvement; reflections for the module as a whole; and reflections on wider transferability beyond Module S. They were also asked for any other additional comments.

At the personal reflection level, the following feedback was provided:

Personal reflections
What has been your experience of this Module S eSTEeM project? If you participated, how did you find it? Is there anything you would like to highlight to us, positive or negative? Did you learn more about Module S, or did it help you build up a better picture about it? Please feel free to answer whether or not you participated in the discussions and workshops.

> *'Yes, I participated in the Tricky Topics Workshop and discussions. I found the workshop discussion a helpful reflective process and an insight into Module S as a whole (from the Module Team, combined AL and analytics perspective), I also found the process collaborative and felt supported in terms of being listened to as an individual and part of the AL team and with the AL suggestions being actioned'.*
>
> *'I thought that the online workshops were good - much better than I anticipated. The use of the forums before/after helped direct thoughts. It was good to have time to reflect on the 'educational' dimension of Module S instead of the chemistry. On the negative side, I thought that we could have done more [I know that resources were limited]'.*
>
> *'I was on LOA when this first started but have appreciated being involved and being asked for tutor feedback to the module team. The data on student participation and the work overload at certain points was interesting and I appreciated being kept informed. I have been pleased to write the signposting material (more to come) which seems to be a help to some students. It seems to be that the problem of helping the "struggling" students by targeting them is going to be an on-going problem. I have used the tricky topics videos as references in my feedback to students who get these relatively basic ideas wrong so these have been very helpful to me as a tutor. I have also encouraged students who have fallen behind to use the signposting material. But overall I have not advertised the signposts to all my students mostly as I do not want to encourage students who are progressing successfully to miss out parts'.*

Reflecting on the impact on Module S as a whole, the following feedback was provided:

Module reflections
Do you think this project was beneficial to Module S? Please explain further if you wish.
Do you have any comments or feedback about the signposting interventions?

> *'Yes, I feel the project has been beneficial to all involved in Module S (students, ALs and Module Team); reflection from ALs and Module Team was listened to, the process was a collaborative and, significantly, key improvements were made, for students, based directly on the project reflection and solutions put forward'.*
>
> *'The signposting through some Block were a great idea and it was helpful to be able to direct students to the videos. I know that both of these interventions were used by my students'.*
>
> *'The removal of some assessments etc was beneficial to the students. I thought that it was good to explore the pinch-points in the course - and the use of the online OU Analyse was excellent'.*
>
> *'Overall I think that it will have helped in the development of Module S and the forward planning for the course'.*
>
> *'Yes, tricky topics and signposts are a useful addition to Module S'.*

Reflecting on wider transferability beyond Module S, the following feedback was received:

Reflections on wider transferability
In the OU, it often reported that there is a perennial need to close a feedback loop between module tutors and campus- based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions.
Could you please reflect on whether this project facilitated your contribution in a collaborative and equitable way, to try to achieve the above?

> *'Yes, see my comments above. In addition, I felt ALs, the face of tuition for students, were listened to and involved in the problem-identification and problem-solving process during the Tricky Topics workshop and discussion - a welcome collaborative process that is perhaps missing on other modules. I must add that I feel, as an AL on Module S (and [alternative module]), I already felt/feel listened to by the respective Module Teams'.*
>
> *'I was pleased to be involved and felt part of the 'course team' even though that is not strictly true! The approach taken was inclusive and 'open minded'.*
>
> *'Yes, I appreciated being part of this project and so closer to the module team and changes being considered'.*

Reflecting on any additional comments, the following feedback was received:

Any other comments?
Is there anything else you would like to comment on that would help us to implement or improve projects like this in the future? Or any further questions you would like to ask?

'A good project that I found beneficial to participate in, and perhaps more significantly, found being kept up to date with the project and seeing discussions during the workshop implemented and of use to students, welcome'.

'I think that it was a worthwhile exercise - it stopped a little early - more could have been done. We added support for students and aided ALs with their teaching. However although we added more support material we didn't subtract any written material so 'overload' of content could still be a problem. We didn't really look at how the support material is structured/ordered on the module web site - is there too much, too hard to find etc?'

'I was thinking about how I could contribute to this – it is quite tricky as I haven't been a tutor on the module since 17J, so haven't seen the changes in operation such as the signposting. I would say that the LDS input was probably the most interesting to me, in particular the workshop (and the talk at the Teaching Conference that MT2 and LD1 did). It is useful to compare student behaviour on this module with other modules (in particular [prerequisite module 2] for me).

I think the signposting materials could be useful in future module production as well – and is something I am looking to bring into [prerequisite module 2]. So with that in mind, I would say that your project has helped to inform changes I want to make in [prerequisite module 2] for 21J'.

'Well done MT2, Lesley, LD1 and [Module S Tutor]'.

'As I write this I wonder if we should have an overall signposting document for tutors, I am more stringent in my comments to students who are behind now than I used to be, with the aim of keeping them going and aiming to pass. I still think the individual student positions are the most important consideration but, I do now try to move students on in some places and not in others. For example, I would advise starting Blocks 2 and 5 on-time. If students have not done the Block 5 experiment by the debrief tutorials then they should miss out the experiment but still attempt the write-up for the TMA03 question. This might be useful for new tutors but would have to have the agreement of all tutors and module team as we may differ on what is the most important'.

There were therefore three key aspects to conclude from the evaluation feedback:

a) the 'signposting' materials and the Tricky Topics videos were evaluated as helpful interventions for Module S. A further suggestion was put forward by the tutor who developed the signposts. This suggestion was the production of an overall signposting document for tutors, to help facilitate ongoing targeted and specific tutor support for 'struggling' students to use the signposting materials. In this way the nuanced practical and emotional support to those students who required it could be continued, whilst not encouraging those students who are progressing successfully to miss out content.

b) the tutors welcomed being a part of the collaborative and equitable discussion and problem-solving process followed in the project. They reported both the Tricky Topics and learning design analytics workshops to be very useful, and in some cases exceeded their expectations. They appreciated being a closer part of the team, being listened to, and being part of formulating and implementing solutions.

c) there was a perception that more could be done, and that perhaps the project would yield further impact and benefit by continuing. This would harness the collaborative process as a more routine way of working, and potentially provide a model for other modules. The signposting intervention was already of interest to the precursor module.

The final project evaluation sheet is shown in Appendix L. The feedback received at each level confirmed several positive aspects of personal experience, perceived impact on the module as a whole, and potential transferability to other modules. Some interesting ideas for further developing the project were received. This would be expected of a successful collaborative action research process, in which participants have become engaged and in which momentum has built up.

The overall evaluation completed the *content* or action research tasks for Phase 2B, as shown in Figure 38. The next section describes the final *process* tasks including the theoretical coding and integration of the ULTIMATE framework.

6.10 Theoretical coding and integration of the ULTIMATE framework

The final part of the data analysis produced the unique framework that conceptualised the unfolding organisational learning process. As described in the Methodology chapter and illustrated in Figure 14 in 4.4.2 Historical development and key characteristics of GTM, identification of the *core category* and *theoretical coding* are key GTM steps in integrating, or pulling together, the framework.

The *core category*, around which all the other categories are related, was identified as **ULTIMATE learning.** This means Using Learning Technology in Making Action-based Transformative Enhancements, as illustrated in Box K.

U	Using
L	learning
T	technology
I	in
M	making
A	action-based
T	transformative
E	enhancements

Box K. Core Category

Using Learning Technology in Making Action-based Transformative Enhancements

The core category captures the essence of the process that was carried out and integrates the components of the framework – the identified categories - together. ULTIMATE learning is a high level concept that characterises the type of organisational learning that unfolded. As introduced in Chapter 1: Introduction, the core category reflects the *strong-process*, *performative,* and *prehensive* perspective from which the research was undertaken. It was undertaken both *from within* and *in-the-flow* of teaching and management activity in a Level 2 distance learning module at the UK Open University. These aspects are reflected in the words used to name the core category. Each of these words will now be explained in turn.

The first word '**Using**' is expressed as a verb, or *gerund*, and is related to a *becoming* ontology. Using' indicates the *prehensive* taking of action and carrying out of practice as an intrinsic part of the research, in contrast to the study of action and the study of practices.

The next two words '**learning technology**' indicate using the standard affordances of collaborative learning technology to connect together practitioners who are possibly disparate and geographically separated, within technology-enabled learning networks.

The next three words (hyphenated) '**in making action-based**' refers to an active production of something, again expressed as a gerund and *in-the-flow* of a continuously unfolding process.

The seventh word '**transformative**' indicates the potential for transformation (from a problematic or *indeterminate situation* to an improved one) by following this flexible process.

The eighth word '**enhancements**' refers to the achievement of *practical improvement outcomes*, or changes for the better, as evaluated by the participants in the learning network and other interested stakeholders. In an educational distance learning context, enhancements improve the quality of the student learning experience (Open University, 2021c).

The nature of this particular type of organisational learning has not been conceptualised before and is a unique contribution to knowledge. It integrates the existing domains of knowledge and practice introduced in Chapter 2: Interdisciplinary multi-faceted research approach and illustrated in Figure 2. It characterises the use of learning technology to follow an unfolding, emergent process in a shared form of reflective thought and action, to collaboratively suggest, trial and implement improvements which may be evaluated as transformative enhancements. It provides a structured but flexible and recoverable action research problem-solving process for interested parties, whether participants or stakeholders. It provides an alternative conceptualisation of shared or social learning to achieve some improvement outcome, that may be more culturally acceptable than the term *organisational learning.* This term originates from the management and organisation studies discipline and may feel inappropriate or 'jargonised' to practitioners in education and distance learning.

6.11 Two key adaptions of Spradley's (1979) semantic relationships

After considering the approach to theoretical coding in all three GTM strands, and the requirement that the conceptual framework be readily understandable and implementable by practitioners, it was decided to retain Spradley's (1979) semantic relationships, with two key adaptations, which complemented the research findings and are described below. These relationships have been used throughout the analysis to relate the categories together. As plain English terms they are also readily understandable by practitioners.

The first creative adaption was to include an 'adds weight to' relationship as a theoretical code, for the *expectations and emotion* category. Expectations and emotion were sometimes used by tutors, and frequently by students, to express sentiments about aspects of their experience. These sentiments made an important contribution to identifying issues.

None of Spradley's (1979) semantic relationships, or indeed any of the Glaserian coding families (summarised by Urquhart, 2013), indicate an appropriate relationship. Indeed, the spirit of GTM suggests the need for a high degree of flexibility in how categories are related, so the concepts are not *forced* into inappropriate conceptual schemes. It is perfectly feasible for researchers to generate their own theoretical codes (Urquhart, 2013). This is the first adaption and the additional theoretical code which has been formulated in this case.

The second creative adaption specified an 'integrates into' relationship for the participant experiences categories. A key feature of the learning network was the *integration* of viewpoints from the disparate and geographically separated participants, including tutors, staff tutors, module team and students, which facilitated the synthesis of ideas for *planning action* in the search for possible solutions.

Working from the previous integrative diagrams and the constitution of the categories identified in each phase, the new conceptual framework was therefore integrated as illustrated in Figure 39. The core category captures the essence of the process, and also gives its name to the framework itself – the ULTIMATE framework. The constitution of each of the categories in the framework were identified in these Findings chapters for Phases 1 and 2.

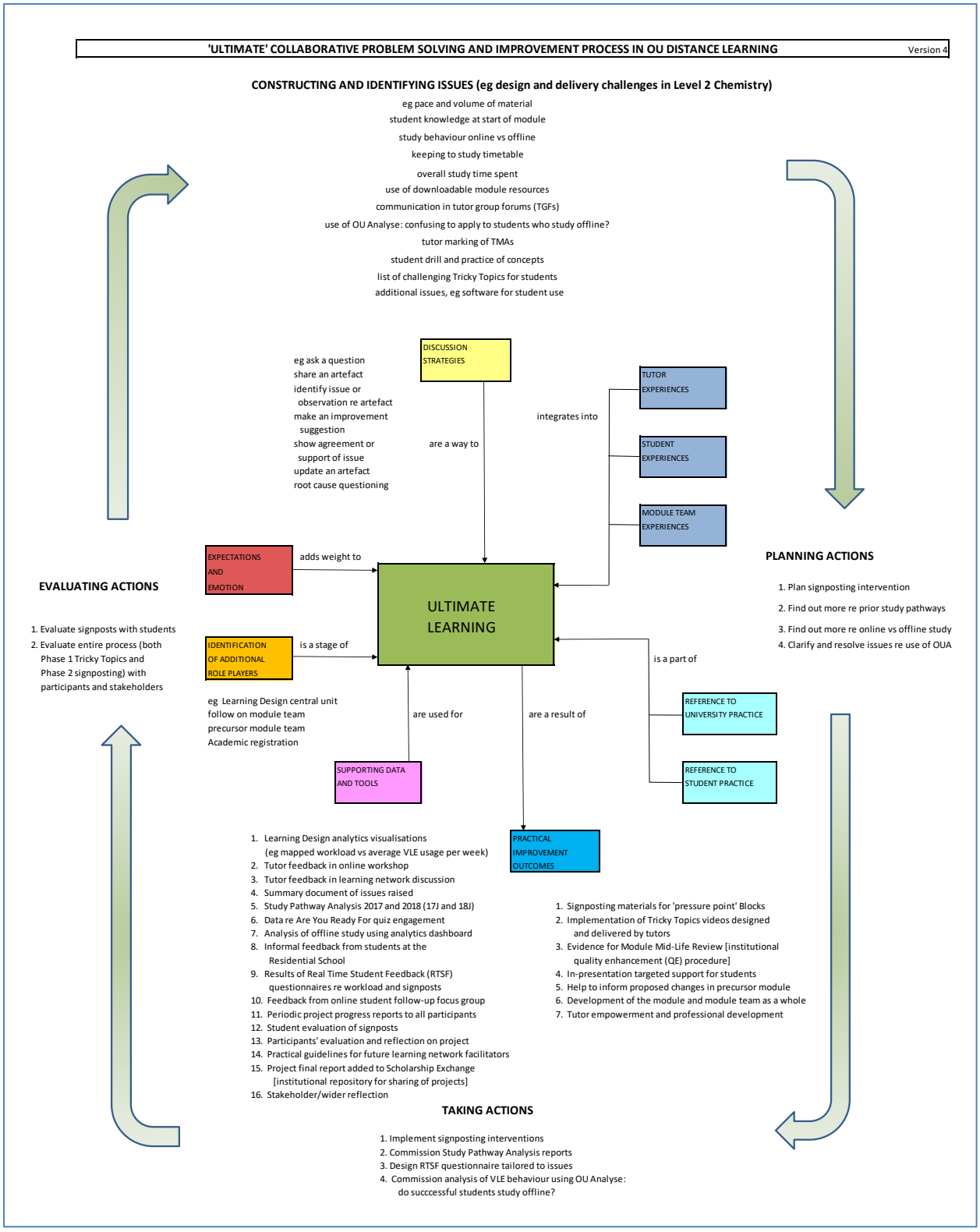

Figure 39. ULTIMATE conceptual framework of a collaborative problem-solving process in distance learning design and delivery [adapted from Spradley's (1979) semantic relationships].

Please note that this Figure should be used in conjunction with the narrative in Box L.

The ULTIMATE framework conceptualises the collaborative problem-solving process using GTM procedures of *iterative conceptualisation*, taking the identified categories and relating them to the core category. Categories at this theoretical coding stage in GTM are abstracted beyond the empirical context. This means that the framework can be then applied to other modules in the OU, in other distance learning contexts, or potentially to any problem solving and improvement process amongst disparate and geographically separated practitioners.

However, empirical examples from the categories were included in the representation of the conceptual framework in Figure 39. This was intended to illuminate the explicit application of the framework by practitioners to a distance learning design and delivery context, to provide a 'worked example', and to underpin its assimilation and cognitive application.

The ULTIMATE framework has been represented both *diagrammatically* and also as a series of written *propositions*, which relate the core category to its sub-categories via theoretical coding. These narrative propositions have been integrated together from the *storyline* provided for each category, to form a *high-level storyline* (Birks *et al.*, 2009; Birks and Mills, 2015). The high-level storyline for the ULTIMATE framework is shown in Box L, which should be considered alongside Figure 39.

A technology-enabled learning network in a distance learning Higher Education context can connect together disparate and geographically separated practitioners and students to learn how to address a challenging learning design or delivery situation by:

- following a **structured but flexible collaborative action research process,** including progressive cycles of co-construction of issues and the planning, taking and evaluation of action
- deploying a **range of discussion strategies,** including asking questions, sharing artefacts, making improvement suggestions, and questioning root causes
- **integrating feedback from tutor, module team and student experiences,** including tutor professional teaching experience, historical experience of institutional practice, student feedback questionnaires and online follow-ups
- **reflectively referring to both university and student practice**
- **using supporting data,** such as learning design analytics
- **using supporting tools,** such as Real Time Student Feedback questionnaires
- **identifying additional relevant role-players,** such as precursor or follow-on module teams, and centralised good practice units
- **being able to express expectations and emotion** in their experiences to add weight to issues under construction and to the planning and evaluation of action
- **and therefore achieving practical improvement outcomes,** or enhancements to the student learning experience.

The collaborative and equitable action research process, which may unfold over multiple cycles spanning several years, can be made visible and explicit by capturing it in a learning technology infrastructure, such as a VLE website. This may enhance engagement between participants and transferability to other modules or different contexts. Participants can be invited based on their problem-solving role or interest.

Box L. High level storyline for ULTIMATE framework

6.12 Summary of Phase 2 Findings: impact achieved and the ULTIMATE framework

The ULTIMATE conceptual framework has been produced. Following the Pragmatist and grounded theory approach, it should be viewed by interested users as provisional, modifiable and adjustable as more empirical contexts are explored in further collaborative research. The identified categories and their associated codes provide an initial implementation and coding framework which could guide other facilitators of technology-enabled learning networks, who are not specialist researchers. In particular, the ULTIMATE framework conceptualises and 'brings to life' a collaborative and equitable unfolding problem-solving process, which has actually been practically carried out and shown to achieve practical improvement outcomes. These outcomes have been evaluated by participants as representing practical improvements, to benefit students in a challenging distance learning design and delivery situation.

The practical improvement outcomes were achieved (in the *content* or action part of the project) as a result of following the unfolding collaborative and equitable problem-solving *process,* conceptualised by ULTIMATE.

Practical improvement outcomes included a signposting materials intervention, implemented to assist students in their navigation of Blocks which had been collaboratively identified as 'pressure points'. This intervention was produced by an interested tutor in conjunction with the module team. Five Blocks have been signposted so far. Signposts have been evaluated by students in dedicated RTSFs (Real Time Student Feedback questionnaires). These RTSFs have served to highlight the signposts to students and to provide an increasingly nuanced level of practical and emotional support for those students who had concerns regarding *pace and volume of material*. Across the delivery of two presentations of the module, students progressively identified the signposts as a helpful intervention, once the additional supporting RTSFs were introduced. This adaption of the RTSFs represented a collaborative learning cycle in itself; as student feedback was secured and acted on for the subsequent presentation.

The utilisation of the project feedback within an institutional quality enhancement procedure, the Mid-Life Review, provided further evidence of acknowledged *impact*. It demonstrated acceptance of the value of the integrated tutor, student, and module team feedback for further faculty planning purposes and for illuminating key module challenges.

A further type of practical improvement outcome or impact achieved was tutor empowerment and professional development. In the evaluation tutors reported a sense of empowerment and development that their views were embraced and key improvements were implemented by themselves, which benefitted students and contributed to the development of the module as a whole. This important outcome meant that tutors had been provided with a means via the collaborative and equitable process to exercise their teaching experience and subject expertise, to feel a part of the module team, and to be a crucial part of development and implementation of solutions. They had also been introduced to institutional data and learning design analytics of interest. This outcome was a crucial achievement in the aim to help close the organisational feedback loop between the multiple remote module tutors, students and campus based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions. There was an additional professional development opportunity and rewarding experience for the tutor who developed the signposting materials, who also presented with me at an external dissemination presentation at Kingston University, and who participated in the online student feedback follow up session.

Apart from module interventions that were evaluated as being helpful to students by both tutors and students themselves, students were also empowered by being given the opportunity to participate in targeted and tailored real-time questionnaires within the Study Planner, and in the dedicated online student feedback follow up session. By adjusting the message and questions in the RTSF, an increasingly nuanced level of practical and emotional support to students was provided, both during the module presentation and in successive deliveries.

This was achieved by indicating to students directly - and early in the module presentation - that the module team were aware of student concerns over pace and volume of material, and that it was frequently experienced by Module S students. They were therefore reassured that they were not alone in their perceptions, and aware that the module team were taking steps to assist. Practical and targeted advice and support was provided. This emerging practice of in-presentation acknowledgment and targeted support is in contrast to the habitual or routine institutional method of obtaining student feedback after the module has completed, via the SEAM (Student Experience on a Module) survey. It thus contributes to *transformational learning* and the development of the module as a whole.

Signposting has also informed planned interventions in the new prerequisite module in the qualification pathway, at Level 1. If Level 1 signposting is implemented this may then feed into increased preparedness for students of Module S, at Level 2. A prominent part of the collaborative discussions with tutors concerned the level of preparedness provided by the Level 1 modules, or by the previous study pathways as evidenced in the Study Pathway Analysis reports that were commissioned as part of *planning action*.

Finally, the project has contributed to the overall development of the module and the module team as a whole, embracing the tutors. By following the collaborative, equitable and inclusive process, the module has benefitted from a type of *organisational learning*, where this was originally defined as 'a process of individual and shared thought and action' by Rashman et al., (2009). It was highlighted that this particular type of organisational learning – ULTIMATE learning - has not been conceptualised before and is a unique contribution to knowledge. It provides a structured but flexible *prehensive* action research process and an alternative Pragmatic conceptualisation of technology-enabled collaborative learning to achieve an improvement outcome. ULTIMATE learning may prove to be more culturally acceptable than *organisational learning* which comes from the management and organisation studies discipline.

A summary of practical improvement outcomes and impact achieved for Module S is provided in Table 33. The thesis will now move to a Discussion of these *content* and *process* Findings.

Summary of impact achieved for Module S		
	Type of impact	Description of impact
1.	Module intervention	Implementation of four Tricky Topics videos designed and delivered by tutors.
2.	Module intervention	Implementation of signposting materials for five Blocks in the module identified as 'pressure points'.
3.	Integration of feedback on identified issues	A new process has been established that collaboratively identifies or *constructs* challenging issues of concern for the module, and integrates feedback from different types of role players [tutors, module team and students] on the identified issues.
4.	Provision of explanatory data on issues of concern	Additional data has been provided in commissioned reports to clarify the complex nature of student preparedness and previous study pathways, and to help tease out the nature of student online and offline study.
5.	Provision of evidence for institutional quality enhancement (QE) procedure	Combined feedback from the tutors, module team and students used as a key backbone of the evidence for module interventions and adjustments in the module Mid Life Review.
6.	Tutor empowerment and professional development	Tutors have been provided with a means via the new process to exercise their teaching experience and subject expertise, to feel a part of the module team, and to be a crucial part of development and implementation of solutions. They have also been introduced to institutional data and learning design analytics of interest.
7.	Student empowerment and benefit from *in-presentation* targeted support	Students were given the opportunity to participate in targeted real-time questionnaires and in a dedicated student feedback follow up online session. This feedback has been used to provide an increasingly nuanced level of practical and emotional support for their concerns regarding pace and volume of material, via real time questionnaires delivered *during* as opposed to *at the end of* the module presentation or delivery.
8.	Helped to inform proposed changes in precursor module	The project has helped to inform proposed future changes in the precursor module with regard to signposting implementation.
9.	Development of the module and module team as a whole	By following the collaborative and equitable process, the module has benefitted from *organisational learning,* where this is defined as 'a process of individual and shared thought and action' by Rashman et al., (2009). Interesting ideas for further development or actions have been received from tutors during evaluation.

Table 33. Summary of practical improvement outcomes (impact) achieved for Module S

Chapter 7: Discussion

7.1 Introduction to the Discussion

> *Challenging dominating ideas and taken-for-granted assumptions is very important for research progress and this is not necessarily best accomplished with efforts to maximize empirical accuracy. Instead, ideals such as problematization and de-familiarization are important – allowing radical rethinking (Alvesson & Deetz, 2000). What are commonly portrayed as key ingredients for good research and scholarship – specialization, incremental work, add to a subset of literature – may actually be the cause of a shortage of good research leading to novel and influential ideas and theory.*
>
> Alvesson and Sandberg (2014, p.971)

This quotation is taken from an appeal for more of what the authors refer to as 'box-breaking' research, in contrast to 'boxed-in' research in management and organisation studies. These authors argue that 'scholarly work is increasingly situated in narrowly circumscribed areas of study, which are encouraging specialization, incremental adding-to-the-literature contributions and a blinkered mindset' (Alvesson and Sandberg, 2014, p.967). They assert that environmental influences in the current academic environment can lead to a dearth of research of 'creativity, imagination, interestingness and practical relevance', in favour of incremental contributions (Alvesson and Sandberg, 2014, p.969). Indeed the research 'box' provides a disciplinary *habitus*, the features of which Alvesson and Sandberg (2014) describe. Their analysis forms the backdrop of my assertion that my interdisciplinary "boundary-hopping" approach is an interesting, creative and highly practically relevant example of 'box-breaking' research. This Discussion will set out the verification of the ULTIMATE framework conceptualised in Figure 39, and make three validated research claims, one for each of the research questions.

ULTIMATE supports the achievement of practical improvement outcomes amongst a working group of disparate and geographically separated practitioners who have a role to play in a challenging or *indeterminate* learning design and delivery situation. A range of practical improvement outcomes or impacts have been achieved. Using the theory building procedures of GTM, ULTIMATE could be rigorously adapted and extended to other educational contexts, or indeed other challenging or *indeterminate* situations beyond formal education.

This Discussion will take the theoretical and practical Findings reported in Chapters 5 and 6, and use them to make the research claims. There is one claim for each Research Question. These claims are illustrated in Figure 40, which completes the diagrammatic progression of the research journey, supported by Isaksson *et al.* (2020), that has been followed throughout. Figure 40 illustrates that the three thesis claims embrace both theoretical contributions to knowledge, and contributions to practice.

As illustrated in Figure 40, and explained initially in the introduction to the research journey diagrams in Section 2.7 Conclusion, the Discussion will embrace the *verification* of the ULTIMATE framework. *Verification* is an assessment of whether specified requirements have been fulfilled (Isaksson *et al.*, 2020). The 'requirements' or characteristics of a new framework were identified via the systematic comparison carried out in the Literature Review, and summarised using the ten desirable quality criteria in Table 7. In this research, *verification* embraces the GTM technique of *theoretical integration,* using the ten criteria to verify the particular contribution of the new framework. This will be explained in the following section.

The Discussion will also explain the *validation* of the theory and practice claims. *Validation* is an assessment of whether the knowledge contribution filled the specified research gap in knowledge, and whether the practice contribution represented an amelioration of the practical problem, that is whether the research fulfilled its requirements *in use* (Isaksson *et al.*, 2020).

These *verification* and *validation* assessments are shown as feedback loops in Figure 40.

Thus, an integrated assessment is made at the end of the research journey before the final reflections, limitations of the current work, and a look forward to future research work, are put forward in the Conclusion Chapter 8: Conclusions, limitations and future research.

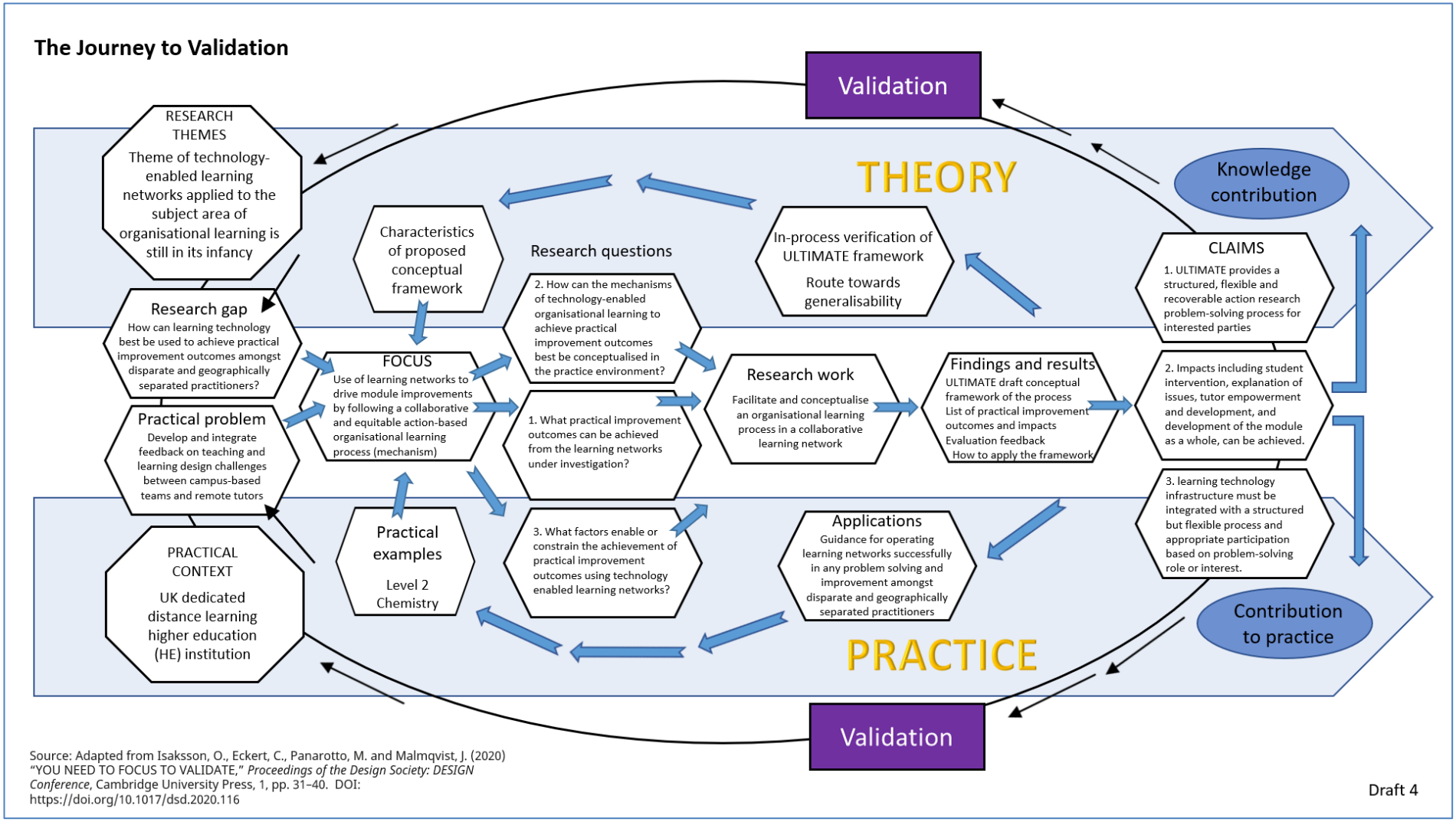

Figure 40. Contribution to knowledge and contribution to practice claims

7.2 Verification: systematic comparison of ULTIMATE back to the other frameworks

In the Literature Review, a set of ten desired quality criteria were derived from the extended pluralistic comparison of the three conceptual frameworks. These criteria were taken from the final column of Table 2. They illuminated the desired characteristics, or 'requirements' of a proposed new conceptual framework, in comparison to those frameworks already in use. They provided a warrant for seeking to conceptualise the new framework.

These ten criteria can now be used for *verification* at the end of the conceptualisation, as illustrated in Figure 40. Having conceptualised ULTIMATE and kept these criteria in mind throughout the GTM conceptualisation process, it is important to return to the criteria at the end for a final assessment of whether ULTIMATE has fulfilled them.

The criteria were listed in Table 7 and are reproduced below for convenience.

Ten desirable quality criteria derived from extended comparison Table 2	
1.	have an *object*, in the sense of purpose, or what is being aimed for, which is to resolve a problem or address a challenge in which improvement is being sought
2.	be explicit in depicting the social relationships involved
3.	be explicit about the use or production of artefacts
4.	be explicit about the identification of an improvement as an intermediary step in the cycle towards achieving a practical improvement outcome
5.	identify a practical improvement *outcome* which is an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders
6.	be analysed at a network level consisting of potentially geographically separated disparate practitioners, participation based on their problem-solving role or interest
7.	depict a structured and rigorous problem-solving process or learning mechanism
8.	lead to possible emergent (unpredicted) transformative organisational learning
9.	be capable of facilitation by practitioners with no specialist research methodology expertise
10.	depict an unfolding temporal series of activities which may take significant time to yield outcomes

Table 7. Ten desirable quality criteria for the new conceptual framework

Source: Drawn from the extended comparison Table 2

As the criteria were produced by a systematic comparison between existing conceptual frameworks, they also contribute towards the task of GTM *theoretical integration.* This is the GTM procedure identified in the Methodology, used to integrate the proposed theory or framework together, often around a *core* category, then also comparing it with those in the literature (Urquhart, 2013; Birks and Mills, 2015; Corbin and Strauss, 2015). In addition, the elapsed period of time since the derivation of the criteria at the outset meant that it was also important to revisit the comparison of the frameworks, and to take account of the fact that they have been developing in the intervening time. *Theoretical integration* thus helps to illuminate the emerging theory at the end of the research work and articulate the unique theoretical contribution.

The final development as previously noted that emerged during the research work was that by further reflecting on the criteria and returning to the interdisciplinary literature both during and after the ULTIMATE framework had been conceptualised, it became apparent that the criteria in Table 7 were closely aligned with a Pragmatic approach. Criteria 7 in Table 7 above emphasises the unfolding process, whilst Criteria 8 directly addresses the transformative learning aspect.

As the Literature Review highlighted, there have been multiple recent calls for a return to the principles of classical Pragmatism in the organisation studies and grounded theory literature (Elkjaer, 2004; Elkjaer and Simpson, 2011; Morgan, 2014, 2020; Lorino, 2018; Buchan and Simpson, 2020; Simpson and den Hond, 2021). This section discusses the unique contribution of the ULTIMATE framework with reference to these calls, and to the extended comparison with the existing conceptual frameworks found in Table 2.

Table 34 summarises how the ULTIMATE framework as it was iteratively conceptualised, fulfilled all of the criteria listed in Table 7, with examples from the Findings.

Each of the criteria in Table 34 are aspects of ULTIMATE and will therefore now be discussed in turn, in comparison to the three existing frameworks presented in the Literature Review. Once again, and as highlighted in the Literature Review, it must be noted that the existing frameworks have significant, evolving and expanding historical theoretical and practical traditions, acquired over varying time periods of development. They are all produced by thought leaders in their respective fields - of communities of practice, of cultural historical activity theory, and of networked learning. The criteria will be discussed in the light of this, and in light of the ever-enriching congruence of ULTIMATE with a Pragmatic approach that was established throughout the course of the research. ULTIMATE provides a Pragmatic, *prehensive* alternative to the existing conceptual frameworks, which can be followed through by practitioners.

How the draft framework fulfils the quality criteria in Table 7		
1.	Have an *object*, in the sense of purpose, or what is being aimed for, which is to resolve a problem or address a challenge in which improvement is being sought.	To provide additional support to students who are challenged with *pace and volume of material.*
2.	Be explicit in depicting the social relationships involved.	Tutors, module team and students as direct participants in the process. Identification of additional role players, eg follow on and precursor module teams, academic registration.
3.	Be explicit about the use or production of artefacts.	Artefacts both used to support the discussion, eg learning design analytics, and produced as a result of actions taken eg signposting materials, results of RTSF questionnaires.
4.	Be explicit about the identification of an improvement as an intermediary step in the cycle towards achieving a practical improvement outcome.	Identification of the signposting intervention as a planned and implemented action.
5.	Identify a practical improvement *outcome* which is an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders.	The signposting intervention has been evaluated as useful by students, tutors and the module team, although signposting materials should be integrated into the module materials so that they can be found most efficiently. Suggestions for further work have been received from tutors during evaluation.
6.	Be analysed at a network level consisting of potentially geographically separated disparate practitioners, participation based on their problem-solving role or interest.	The unit of analysis is the network itself, underpinned by the unfolding collaborative organisational learning process or mechanism.
7.	Depict a structured and rigorous problem-solving process or learning mechanism.	The unfolding problem-solving process which took place as a result of the insider action research has been conceptualised using a rigorous analysis approach. It has been abstracted to a series of categories that are related together, to form a coherent conceptual framework that could be applied in other contexts.
8.	Lead to possible emergent (unpredicted) transformative organisational learning.	The integration of the tutor, student and module team voices has led to collaborative learning about the complex, interrelated and somewhat intractable issues which the module team and faculty management had been facing. Signposting project outcomes have informed planned interventions in a precursor module.
9.	Be capable of facilitation by practitioners with no specialist research methodology expertise.	The conceptualisation of the categories and their associated open codes provides a coding framework for practitioner researchers to apply to their own contexts. The flexibility inherent in the abstraction means that the collaborative organisational learning process is *designed for*, not *designed* or prescriptive. The associated guidelines provide implementation tips and guidance for facilitating a learning network with no specialist research methodology expertise.
10.	Depict an unfolding temporal series of activities which may take significant time to yield outcomes.	The combination of successive action research cycles of *constructing issues*, *planning action, taking action* and *evaluating action* along with rigorous qualitative analysis provides structure to the unfolding path towards achieving practical improvement outcomes, which may take several years.

Table 34. How the draft framework fulfils the quality criteria in Table 7

1. **Object - sense of purpose or what is being aimed for**

   A fundamental aim of this research was to actively *seek* the achievement of practical improvement outcomes, by responding in an inclusive and equitable way to a design and delivery issue of concern which had been collaboratively identified. Thus, a sense of purpose, a goal, or what was being aimed for, was built directly into ULTIMATE. The explicit purpose or *object* in ULTIMATE is to resolve a problem or address a challenge in which improvement is sought; even if this is or has been difficult to define or was not originally anticipated.

   In Phase 1, the identified purpose was to identify Tricky Topics or conceptually challenging areas for students. During Phase 1 however, it became apparent that the tutors felt there were several more fundamental issues for the students and for the module, in addition to Tricky Topics. In Phase 2, the purpose was to reflect on this list of additional issues, and then to provide additional support to students who were challenged with pace and volume of material. In Pragmatist terms, this resonates with the first stage of Dewey's Inquiry process, in recognising a situation as problematic (Morgan, 2014; Lorino, 2018). *Situation* is an important concept in Pragmatism, in which Inquiry does not start from a well-defined problem. Instead, it starts from an *indeterminate situation* that is characterised by a feeling, or emotion, of *unease* that something is wrong. During the course of the Inquiry, the problem is *constructed* (Lorino, 2018). This stage has obvious resonance with the *constructing issues* stage in action research. Dewey argued that feelings or emotions, especially *doubt*, are a driving force of the Inquiry (Lorino, 2018), as there is a (perhaps increasing) feeling that things cannot go on as they are, and some change needs to be made to the existing habitual ways of working. By including expectations and emotion as a specific category in the ULTIMATE framework, to add weight to the issues under construction, ULTIMATE represents a valuable alternative contribution by embracing the emotion of a 'felt need

for change' within a more fully Pragmatic approach. Emotion or *doubt* and a 'felt need for change' are not embraced specifically in any of the other three frameworks in the comparison Table 2. Certainly, a purpose is present in each but is identified in somewhat different ways, as explained below.

Firstly - the Value Creation Matrix (VCM) evolved from a retrospective evaluation framework, and 'purpose' only historically became explicit when it was introduced as 'aspiration' in the later Value Creation Framework (VCF). Aspiration tends to be presented as an 'aspirational narrative' which captures how individual practitioners would like to improve their practice, or what the aspiration might be for improving practice at group or strategic levels, should they decide to participate in the social learning space. ULTIMATE specifically starts out from the problematic or challenging situation, rather than from a general aspiration to improve and looking for ways in which that might happen.

Secondly - in CHAT, the *object* is foregrounded as the mutual aim of an entire *activity system*, and the motivation for joint effort to achieve an outcome. Engeström and Sannino (2010, p.6) comment that 'Object refers to the 'raw material' or 'problem space' at which the activity is directed', which can appear to be very similar to the idea of an *indeterminate situation.* In a comparison of CHAT and John Dewey's Pragmatism, Miettinen (2006, p.389) draws many similarities between the two traditions. He points out that:

> *Both activity theory and Deweyan pragmatism can be regarded as theories of activity. Both regard the concept of transformative practical activity as a theoretical category that makes it possible to solve philosophical dilemmas that emerged from Cartesian subject-object (and mind-body) dualism.*

This means that *both* activity theory and Pragmatism embrace a transformative rather than a static approach. Both the *subject* (disparate participants) and the *object* (the mutual aim of the activity system in activity theory, or the indeterminate situation in Pragmatism) can be mutually transformed by the activity. They are not static. As Miettinen (2006) confirms, both approaches have much to offer in understanding and guiding organisational change and development. ULTIMATE however offers a Pragmatic framework for practitioners to collaboratively construct issues in problematic or challenging situations, with a felt need for change. The indeterminate situation becomes the *object*.

An example given in Findings of a tutor expressing an aspect of the indeterminate situation in Module S is:

> *The point is, that until I know exactly what the background of a student is, I'm not really in a position to propose a plan for remedial action. I do know that a number of students are arriving woefully unprepared, and it is getting worse, year on year.*

This insight contributed to the collaborative planning of the action to find out more about student study choices before the module and previous study pathways taken.

Thirdly - in the ACAD framework, the purpose is considered as *task driven*, as a set of suggestions of things to do. *Purpose* is embraced in an *epistemic* set of suggestions in the ACAD terminology; apparently suggesting a knowledgeable teacher of students or a facilitator in a formal or non-formal learning context. This reflects the most widely adopted definition of networked learning, and much of the focus of the networked learning field to date (Networked Learning Editorial Collective (NLEC), 2021).

However, in an extensive theoretical discussion of professional learning and education published a period of time after the ACAD framework was launched, Markauskaite and Goodyear (2017) distinguish between two different types of *object* in the literature. An object can be characterised either firstly as a broad target of thought or action, that is a motive, as in the CHAT framework, or secondly as a specific concrete activity, such as the list of suggested tasks in the ACAD framework. Learning associated with change and improvement or 'learning for future practice' (Markauskaite and Goodyear, 2017, p. 202) is oriented towards the former of these understandings of object. In contrast, learning from a knowledgeable teacher is oriented towards the latter, and the object has to be realised via a list of specific tasks. These tasks frequently 'produce a specific artefact that gives a tangible form to some general capacities or understandings' (Markauskaite and Goodyear, 2017, p.202).

Thus, objects can in fact have both *entitative* and *processual* dimensions. An object can be a concrete entity or can be dynamic and continually evolving or unfolding over time. As previously explained in this section, the *indeterminate situation* is the object in the Pragmatist, processual and transformative approach of ULTIMATE. In the research context, this was associated with resolving a problem or seeking an improvement to address a collaboratively identified distance learning challenge or issue, for which there was no known answer, and which could not be resolved by habitual ways of working. ULTIMATE therefore conceptualises a type of Pragmatic Inquiry as Dewey saw it: 'as a process that starts with a sense that something is wrong and that the normal course of activity cannot proceed uninterrupted' (Elkjaer and Simpson, 2011, p.66).

2. **Social relationships**

The key unique aspects about social relationships inherent in the ULTIMATE framework is that they are collaborative, inclusive and equitable, whilst participants are also focussed together in an unfolding, structured but flexible organisational learning process. As identified in Table 5, the action research approach means that practitioners are researching *with* each other on issues which affect them and their students, and to which their professional experience and insights can be brought to bear. Therefore, they do not feel that they are being researched *on*, being subjects for someone else's research, being led by an "expert", or providing data for a relatively separated researcher, observer or specialist consultant to make their own 'expert' interpretations.

This understanding of the prevalent production of knowledge by separated research "experts", or specialists external to the situation, has recently been challenged in a Call to Action Research for Transformations (ART). The call proposes that 'action research provides a methodology in which the chasm between expert knowledge and stakeholder participation is overcome' (Bradbury et al., 2019, p.5). The authors of this call make a powerfully worded challenge to prevailing academic practices of knowledge creation, which tend to rely on neutral or separated study and observation in contrast to the participatory taking of action. The idea was illustrated in the Methodology in Figure 11.

The social relationships in this type of collaborative and unfolding action research also contribute towards the current ongoing debate regarding *Close-to-Practice* (CtP) research, as defined by BERA (2017) and discussed in 4.6 Evaluating and ensuring quality and rigour in the methodological approach. Good quality CtP research involves collaboration between 'people whose main expertise is research, practice, or both' (BERA, 2017, p.2). In an introduction to a special section in *British Educational Research Journal*, Biesta and Aldridge (2021) discuss the often contested relationships between

educational research, theory and practice in the context of CtP research. Participants in an ULTIMATE project are jointly taking a reflective "step back" from the challenging or indeterminate situation with which they are involved. They are contributing their historical and current teaching experience, and their insights on university practice. They are expressing expectations and emotion as appropriate. They are assimilating and interpreting supporting data, such as learning design analytics, that is shared as part of the process. They are witnessing, or helping to design, the implementation of interventions which they themselves have played a part in specifying and experiencing the results. They are reflecting on and contributing towards evaluation. All of this takes place both for individual participants and for the working group as a whole, as they collaboratively work through the unfolding Inquiry process.

The remote tutors for Module S clearly showed that they understood they were part of a collaborative process, and experienced the social relationships as inclusive, as shown by the quotes below:

> *'….. I also found the process collaborative and felt supported in terms of being listened to as an individual and part of the AL team and with the AL suggestions being actioned'.*
>
> *'I was pleased to be involved and felt part of the 'course team' even though that is not strictly true! The approach taken was inclusive and 'open minded'.*
>
> *'Yes, I appreciated being part of this project and so closer to the module team and changes being considered'.*

As the evaluation feedback identified, this positive experience from the remote tutors was a most important aspect, in a project which was designed to answer a perennial need to close a feedback loop between remote module tutors and campus based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions.

It should be re-iterated however, that Module S was a small module in Open University terms (approximately 160 students per cohort), and that the 7 remote tutors who took part in the project were already familiar with working with each other online. They did however actively acknowledge the existence of the *process*, the collaborative and inclusive approach and their feelings of being a part of the 'course team', which contributed towards a feeling of development of the module as whole. This outcome was especially notable given the noted historical organisational need to fully embrace the experience and teaching capabilities of remote module tutors.

There was also a social relationship between myself as researcher/facilitator of the process, the project leaders and the participants. The ULTIMATE framework was designed specifically to provide a bridge from more traditional research approaches where the researcher may be positioned as a separated 'specialist' outsider. A specialist researcher or facilitator may also be perceived by participants as disconnected or unknowledgeable about the local context or practice, which may then render them unqualified to facilitate in the eyes of some practitioners. Instead, the aim of ULTIMATE is that the facilitator can use the proposed practical guidance without requiring specialist research methodology expertise, as long as support is available if required. ULTIMATE explicitly encourages contributions from a variety of disparate practitioners. Therefore, any facilitator, whether an insider or outsider to the practice area, could be regarded as another type of practitioner with a different contribution to make.

During the course of the unfolding Inquiry process, which may take several years as it moves through several cycles, learning may occur between the different participants with regard to the conduct of research and conduct of practice. In this project, significant gradual learning and mutual enculturation took place between myself as researcher/facilitator and my scholarship project co-leader, who was the Module Chair for Module S and is a Chemistry teacher. Through our working together, my co-leader has learned and experienced much about how to undertake a collaborative and structured Inquiry process in this context. I have learned and absorbed much about the practice of designing and delivering distance learning modules at the Open University. I have learned about the complex design and delivery challenges that may face a module in practice, about interrelating with different types of practitioners and stakeholders, and about some practical ways to support the enhancement of the student experience. All of this social learning together between project participants can culminate in *transformative* organisational learning, which will be discussed under Criterion 8.

In the informal evaluation and reflection with my project co-leader, the Chair of Module S, indicated his appreciation for the authority of an experienced facilitator of the process, as he learned and developed. His reflection indicated his sentiment that if he had tried at first to lead his module team in this process, "it would have been like reading a self-help book", and he did not believe he would have had the appropriate authority in a process which was entirely outside of his previous experience.

As the Literature Review identified, social relationships are woven into the fabric of each of the comparison frameworks, in different ways. The aim and focus of this research was to follow a structured and rigorous problem-solving process or mechanism, and it is the social relationships *bound to this unfolding process* which can be characterised as different to the social relationships in the other frameworks. Elkjaer & Simpson (2011, p.55) sum up this aspect by characterising Pragmatism as a 'temporal view of social practice in which selves and situations are continuously constructed and reconstructed through experimental and reflexive *processes* of social engagement' [my emphasis]. In CHAT, the social relationships are conceptualised as interactions, tensions and *contradictions* within an activity system, where individuals are bound up in communities, rules and divisions of labour.

In ULTIMATE, participants are invited to the learning network and improvement process based on their problem-solving role or interest. Participants should have a direct stakeholder role, i.e. have some experience, expertise or practice position which is relevant to the problem or *indeterminate situation* at hand, or be affected by it. As the process unfolds, additional participants may be identified as relevant role-players, especially if the identified issues span organisational units or boundaries.

In Phase 1, the tutors, module team and Tricky Topics specialist were direct participants. For Module S in Phase 2, the Senior Manager Teaching and Learning joined as a project team member. Students were subsequently directly included in this Phase. Identification of additional role players included follow-on and prerequisite module teams, and academic registration.

3. **Use or production of artefacts**

As the Literature Review identified, the use or production of artefacts is inherent in all networked learning and distance learning contexts, and indeed in most human activity. Table 2 confirms that the role of artefacts is explicit in all the frameworks considered.

In ULTIMATE, artefacts are also explicit, and are currently referred to as 'supporting data and tools'. Key examples of supporting data used in the *content* or action part of the project in Phase 2 were the learning design analytics visualisations, and the Study Pathway Analysis reports. These were both critical components in supporting the unfolding Inquiry process, as tutors, staff tutors and the module team were exposed to additional complex supporting information and data, commissioned in response to *constructing issues* and *planning actions.*

Examples of tools in the *content* or action part of the project were the Tricky Topics Structure Chart templates in Phase 1, and the RTSF (Real Time Student Feedback) questionnaire tool in Phase 2. These were artefacts that were *used* during the unfolding process. Further artefacts or 'deliverables' were *produced as a result of* the process, which included the Tricky Topics videos, the signposting materials, results of RTSF questionnaires, report of the student feedback follow-up session, the Module Mid-Life Review document, and project progress reports. All of these contributed to and scaffolded the unfolding organisational learning process. Remote tutors especially reported it helpful to be kept up to date via progress reports in a project which took place over a significant time of period and did not require their continuous contribution.

The artefacts used in the *process* part of the project supported the analysis and the conceptualisation. These were the integrative diagrams, the interactive spreadsheets, and the high-level diagram of the ULTIMATE framework. These were all used to

communicate the rigour of the qualitative analysis, and to share this unfolding analysis with interested participants and other stakeholders. They were designed and produced to clearly communicate and encourage assimilation of the analysis process itself, and therefore to help in the production of *actionable knowledge*, which is usable by practitioners and theoretically robust for scholars.

Artefacts *to support and scaffold the unfolding process of organisational learning,* using the affordances of collaborative learning technology, are thus one of the key aspects of ULTIMATE learning. Artefacts do not need to be rigid or fixed 'finished products' as they are often seen (Markauskaite and Goodyear, 2017, p.207), and can be part of the movement or flow of the process.

In ULTIMATE this might be the updating or different treatment of an artefact in an action research cycle as a result of feedback received in the previous cycle. A particular example of this from Findings in this research was the production of further signposts after student evaluation of those for first two Blocks. A second example was the refinement of signposting promotion to students, so that they were given additional prominence on the Study Planner and introduction at an earlier stage in the module, and thus promoted as an intervention designed to support an acknowledged concern that the module team were aware of. This yielded the progressively nuanced emotional and practical support for student concerns and challenges on *pace and volume of material*.
In VCM/VCF, artefacts can produce *immediate value* or *potential value* in Cycles 1 or 2. When they are used or implemented, they can become *applied value*, for example in a new or promising practice, or implementation of a resolution. When they have been positively measured or evaluated using feedback with respect to an outcome, they can be described as *realised value.* The production and implementation of the signposting materials for Module S can in fact can be related to this value-adding path, as follows.

The signposting material, having been produced, had a *potential value* in that each signposting document was a developed intervention which could be implemented, but was yet to prove useful in practice. The signposts were then implemented on the live module website, promoted to all students, and alerted to all tutors. This demonstrated *applied value*. Finally the signposts were evaluated by both students and tutors as being helpful and 'making a difference'; to thus achieve *realised value* (Wenger-Trayner and Wenger-Trayner, 2020, p.79-97). As a result of the participant evaluations and the entire project, there was evidence that a level of *transformative value* had been achieved. Participants felt that the project had contributed to the development of the module as a whole. As the Tricky Topics videos (in Phase 1) and the signposting materials (in Phase 2) were artefacts that were directly produced by tutors as a result of the collaborative reflection, this contributed to their feeling of empowerment, and becoming closer to the module team. An example of this evaluation given in Findings was:

> *'Yes, I feel the project has been beneficial to all involved in Module S (students, ALs and Module Team); reflection from ALs and Module Team was listened to, the process was a collaborative and, significantly, key improvements were made, for students, based directly on the project reflection and solutions put forward'.*

In this project, momentum was built up in the action research cycles, such that an improvement suggestion for a further refinement on the signposting materials was made during the evaluation. This formed evidence of sustainability and continuing transformation:

> *'As I write this I wonder if we should have an overall signposting document for tutors, I am more stringent in my comments to students who are behind now than I used to be, with the aim of keeping them going and aiming to pass. I still think the individual student positions are the most important consideration but, I do now try to move students on in some places and not in others. [.....] This might be useful for new tutors but would have to have the agreement of all tutors and module team as we may differ on what is the most important'.*

The VCF therefore can have a role in reflecting on and assessing the value associated with the various incremental stages of value creation. A *practical improvement outcome,* as defined in 1.2 Overall aims and research themes, is an example of *realised value* or *transformative value.* The practical improvement outcome occurs when it has been evaluated as an organisational change for the better, by participants in the learning network and other interested stakeholders.

As highlighted in the Literature Review, each of the comparator frameworks is explicit in the use or production of artefacts, but not in the conceptualisation of an unfolding process or *social mechanism* (as defined in The role of mechanisms), that supports the use of artefacts.

4. **Identification of an improvement as an intermediate step**

In ULTIMATE, the identification of an improvement that is aimed for or sought, is an intrinsic part of planning action after constructing issues in the action research cycle. This equates to the search for potential solutions in a situation which cannot be resolved through existing habitual routines or action, in the Pragmatic Inquiry process (Elkjaer and Simpson, 2011; Morgan, 2020). The search, in order to plan action, is frequently experimental or abductive ("What if we do X?"), as new creative solutions are put forward and discussed amongst participants. In ULTIMATE, as an action research process, this is undertaken collaboratively. Anyone with a problem-solving role or interest in the project is able to suggest a possible route forward, in the light of all the supporting data, evidence and collaborative insight.

Abductive reasoning has been recently highlighted as fundamental to organisational development and change (Shani, Coghlan and Alexander, 2020), and also as an integrating mechanism in between *the first-person, second-person* and *third-person* aspects of action research (Coghlan and Shani, 2020).

Confronted with 'an array of puzzling and paradoxical data' within the *indeterminate situation*, which cannot be resolved by normal or habitual ways of working, abductive reasoning is the vital element in the production of new knowledge and in the creation and development of innovative organisational interventions (Shani, Coghlan and Alexander 2020, p.70). In ULTIMATE, the abductive element means that the intervention is trialled experimentally as a possible improvement, and then evaluated within the action research cycles. In this project, it was the abductive leap to the signposting intervention that was identified as the improvement to be implemented and evaluated.

Shani, Coghlan and Alexander (2020, p.64) cite Charles Peirce, one of the original Pragmatists, who articulated abductive reasoning as distinct from deductive or inductive reasoning. Abductive reasoning helps to answer the question "What is going on?", as opposed to "What is it?" (deductive) or "Is it so, and how do I know?" (inductive). These authors additionally highlight the contrast provided by Gibbons *et al.*, (1994) between 'Mode 1' and 'Mode 2' knowledge production. Mode 1 knowledge production is characterised by 'the explanatory knowledge that is generated in a disciplinary context, set by an academic agenda, usually articulated within a singular discipline and accountable to that discipline' (Shani, Coghlan and Alexander, 2020, p.62). Mode 2 knowledge production is described by these authors using five characteristics provided by Gibbons *et al.*, (1994):

- *generated in the context of application and seeks to address practical issues*
- *trans-disciplinary, mobilizing a range of theoretical perspectives and practical methodologies to solve problems*
- *socially accountable and reflexive*
- *heterogeneous in that who participates is flexible and may change as the project requires*
- *requires forms of quality control, which are grounded in the above four characteristics pertaining to its practical orientation, trans-disciplinarity, social accountability, and heterogeneity.*

It is clear from this contrast that ULTIMATE is aligned to a form of 'Mode 2' knowledge production. It seeks to address practical issues, has embraced a range of theoretical perspectives in its production, provides a socially accountable and reflexive framework, and is explicitly heterogeneous, to integrate insights from disparate practitioners.

Thus in identifying an improvement as an intermediate experimental step during the *planning actions* stage, ULTIMATE provides for the creative and abductive leap from practitioners that is vital in the identification and implementation of successful interventions, and articulated by Shani, Coghlan and Alexander (2020).

In CHAT, the learning mechanism is to look for *contradictions* as 'historically accumulating structural tensions within and between activity systems' (Engeström, 2001, p.137). Contradictions can drive cycles of *expansive learning.* A strategic action in expansive learning is 'modeling', to examine possible new solutions or patterns of activity as a result of the analysis of contradictions (Engeström, 2001, p.152). 'Modeling' in the expansive learning cycle equates to the identification of an improvement as an intermediate step**,** which is then considered, implemented and evaluated, or rejected.

In VCM/VCF, an improvement tends to be characterised as the retrospectively assessed *applied value*. As explained in the previous section on artefacts, an example would be after implementing a new artefact and before it has been measured or evaluated. Improvement as an intermediate step could also be classed as a forward-looking *aspiration*, in any of the cycles in the VCF. However abduction does not appear to be embraced specifically within VCM/VCF, or within the more recent *social learning spaces* theorised by Wenger-Trayner and Wenger-Trayner (2020). Indeed Wenger-Trayner and Wenger-Trayner (2020, pp.52-53) declare that although the closest philosophical fit to their focus on value creation is 'probably pragmatism', they do not wish to claim affiliation with any philosophical school, and that their 'approach to value creation has echoes of interpretivist and constructivist thinking in social theory'. As learning theorists, Wenger-Trayner and Wenger-Trayner (2020, p.54) also continue to 'look at value creation in historical terms', in contrast to the *prehensive* and forward looking *in-the-flow* approach of ULTIMATE.

The identification of an improvement as an intermediate or experimental step in an organisational learning and problem-solving process does not currently appear to be accommodated within ACAD.

The search for a proposed improvement is also evident in the Pragmatist underpinnings of the Strauss and Corbin grounded theory paradigm. The paradigm has three features including *conditions, action-interactions,* and *consequences* or *outcomes* (Corbin and Strauss, 2015). These features can be simplified and paraphrased into everyday language as: "When this happens, I do this, with the anticipation of having this result" (Corbin & Strauss, 2015, pp.156-157). The paradigm provides a way of reflecting on actions that may be, or have been, taken in response to certain conditions. It reflects Strauss's more emphatic connection than Glaser with Pragmatism, although this underpinning was not articulated by Strauss himself until the end of his career (Corbin and Strauss, 2015). As previously identified the paradigm can provide a 'jumping off points to think about relationships in data' (Urquhart, 2013, pp. 26-28), and does resonate in the case of ULTIMATE.

Charmaz (2014, p.202) also emphasised the role of the emotion of *doubt* in abductive reasoning, and makes the connection between doubt and the reflection on premises and assumptions in a habitual or routine situation, that is characterised in the action research table top model in Figure 13. Doubt 'signals a need to reassess prior understandings' and can lead to 'hunches about imagining possibilities and creating new connections' Charmaz (2014, p.202). This can lead to discoveries and *transformational learning.*

5. **Identification of outcome**

In ULTIMATE, an outcome is identified as a *practical improvement outcome*; an organisational change for the better, as evaluated by participants in the learning network and other interested stakeholders. Uniquely among the frameworks it is explicitly linked to the following of a directed but unfolding *process* or *mechanism* to seek, or learn how to address, a collaboratively identified challenge or goal. The outcome is evaluated as part of the equitable and inclusive process, giving an equal voice to all the learning network participants.

The Findings were summarised in Table 33 and illustrated a range of practical improvement outcomes which were achieved, including a level of *transformational learning* and the development of the module as a whole.

Unsurprisingly, *outcome* is explicitly identified in each one of the frameworks, which were all designed specifically to depict collaborative or collective activity for some purpose. In VCM/VCF, outcome is characterised as *realised value* or possibly *transformative value* associated with community or network interactions. In CHAT, the outcome is that expected or produced as a result of the combined activity of the human activity system, motivated towards pursuing the object. *Contradictions* may become evident within or between interrelating activity systems, which may compromise the achievement of desired outcomes. *Expansive learning* may drive transformative outcomes. In ACAD, suggested tasks, by implication from a knowledgeable facilitator, lead to emergent 'co-configured' activity which produces an outcome.

6. **Specification of unit of analysis**

In ULTIMATE, the unit of analysis is the working group or learning network for the particular *indeterminate situation*. This is transformed into a more stable or more resolved situation. The indeterminate situation may consist of potentially geographically separated disparate practitioners, located across several different organisational contexts and boundaries. The indeterminate situation could also be spread across several different organisations or agencies. Participants are invited to the learning network based on their problem-solving role or interest.

By comparison in VCM/VCF, the unit of analysis is the entire set of interactions for a particular community, network or *social learning space* (Wenger-Trayner and Wenger-Trayner, 2020). The set of interactions are considered reflectively in order to ascertain value achieved or aspired to. In CHAT, the unit of analysis is the activity system, or multiple interrelating activity systems. As for ACAD, it is the network, as 'not all its qualities can be defined as aggregates of the actions or preferences of individuals' (Carvalho and Goodyear, 2014, p.14).

This section has summarised how the unit of analysis is considered as the *indeterminate situation* in ULTIMATE, in comparison to the other frameworks.

7. **How learning is driven**

Learning is driven in ULTIMATE by facilitation of the unfolding *process* or *mechanism* to seek, or learn how to address, a collaboratively identified challenge or goal. This is equivalent to a Pragmatic Inquiry process. The process is structured and rigorous, following through a combination of the action research stages *constructing issues, planning action, taking action,* and *evaluating action*. However, it is flexible and not prescriptive. It is driven by the combined action of the facilitator(s), the straightforward stages of the process which form a series of steps to follow, and the analysis undertaken during each of the cycles which helps to drive the activity in the subsequent cycles. With the support of the proposed practical guidelines and the qualitative coding structure that could be supplied to support this research, working groups could learn how to drive and take responsibility for the process themselves, thus acquiring ownership of it without extensive or specialist research methodology expertise. They can be supported by a facilitator or centralised good practice unit as required.

By contrast, in CHAT learning is driven by the expert guiding hands and facilitation of the research team who intervene within the interactions between different aspects of the activity system, motivated towards the object. E*xpansive learning* - which is a radical transformation of the system into new forms of activity, or the *transformational learning* which takes place in CHAT - is driven when resolutions between *contradictions* between different parts of the activity system are facilitated with the support of the expert team.

In VCM/VCF and the more recent *social learning spaces* theorised by Wenger-Trayner and Wenger-Trayner (2020), the learning is driven by activities with an *aspiration* to improve practice, followed by measurement or evaluation of an outcome. Measurement or evaluation occurs in VCM/VCF Cycle 4, with critical reflection in VCM/VCF Cycle 5. Learning is evaluated in each cycle via 'learning loops'.

In ACAD, Goodyear, Carvalho and Yeoman, (2021, p.446) recently confirmed that 'ACAD has a dual focus – analysing and understanding what exists and (re) designing for the future'. It is best or most frequently used by teachers optionally supported by specialist educational designers within cycles of incremental design improvement. Teachers are understood as supporting other people's learning, in contrast to a process-based Inquiry into a complex and possibly fragmented *indeterminate situation* in which there is no known answer.

The learning mechanism in ULTIMATE does however embrace the 'actual interweaving of activity, tools and language' in an unfolding sequence of events as characterised by Goodyear (Association of Learning Technology, 2017). This has been conceptualised using a rigorous qualitative analysis approach and abstracted to a series of categories that are related together. Together they form a coherent conceptual framework that could be applied by practitioners to help drive organisational learning and problem-solving in distance learning and other contexts. In this way ULTIMATE can help to provide *actionable knowledge*, previously defined as 'collaborative and generative possibility knowledge intertwined with transformative action' (Sannino & Engeström, 2017, p. 80), and characterised as 'knowledge that is usable by practitioners and theoretically robust for scholars' by Coghlan (2019).

This subsection has summarised how the learning is conceptualised as being driven in ULTIMATE in a somewhat different manner to each one of the comparator frameworks. The ULTIMATE framework reflects the reality of *how* the learning actually took place, and how it may be driven *from within* and *in-the-flow* of distance teaching, learning and management activity using an *unfolding, prehensive process* or *learning mechanism* approach.

8. Achieving transformation using the ULTIMATE framework

In ULTIMATE, transformation is possible as emergent or unpredicted organisational learning, which becomes apparent after following through several action research cycles. Each cycle is based on and driven by the analysis and evaluation from the previous cycle, to produce an unfolding learning process of ever-increasing sophistication. Findings in this research concluded that the integration of the tutor, student and module team voices led to collaborative learning about the complex, interrelated and somewhat intractable issues that the module team and faculty management had been previously facing. This collaborative and integrative learning led to the achievement of a series of *practical improvement outcomes*. Students were provided with progressively nuanced emotional and practical support for their concerns on the collaboratively identified issue of *pace and volume of material*, via the supporting RTSF questionnaires and signposting materials. Signposting has also informed planned interventions in a Level 1 precursor module for Module S. The Tricky Topics videos were evaluated as useful by students, tutors and the module team. The format of these tutor-led videos has been shared with, and emulated in, other modules. Tutors have felt included, 'closer to the module', and embraced into the module team. All of these practical improvement outcomes have been produced as a result of a transformative and unfolding ULTIMATE learning *process* or *mechanism* which did not exist previously.

As mentioned in Chapter 2: Interdisciplinary multi-faceted research approach, in a recently published proposal of a model aimed to help organisations to transform into *learning-driven organisations*, Garad & Gold (2019) build on arguments in the management and organisation studies literature that ideas about the learning organisation and organisational learning have 'not achieved what was hoped for', and that 'their influence on business organisations has been limited' (Garad & Gold, 2019, p.338). They define learning in this context as:

> *The process of modifying organizational behaviour through the use of different processes, practices, methods and activities in drawing lessons learned from within and outside the organization for the purpose of systematically improving performance and transforming into a learning-driven organization.*
>
> Garad & Gold (2019, p.333)

They also highlight the need for practitioners to have 'guidelines for practice' instead of an extended discussion of concepts. This is because practitioners need theories, frameworks and concepts to be understandable and actionable, which would then help to create *actionable knowledge.* ULTIMATE, along with its proposed practical guidelines, represents such an understandable and actionable framework.

In VCM/VCF, transformation is conceptualised as *reframing* or *transformative value*. In the recent re-theorising of VCM/VCF to embrace *social learning spaces*, Wenger-Trayner & Wenger-Trayner (2020, p.118) comment that 'what we call *transformative value* doesn't always happen – perhaps even rarely'. They point out that not all social learning spaces have this aspiration, and that it is likely to be 'unplanned or unforeseen' and 'potentially the most controversial' (Wenger-Trayner & Wenger-Trayner, 2020, p.122) . By contrast, emergent, unpredicted organisational learning is an explicit aim in ULTIMATE – the answer was not known amongst stakeholders before the Inquiry started, and could not be solved by normal experience or habitual ways of working.

This is the transformation of the *indeterminate situation* that prompted the Inquiry in the first place.

Wenger-Trayner & Wenger-Trayner (2020, p.122) do point out very sensibly that transformative value can challenge the status quo – and could 'run into systemic inertia, hierarchical tensions, or cultural resistance'. These could be considered as *constraining factors*. However as they acknowledge that transformative value is also the route to stimulate innovation or open up new possibilities.

In the CHAT framework, transformation is achieved through *expansive learning* as previously described. Expansive learning is brought about through resolving historically accumulating structural tensions or *contradictions* within the entire activity system, or between multiple activity systems. In the discussion of Criterion 1, the *object*, it was confirmed that both activity theory and Pragmatism embrace the concept of transformative practical activity. The mechanism of expansive learning does appear to require the intervention of a specialist researcher or consultant, or team of same. In comparison ULTIMATE is a Pragmatic framework designed to be readily understood and implementable by practitioners. It is designed to empower them to take responsibility and agency for their own Inquiry processes in their own contexts. They can be supported by the practical guidelines proposed as part of this research, and by centralised good practice units such as a Learning Design unit. This will help to gradually build up confidence and capability in working through the approach.

Transformation does not appear to be explicit or apparent in ACAD, or indeed is its aim.

Transformational learning in the specific context of UK HE curriculum reform has been recently described in a UK research-intensive university (Howson and Kingsbury, 2021). This interesting account articulates the 'engagement with the [institutional] policy texts in the curriculum review process as a form of transformational learning' (Howson & Kingsbury, 2021, p.5). The authors refer to a frequently articulated requirement for integration of 'bottom up interest' from departments and individuals, with top-down strategic policy intention - especially by understanding, translating and adopting the language of curriculum reform. However as the authors acknowledge, their discourse analysis approach of policy texts and departmental documentation did yield some useful insights, but did not account for lived experience of practitioners or actions taken.

A Pragmatic approach such as ULTIMATE could be used to engage practitioners and academics directly as they grapple with the language and intention of this type of strategic policy reform. Driven by the *indeterminate situation*, practitioners could collaboratively construct the issues that arise from policy intentions, and plan, carry out and evaluate their own actions. The aim of ULTIMATE is that the collaborative agency would increase the likelihood of joint ownership of departmental review processes, and contribute towards enhanced transformation. By embracing the more fully Pragmatic ULTIMATE approach, the unfolding, emergent engagement and learning process regarding implementing policy is scaffolded and made explicit, as a Pragmatic Inquiry. Issues such as accommodating and engaging with different types of language used in policy intention and interpreting this for the local implementation context can be embraced. The social relationships, as discussed in Criterion 2, become more participatory, democratic and equitable than a top-down and bottom-up coordination.

It is also useful to consider the transformative, emergent or unpredicted organisational learning possible though ULTIMATE, as a *threshold concept.* In a discussion specifically focused on using grounded theory to discover threshold concepts in transformative learning experiences, Tucker, Bruce and Edwards (2016) provide an overview of threshold concept theory as originated by (Meyer and Land, 2003). A threshold concept can be considered as a learning portal that 'represents a transformed way of understanding, or interpreting, or viewing something and opens up previously inaccessible ways of thinking' (Meyer and Land, 2003, p.1). Tucker, Bruce and Edwards (2016, p.25) recount five main characteristics of threshold concepts, as follows:

- ***transformative:*** *causing a shift in perception and identity*
- ***troublesome:*** *initially difficult, counter-intuitive or uncomfortable*
- ***irreversible:*** *unlikely to be forgotten or unlearned*
- ***integrative:*** *exposing something previously hidden or where the connectedness was not understood*
- ***bounded:*** *may help to define boundaries or borders with new conceptual areas.*

These five characteristics are effective in summarising some characteristics of the transformative learning that can be achieved in an ULTIMATE learning network. Normally applied to threshold concepts in academic learning, they can also be applied to organisational learning for improvement. Crossing a *liminal space* of academic or conceptual learning requires an ontological and epistemic shift, to reconstitute or reconfigure existing conceptual knowledge schemes and ways of doing things (Tucker, Bruce and Edwards, 2016, p26). It can be argued that this is also required in a similar way for transformative organisational learning. There is no known answer or solution for the *indeterminate situation*, and the unfolding ULTIMATE process is emergent and cannot be foreseen.

This means that it is not possible to predict or hypothesise about the outcome. It may be that nothing can be achieved. A risk must be taken, both by the facilitator and the participants, in traversing across the *liminal space*. The approach underpinning ULTIMATE can represent such an ontological and epistemic shift, for both practitioners and academics. It could be argued that a majority of researching academics are enculturated in more 'conventional' positivist or interpretivist approaches. They may not be predisposed or comfortable with *prehensive,* action-oriented approaches, nor have an efficacious and reasonably comprehensive understanding of Pragmatism and its implications for practice, or for integrating theory and action. This represents another *constraining* factor.

This can make any resultant shift in perceptions regarding an ULTIMATE process both **transformative** and **troublesome***,* from the list of threshold concept characteristics above, and this troublesome transformation could apply to both academic and practitioner communities.

However, once a practitioner working group have traversed the unfolding organisational learning path, their lived experiences and collaboration in the ULTIMATE process, plus any mutually recognised practical improvement outcomes that are achieved, mean that the process is unlikely to be forgotten or unlearned, ie is **irreversible**.

A key feature of the learning network for Module S was the **integration** of viewpoints from the disparate and geographically separated participants, including tutors, staff tutors, module team and students. This facilitated the synthesis of ideas for planning action, in the search for possible solutions. This **integrative** feature of the *content* in the project was then translated into the *process* conceptualisation of the ULTIMATE framework. Findings explained the second key adaption of Spradley's (1979) semantic relationships, to specify an 'integrates into' relationship for the participant experiences categories, during theoretical coding.

Integrative thinking has also been identified in the 'integrative pedagogy' (IP) model proposed by Tynjälä, Häkkinen and Hämäläinen (2014, p.993). This model conceptualises the development of professional expertise of an individual as an integration of their conceptual/theoretical, practical/experiential, self-regulative and sociocultural knowledge. I have applied it to my own development of professional expertise, and it is therefore illustrated that forthcoming section, in Figure 44.

Although developed as a model for individual or *first-person* expertise development, the principles in the IP model could also be extended to embrace integrative thinking at *second-person* or *third-person* action research levels. Integrative thinking makes the connection between conceptual and practical knowledge, reflective or self-regulative knowledge, and sociocultural knowledge - or the 'way we do things around here'. These useful guiding principles underscore the pivotal nature of integrative thinking in problem-solving, and in the integration of theory and practice.

As previously highlighted, it has also been argued that *abductive* reasoning provides for the creative leap from practitioners that is vital in the identification and implementation of successful interventions, as characterised by Shani, Coghlan and Alexander (2020). Thus the importance of both integrative and abductive thinking in the ULTIMATE framework has been validated. The **integrative** characteristic was listed as the fourth key characteristic of threshold concepts in the list above - exposing something previously hidden or where the connectedness was not understood. Transformative ULTIMATE learning can thus be considered as a threshold concept embracing both integrative and abductive thinking.

The final characteristic of a threshold concept in the list above is **bounded**. This is the characteristic that may or may not be present (Tucker, Bruce and Edwards, 2016, p26) and may help to define boundaries or borders with new conceptual areas. The interdisciplinary nature of this research, summarised in Figure 2 and expressed throughout, indicates the integration of knowledge and concepts at the intersection of networked learning, organisational learning and development, and process and practice studies. It also integrates the action research and theory building methodologies. This **bounded** characteristic is indeed present in ULTIMATE learning considered as a threshold concept, as the bounded nature illustrates the intersection of the disciplines and methodologies within the overall Pragmatic approach and shown in Figure 2.

This subsection has considered how *transformative* learning can be evidenced in ULTIMATE as emergent or unpredicted organisational learning, between a working group of disparate and potentially geographically separated practitioners, in the context of an *indeterminate* distance learning design and delivery situation. Such transformative learning becomes apparent after following through several action research cycles.

Achieving transformative learning can be considered as a *threshold concept,* embracing both integrative and abductive thinking. The enabling ULTIMATE framework and associated proposed practical guidelines, plus facilitation support as required, can assist working groups in crossing the constraining factor of the *liminal space.*

9. **How the learning is facilitated**

In the ULTIMATE framework, the working assumption was that the framework and process would need to be understandable and applicable by practitioners with little or no specialist research methodology expertise. The conceptualisation of the categories and their associated open codes provides a flexible coding framework for practitioner researchers to apply to their own contexts. The flexibility inherent in the abstraction means that the collaborative organisational learning process is *designed for* (Wenger, 1998), not designed or prescriptive. The proposed practical guidelines will provide implementation tips and guidance for facilitating a learning network with little or no specialist research expertise. Support can be provided, and the learning network facilitated initially by a skilled and dedicated researcher, as required in each situation.

In VCM/VCF, the assumption is of learning as a Community of Practice or network, with the general aspiration to improve practice. There is no specific indication of a facilitator, although the role of *systems convener* has been conceptualised and described by Wenger-Trayner et al. (2015), as previously described. In CHAT, the intervention project is facilitated by a skilled intervention researcher or research team, frequently using face-to-face workshops or 'Change Laboratories', as per the Sannino and Engeström (2017) example. In ACAD, the assumption appears to be facilitation by a knowledgeable teacher who can suggest a list of tasks, or as a dedicated learning network project to achieve a particular goal.

Thus all of the frameworks have a different approach to facilitation and different requirements of a facilitator. ULTIMATE is designed to support the capacity development requirements of practitioner working groups who wish to carry out their own problem-identification and problem-solving processes within *indeterminate* or challenging situations in which they have a role.

10. **How ULTIMATE embraces temporality**

    In ULTIMATE, temporality is embraced by a forward-looking and unfolding series of activities within a *prehensive process* or *mechanism* which may take significant time to yield outcomes. The combination of successive action research cycles of *constructing issues, planning action, taking action* and *evaluating action* and underpinning qualitative analysis provides structure to the unfolding path towards achieving *practical improvement outcomes*, which may take several years. In this research context, each action research cycle was carried out over a presentation or delivery of the module, over two successive years. The second cycle was based on the analysis and evaluation from the first, which drove further action. Further supporting evaluation data from students was yielded in the third year.

    In VCM/VCF, temporality is accounted for by an unfolding series of interconnected practice events, connected by participant narratives, to build up 'value creation stories'. In CHAT, temporality is more represented by recurrent and evolving 'activity time' than 'action time', the latter being associated with specific finite actions (Montoro, 2012). Historicity means that activity systems take shape and get transformed over lengthy periods of time, in contrast to the finite time-boundedness of goal-directed actions. In ACAD, co-configured activity emerges over time, which is *designed for* and not designed. However there is little further elaboration on temporality in ACAD.

Thus all of the ten criteria discussed in the ten preceding subsections, and summarised in Table **7**, contribute towards building up a picture of the unique contribution of the ULTIMATE conceptual framework. By systematically comparing the existing conceptual frameworks in the literature before ULTIMATE was conceptualised, and then using the GTM technique of *theoretical integration* and the ten criteria to compare, revisit and reflect again afterwards, the particular contribution of the new framework has been articulated and verified.

7.3 The unique practice contribution of the ULTIMATE framework

This section relates to the practice contribution of the first claim, and to answer RQ1:

RQ1: *What practical improvement outcomes can be achieved from the collaborative technology-enabled learning networks under investigation?*

This is a claim for a contribution to practice. By following the collaborative and equitable action-based organisational learning process which has been conceptualised by ULTIMATE, a variety of practical improvement outcomes were achieved for the successful learning network. These included targeted student interventions and increasingly nuanced emotional support for students who were challenged by pace and volume of material, clarification of challenging design and delivery issues, tutor empowerment and development, provision of data for institutional quality enhancement procedures, and development of the module as a whole.

As highlighted in 7.1 Introduction to the Discussion, *validation* is an assessment of whether the knowledge contribution filled the specified research gap in knowledge, and whether the practice contribution represents an amelioration of the practical problem, that is whether the research fulfilled its requirements *in use* (Isaksson *et al.*, 2020).

The contribution to practice and achievement of practical improvement outcomes by following through an ULTIMATE process means that the research fulfilled its requirements *in use*, and has been validated in the particular context in which it was carried out.

7.4 The unique knowledge and theory contribution of the ULTIMATE framework

Having verified the knowledge and theory contribution of ULTIMATE in the *theoretical integration* in Section 7.2, the claims for Research Question 2 can be validated.

RQ2: *How can the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment?*

The Findings culminating in Section 6.10 and 6.11, and in the diagram in Figure 39, indicated that the ULTIMATE framework has been conceptualised as an unfolding, emergent and collaborative action research process, the mechanism for which is not evident in the other comparator frameworks. In carrying out *iterative conceptualisation* according to the systematic procedures within GTM, a new framework has been rigorously derived. ULTIMATE succeeds in uniquely conceptualising a type of collaborative and equitable Pragmatic Inquiry as Dewey saw it: 'as a process that starts with a sense that something is wrong and that the normal course of activity cannot proceed uninterrupted' (Elkjaer and Simpson, 2011, p.66). ULTIMATE starts with an *indeterminate situation* and offers a path for disparate practitioners to follow, to collaboratively construct issues in problematic or challenging situations, with a 'felt need for change'.

In Section 3.3 in the Literature Review, Boyd (2019, p.5) concluded that:

> *despite the affordances of collaborative learning technology and the emerging research area of networked learning, there is little conceptualisation of possible organisational learning mechanisms using learning networks, especially in a way which may be transferable to other contexts in an actionable manner.*

ULTIMATE provides such a conceptualisation.

ULTIMATE has utilised a combination of insider action research, previously identified as one way to develop new organisational learning capabilities (Coghlan and Shani, 2008), and Grounded Theory Method. This combination has both simultaneously enacted and conceptualised a mechanism by which disparate and potentially geographically separated practitioners who may not necessarily know each other or have a routine working relationship, can collaborate in a problem-identification and problem-solving *process* which they mutually own and feel a part of. In the given distance learning research context, this mechanism can help remote module tutors to utilise and contribute insights from their often extensive subject teaching and learning expertise, and their historical experience of teaching at the OU. It can empower remote tutors to become a 'part of the solution' in challenging learning design and delivery situations.

It is important to emphasise once more that the structured but flexible collaborative *process* can be followed by practitioners, in contrast to periodic fragmented discussions within different module teams which may be insufficiently integrated or connected together over time.

The ULTIMATE approach can therefore unite together disparate and geographically separated practitioners, students and stakeholders within a type of problem-identification and problem-solving organisational learning process, using the standard affordances of collaborative learning technology. The research has taken an alternative Pragmatic view to more traditional interpretivist or constructivist qualitative approaches and was designed around *taking action* and changing practice in a *strong-process, performative* and *prehensive* (Langley and Tsoukas, 2016) manner. This meant it took place *from within* and *in-the-flow* of teaching and management activity in a Level 2 HE distance learning module. In the contemporary community of the management and organisation discipline, this type of *prehensive* research approach is very unusual (Langley and Tsoukas, 2016).

In the education and networked learning disciplines, action research is an established approach associated with reflexive practice improvement which can be characterised as *from within* and *in-the-flow*, but the adoption of a more comprehensive Pragmatist approach is much less influential. Indeed, a pragmatic approach (with a small P) is often used to underpin the mixed-methods research (MMR) that is frequently undertaken in the networked learning discipline. This pragmatic approach restricts itself to a perhaps convenient belief that pragmatism 'opens the doors to multiple methods, different worldviews, and different assumptions' (Creswell and Cresswell, 2018, p.11), to support a type of "pick and mix" approach, without appearing to engage with the fundamental transformational and processual aspects of Pragmatism.

The unique knowledge and theory contribution of the ULTIMATE framework can therefore be articulated via five different perspectives highlighted in the claims for RQ2. It is important to re-emphasise that the claims are made for a single Pragmatic Inquiry of 7 tutors and one distance learning module team in the UK Open University. The assertions are therefore warranted in this particular context, but do not claim generalisability or *theoretical saturation*. The route towards generalisability, further *verification,* and rigorous and systematic extension of the ULTIMATE framework beyond the original bounded context can however be clearly set out. It is discussed in Chapter 8: Conclusions, limitations and future research.

The claims are thus:

- ULTIMATE has uniquely conceptualised a *prehensive* structured, flexible and recoverable technology-enabled action research *process* for a working group of disparate and geographically separated practitioners.

- ULTIMATE provides a Pragmatic alternative to existing conceptual frameworks, and is characterised by a type of unfolding and emergent *process* or mechanism.

- ULTIMATE provides a cognitive model which is understandable and clear for practitioners. ULTIMATE facilitates equitable and democratic practitioner collaboration in the action research process, which practitioners can lead themselves with appropriate practical guidance and support.

- ULTIMATE helps to provide integrated *actionable knowledge* that is usable by practitioners and theoretically robust for scholars, whilst also being intertwined with transformative action (Sannino and Engeström, 2017; Coghlan, 2019). It thus supports practitioners to reflect on and help provide solutions to complex problems and supports *transformative learning.* It provides a rigorous example of *Close-to-Practice* (CtP) research as defined by the British Educational Research Association (BERA, 2017).

- ULTIMATE provides a theoretical contribution at the intersection of networked learning, organisational learning and development, and process and practice studies.

In considering these claims for the answer to RQ2, it can be asserted that the knowledge contribution of ULTIMATE has filled the specified research gap of insufficient conceptual and practical understanding about the mechanisms by which technology-enabled organisational learning might happen, and how learning networks might be best used to achieve practical improvement outcomes amongst disparate and geographically separated practitioners. The claims have thus been validated *in use* in the particular context in which the research took place.

7.5 Enabling and constraining factors

The following two sections relate to the contribution to knowledge and practice claims to answer RQ3, which deals with enabling and constraining factors:

RQ3: *What factors enable or constrain the achievement of practical improvement outcomes using technology-enabled learning networks?*

In order to discuss enabling and constraining factors, this Discussion now returns to the concept of *organisational learning mechanisms* (OLMs) and organisational *capabilities.* These notions were introduced in the Literature Review in The role of mechanisms, and further highlighted in the description of insider action research in the Methodology in 4.3 Insider action research.

To remind the reader, a *cognitive OLM* represents the individual learning or *first-person* action research practice of individual role-players as they participate, engage with and contribute to a collaborative action research process*. Cognitive OLM*s provide the conceptual and linguistic means for individuals to learn in an organisational context. A *structural OLM* refers to organisational infrastructure – in this context, the discussion forums, tools and data of the learning network itself within a particular module or *second-person* action research working group, utilising a learning technology infrastructure. A *procedural OLM* refers to the process stages or steps, which have been agreed to promote and support *third-person* learning beyond the original working group.

As identified in the claims for RQ2 in the previous section, ULTIMATE has conceptualised a type of collaborative action research process. At this stage, the process has been successfully followed only in Module S, as an exploration of the learning network approach. If this process were to be transferred amongst more OU modules, taken up across the institution, or adopted in other contexts, it could start to become a more fully-fledged *procedural OLM*.

Section 3.3 on The role of mechanisms in the Literature Review indicated that effective and successful action research embraces and integrates each of the *first-person, second-person* and *third-person* practices, and that these can be related to *cognitive, structural* and *procedural* organisational learning mechanisms respectively. If this integration happens successfully and systematically, it can contribute to the development of new or enhanced organisational *capabilities*, which enable an organisation or working group to learn, problem-solve and achieve its desired outcomes (Coghlan and Shani, 2008; Coghlan, 2019).

Figure 41 illustrates diagrammatically the integration of organisational learning mechanisms in the Module S learning network within this distance learning HE context. The enabling factor in answer to RQ3 is that the standard affordances of the learning technology infrastructure should be integrated with a structured but flexible collaborative problem-solving *process*. This must be further integrated with appropriate and collaborative participation of stakeholders, based on their problem-solving role or interest. Using the different coloured shapes to represent different roles of participants, their progressive contribution to the different stages in each action research cycle can be illustrated. For example, Figure 41 shows that in Phase 2 students, as indicated by the orange ellipses, were involved as an emergent development in *evaluating action* in the first cycle and in *constructing issues* and onwards in the second cycle. Thus to strengthen the unfolding process additional role players can be identified and invited to contribute, based on their problem solving role or interest.

The *second-person structural OLM* is illustrated by the blue DNA strand in Figure 41, indicating the learning network infrastructure.

The *third-person procedural OLM* is illustrated by the red DNA strand. ULTIMATE has conceptualised the red strand.

The diagram develops the DNA double helix analogy illustrated in Figure 15. It illustrates the necessary continuous connection and integration between the different aspects of an effective technology-enabled learning network. The aspects are mutually dependent.

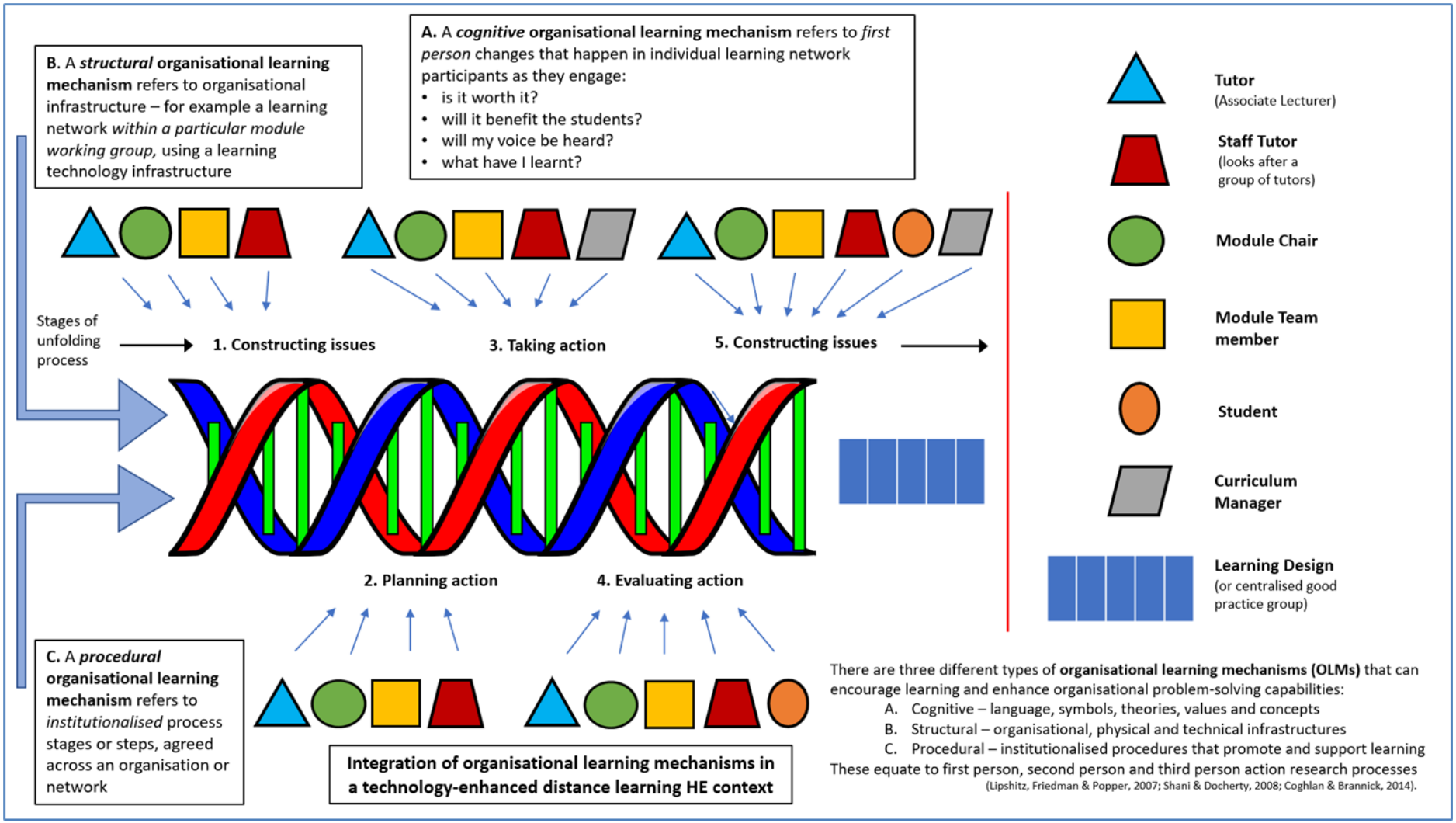

Figure 41. Integration of cognitive, structural and procedural OLMs in a distance learning design and delivery context

Thus, the three action research practices and three OLMs should be integrated together to form a coherent intervention strategy which has *impact* not only for its original working group but as a disseminated package that would be understandable and applicable in other modules, in other HE contexts, and indeed further afield. Carefully constituted and integrated OLMs can be deployed to support institutional quality enhancement or continuous improvement procedures (Oliver, 2009). Indeed, one of the outcomes from this research is the inclusion of student and tutor feedback as a key backbone of the evidence for future interventions and adjustments in the module Mid Life Review; which is an institutional quality enhancement procedure.

By conceptualising the process, ULTIMATE has facilitated the initial practical integration of the three organisational learning mechanisms, to enhance technology-enabled organisational or institutional learning *capabilities* and ability to problem-solve and improve.

The notion of integrating the three organisational learning mechanisms, to enhance organisational learning *capabilities* within an unfolding collaborative action research process, is an important concept to communicate, within the research findings. I have presented it using Figure 41 in various dissemination presentations (see Appendix M), to fellow researchers, practitioners and possible future stakeholders. I have also developed my diagram in Figure 41, with another creative educational analogy of a chemistry beaker. This is illustrated in Figure 42.

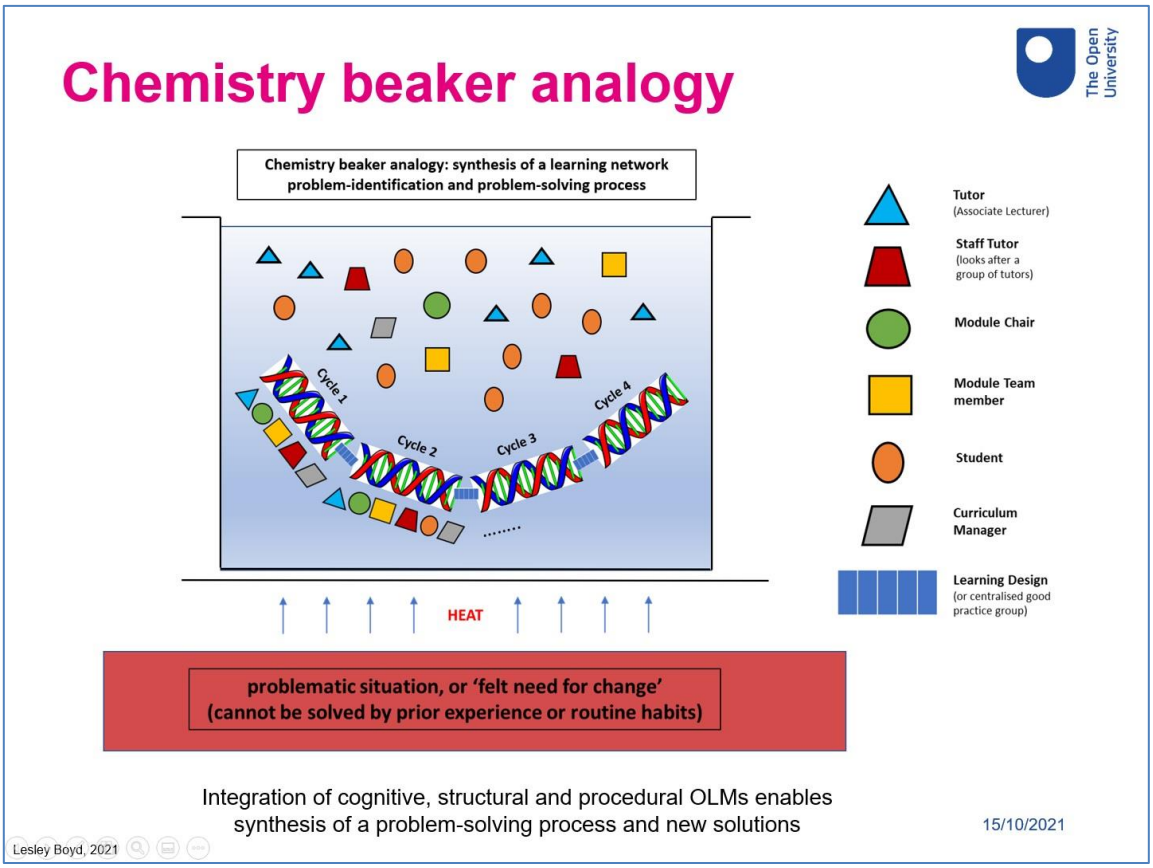

Figure 42. Chemistry beaker analogy

Having explained the necessary integration of the OLMs, the chemistry analogy shows how the disparate participants are initially floating separately in a suspension. The heat energy under the beaker is provided by the problematic or *indeterminate situation*, or 'felt need for change'. Participants can then 'bind' to a problem-solving process that is being gradually synthesised as the action research cycles unfold, to contribute towards achieving solutions or improvements.

There are also a series of constraining factors or obstacles that may prevent this integration, and the achievement of practical improvement outcomes using technology-enabled learning networks. The two less successful learning networks in Phase 1 were characterised by lower rates of participation and a less comprehensive degree of buy-in from the respective module teams. In contrast Module S had a high degree of module team and tutor buy-in combined with a sufficient 'felt need for change' – an *indeterminate situation* that was troubling them and presenting as challenges for both the students and the tutors who were trying to support them. The presenting challenges were somewhat intractable and couldn't be resolved by normal or *habitual* routines of ways of working. Thus the first important constraining factor in the achievement of practical improvement outcomes using learning networks is a lack of perceived motivation towards a troublesome *object*. This can manifest as lack of a 'felt need' to try something different, or to try a collaborative process that is both emergent and experimental.

As illustrated by Module S, the module team need to be facing a challenging situation and simultaneously prepared to try something new to address it. If these motivations are absent, the module team will not be willing to 'make the effort' to learn, in the questioning terminology identified by Engeström (2001) that was highlighted in the Literature Review.

Having started out on the journey, the module team need to stay focussed on the unfolding process, interpreting it as a structured but flexible problem-solving mechanism which may take some time to achieve results. Depending on their prior experience, they may require the practical support of a facilitator to provide the authority and experience to build their problem-solving capacity and ULTIMATE learning capabilities. If focus on the process is absent, it is likely to represent a second important *constraining factor*. The unfolding process integrates problem-identification and problem-solving activities which may otherwise be fragmented, both in time and amongst role players.

The third important constraining factor is the crossing of the *liminal space*, if technology-enabled organisational learning is treated as a *threshold concept.* As described in the *theoretical integration* in 7.2 Verification: systematic comparison of ULTIMATE back to the other frameworks, a threshold concept can be considered as a learning portal that 'represents a transformed way of understanding, or interpreting, or viewing something and opens up previously inaccessible ways of thinking' (Meyer and Land, 2003, p.1). Achieving *transformative learning,* by which assumptions about habitual ways of thinking and doing are critically reflected upon and possibly changed, can be helpfully considered as a threshold concept, embracing both integrative and abductive thinking. The enabling ULTIMATE framework and associated practical guidelines, plus facilitation support as required, can thus assist working groups in crossing the constraining factor of the *liminal space*.

The fourth constraining factor is driven from my own reflection of the entire project and concerns the familiar online *habitus* of participants, amongst the plethora of online *spaces* that proliferate across organisations and educational institutions. In this research context at the OU, module tutors are accustomed to discussing issues in the *habitus* of their own dedicated forum for each module, generally called the 'AL forum'. In order to participate in a collaborative process which can embrace a variety of disparate practitioners and stakeholders across the organisation, the dedicated online site of the learning network is required. This is not a familiar habitat, and requires participants to save the dedicated URL of the site, and be willing to return to it for the duration of the ongoing process. In their exploration of *epistemic fluency,* Markauskaite and Goodyear (2017, p.11) confirm that 'inter-professional problem-solving depends upon an ability to construct, and function within, shared epistemic spaces'.

This aspect did prove challenging for Module S as tutors are most understandably used to discussing ongoing issues in their dedicated tutor forums. The constraining factor is effectively summarised by Alvesson and Sandberg (2014) in their discussion of 'boxed-in' versus 'box-breaking' research that was introduced in 7.1 Introduction to the Discussion:

> *The habitat is the 'natural' terrain in which one moves, and the habitus is the set of cultural dispositions that has been acquired for being able to navigate competently within the habitat (and less smoothly in other habitats).*
>
> (Alvesson and Sandberg, 2014, p.971)

Thus despite complete familiarity of participants with the learning technology interface of a VLE, a certain cultural shift and maintained focus is required to interact comfortably and sustainably within a dedicated learning network site for the duration of the entire process.

The fifth and final constraining factor is organisational politics. As identified in the description of project risks in 4.7.12 Managing project risks, interacting with organisational politics is a particular challenge for insider action research. The learning mechanism of collaborative Inquiry has to be politically accepted as a legitimate way of developing new organisational learning capabilities. For the specific context of this research project, to be sustainable the ULTIMATE framework needs to be accepted in the UK OU by practitioners and academics alike, as the basis for a legitimate new framework that could be rigorously but flexibly transferred to other modules. Only if it is politically accepted as a Pragmatic alternative to conducting research, can it assist in producing *actionable knowledge* to drive improvements within and across modules. It can then contribute towards organisational learning and the sustainable achievement of practical improvement outcomes and quality enhancements that improve the student learning experience.

This section has therefore discussed enabling and constraining factors from four different perspectives. These are:

- The enabling factors are that a successful technology-enabled learning network will consist of a learning technology infrastructure (*structural OLM*) integrated with a collaborative action research process (*procedural OLM*), and with engaged individual participation based on problem-solving role or interest (*cognitive OLM*).
- By using the rigorous procedures of GTM to conceptualise the action research process, ULTIMATE has provided a means for this practical integration of cognitive, structural and procedural *organisational learning mechanisms* that is a necessary enabling factor for successful organisational learning and the production of *actionable knowledge.*
- Integrated together, the mechanisms can provide a means for a profound shift in the way that disparate and geographically separated practitioners and stakeholders can share their experiences and mutually transform. They can cross the chasm between 'expert' knowledge and collaborative participation in identifying and addressing complex practical challenges in which they play a part (Bradbury et al., 2019).
- Constraining factors are:
    - lack of 'felt need for change'
    - lack of sustained focus on the unfolding problem-solving process
    - inability to cross the *liminal space*
    - reluctance to depart from the familiar online *habitus* of participants
    - lack of political acceptance of the learning mechanism of collaborative Inquiry as a legitimate way of developing new organisational learning capabilities and to produce *actionable knowledge.*

The Discussion will now proceed to the methodological contributions.

7.6 Methodological contribution

In the Literature Review, attention was drawn to the call by Sannino and Engeström (2017, p.80), who refer to the current demand for *actionable knowledge* in organisational research. Understood as 'collaborative and generative possibility knowledge intertwined with transformative action', they describe 'looking in vain' for recent discussions of 'theoretically and methodologically ambitious approaches' in major journals. This research has made an original contribution to this call.

There were seven main reasons for the methodological combination of action research and GTM, described in Section 4.5. Each of these reasons has resulted in a specific contribution of this research. Each reason will be repeated in the following section, with a brief summary of each contribution.

1. **provides a rigorous and systematic approach to qualitative data analysis and theory building, to underpin the action research cycles**. This has been achieved, resulting in a rigorous theory-building and action-oriented approach, and culminating in the conceptualisation of ULTIMATE. The emphasis in analysis was on *conceptualisation* rather than *description* (Corbin and Strauss, 2015). The ongoing analysis has also underpinned the action research cycles, to provide rigorous and organised evidence for the next stage of each cycle. The combination of qualitative analysis and coding of myself as researcher, and the integration of contributions and insights from each of the learning network participants, led to the collaborative construction of issues, and from there to the collaborative planning, taking and evaluating of action.

2. **particularly suited to conceptualising unfolding *process.*** The historical development of GTM from its inception has focussed on its ability to conceptualise unfolding events in a *basic social process*, which emerges between individual people interacting together and in response to certain events or conditions. The ULTIMATE

framework has been produced in which the dynamics of a technology-enabled organisational learning process to actively *seek* practical improvement outcomes has been articulated, as an *enacting* framework, as characterised by Sandberg and Alvesson, (2020). This type of framework could be contrasted to other types of theoretical or conceptual framework proposed by Sandberg and Alvesson (2020). Other types identified are those primarily aimed towards *explaining* phenomena, *comprehending* the detailed meaning of phenomena, *ordering* or categorising phenomena, or *provoking*, challenging or reconstructing phenomena.

3. **to produce a theory that resonates with practitioners**. The products of the GTM analysis, including open codes, categories, relationships between categories and the core category, have been represented in a manner which is understandable by practitioners or non-specialists. Integrative diagrams have been used to visually communicate the mechanisms of an effective unfolding process, and how the components of a technology enabled learning network might relate together. These integrative diagrams have been converted to interactive spreadsheets, whereby evidence for each open code and category was organised and represented using the already familiar interface of an Excel spreadsheet. The use of this interactive device helped to communicate the rigour of the analysis process and to underpin the collaborative learning process between separate stakeholders and project team members. Successive integrative diagrams helped to capture and organise the complexity of the evidence over time. Finally, in *theoretical coding,* the last stage of *iterative conceptualisation,* a similar and consistent representation was used to illustrate the ULTIMATE framework. The framework has been integrated with the action research cycle as illustrated in Figure 39. Similar types of four-stage improvement or action research cycles are already familiar and therefore understandable to most practitioners.

Examples from the Module S project have been included to illuminate the framework and communicate its grounded nature, not only in the data and evidence produced, but also directly in the practice of driving module improvements. Therefore, the framework does not appear too abstract, too 'academic', detached from practice, or difficult as a framework for practitioners to relate to. It could be applicable by them whilst also being sufficiently theoretically robust for scholars, hence producing the *actionable knowledge* called for by Sannino and Engeström (2017) and characterised as an outcome of insider action research by Coghlan (2019).

4. **provides a theory-making approach for an area which is under-conceptualised in the literature and is characterised by interdisciplinarity.** Using technology-enabled learning networks to achieve practical improvement outcomes, and to conceptualise the mechanisms by which an unfolding process of organisational learning might happen, is an interdisciplinary endeavour. As previously observed the process of concept formation is still in an immature state in the field of learning networks and networked learning generally (Sloep, 2016). Indeed, a recent commentary paper has called for a reconsideration and redefinition of the concept of networked learning itself (Networked Learning Editorial Collective (NLEC), 2021). The proposed re-definition for discussion introduces the concept of *knowledgeable action,* as illustrated in Box M:

> ***Networked learning involves processes of collaborative, co-operative and collective inquiry, knowledge-creation and knowledgeable action, underpinned by trusting relationships, motivated by a sense of shared challenge and enabled by convivial technologies. Networked learning promotes connections: between people, between sites of learning and action, between ideas, resources and solutions, across time, space and media.***

Box M. Redefinition of networked learning proposed for discussion (Networked Learning Editorial Collective (NLEC), 2021, p.320)

Whilst accentuating processes of collaborative inquiry, the concept of *knowledgeable action* additionally moves the definition away from its previously restrictive indication of networked learning as something done in formal educational circles:

> *Word choices within the* [customary] *definition also suggest that networked learning is restricted to formal education—in which people have defined roles (as learners and tutors) and in which learning is intentional (rather than incidental). This omission and circumscription are serious deficiencies.*
>
> Networked Learning Editorial Collective (NLEC) (2021, p.316)

However, there is currently no evidence in the proposed redefinition of networked learning that embraces any ideas of organisational learning as distinct from *incidental*, *informal* or *non-formal* learning, which are forms of learning usually carried out by individuals, albeit collectively or collaboratively. In organisational learning, there is no teacher or exemplar to explain or model a previously known answer or behaviour.

This research is thus contributing a theory-making approach in an area which is under-conceptualised in the literature and is characterised by interdisciplinarity.

It is worth noting at this juncture the comparison between the terms *knowledgeable action* put forward in the definition in Box M, and *actionable knowledge.* In their extended exploration of the concept of *epistemic fluency* or multiple ways of knowing, Markauskaite and Goodyear (2017) distinguish that:

> *'Knowledgeable action and actionable knowledge blur the boundaries between declarative and procedural knowledge, between understanding and doing and between knowledge as possessed and knowing in practice'.*
>
> Markauskaite and Goodyear (2017, p.85)

In this thesis, the repeatedly referenced definitions of *actionable knowledge* as 'intertwined with transformative action' provided by Sannino and Engeström (2017, p.80) and 'knowledge that is usable by practitioners and theoretically robust for scholars' (Coghlan, 2019) are preferred.

5. **provides an approach for achieving *impact* as an intrinsic part of the research endeavour as opposed to impact as a *far-off aspiration.*** Action research has been justified as a collaborative methodological choice whose purpose is to 'understand and improve' (Bradbury, 2015), and to engage in a project which actively *seeks* achievement of a practical improvement outcome, in order to research about the mechanisms required to achieve it. The research has been situated directly within a practice area and is contributing direct improvement impact to that area, via the achievement of practical improvement outcomes, as defined in Box A in 1.2 Overall aims and research themes. Findings have illustrated that these outcomes and this impact has been achieved in several different ways, specifically for Module S as the module that progressed to Phase 2. These different ways were summarised in Table 33.

6. **promotes collaborative team working and joint ownership of the research process.** Collaborative and equitable team working was a fundamental part of this research project, following the action research approach of researching *with*, as opposed to researching *on* or researching *for* and as described in Table 5. This extended to continuous collaborative work between myself as researcher and the module chair (also as joint scholarship project leaders); with the Senior Manager for Learning and Teaching as project team member; between ourselves and the participating tutors; and with the participating students in the online follow up session.

The research therefore made a departure from 'traditional' or 'conventional' social science research where the researcher is deemed to be the specialist, and the research design and implementation 'belongs' to the researcher. Participants are subjects of the research as opposed to problem co-definers and a part of the solution. Evaluation of the entire process indicated that the tutors did recognise its collaborative nature and felt a part of the team. Additionally, they went on to suggest further improvement actions.

7. **aims to make an innovative contribution and to provide a framework which could be applicable and transferable to other contexts.** This research project illustrates one innovative approach to the integration of theory and practice. By combining insider action research with GTM to conceptualise the mechanisms of an emergent technology-enabled organisational learning process *as it unfolds*, an innovative contribution has been made. The emphasis on *conceptualisation* over *description* has resulted in the production of an understandable theoretical framework which could be applied in other modules in the OU, in other Higher Education contexts, or further afield. The framework conceptualises a collaborative process which whilst not prescriptive, could be implemented with discretion by practitioners or non-specialist researchers in their local conditions, to achieve their own practical improvement outcomes or impact.

   The research provides a framework for connecting disparate and geographically scattered practitioners across the different boundaries of a highly complex distance learning higher education institution. It could therefore be potentially applied to other similar fragmented or distributed organisational, inter-organisational or multi-agency contexts where disparate practitioners, possibly from different organisations, are geographically scattered.

7.7 **Summary of Discussion**

This Discussion has asserted the contribution to knowledge, contribution to practice, and methodological contributions claims of this thesis. The thesis will now proceed to Conclusions, limitations of the current research and possibilities for further verification and validation of the UTLIMATE framework, in associated problem-identification and problem-solving practices.

Chapter 8: Conclusions, limitations and future research

In a world characterised by deep uncertainty, challenges to humanity and increasingly ubiquitous technological interconnection, there is an opportunity to use networked learning technology that is typically used for academic learning or professional development, to afford geographically scattered and disparate practitioners and stakeholders the ability to grapple together with a problem area requiring improvement. Technology-enabled *learning networks,* as defined in this research, can be used to provide the infrastructure for the unfolding process of a particular type of collaborative organisational learning that can lead to the mutual and equitable identification and resolution of challenges. The expertise and experience of participants in such a network can be integrated together to underpin a learning process that is at once individual, or *first-person*, and collaborative or *second-person*, for the working group. Individual and collaborative experience of the process can be used to disseminate and share with those not originally involved - a *third-person* audience – so that they may learn from it and use it to support their own learning processes.

This Conclusion will now move to a discussion of extending and verifying the ULTIMATE framework, the limitations of the current research and suggestions of ways for moving forward, followed finally by my personal reflections on the entire research journey.

8.1 Extending and verifying the ULTIMATE framework

The research was focussed on facilitating and conceptualising a process-based framework in which the learning was driven by a structured but flexible problem-solving process or learning mechanism. The purpose of such a process was to resolve a problem or address a challenge in which improvement was sought, in a complex distance learning design and delivery scenario in which the relevant expertise and individuals of disparate role-players was spread across geographical and functional boundaries.

In the Discussion chapter, the claims against each research question were put forward. RQ2 concerned the conceptualisation of the unfolding process or learning mechanism:

RQ2: *How can the mechanisms of technology-enabled organisational learning to achieve practical improvement outcomes best be conceptualised in the practice environment?*

The claims for RQ2 were set out as a contribution to knowledge and theory. ULTIMATE has conceptualised a structured, flexible and transferable technology-enabled action research process for a working group of disparate and geographically separated practitioners. It is self-evident that this conceptualisation has taken place within the confines of one particular distance learning module at a dedicated distance learning institution in the UK. This is the key limitation of the current research work which has been completed within the confines of a PhD project. Although two further learning networks were originally planned in the internally funded Phase 2 scholarship project, the complexity and richness of the first learning network culminated in the joint decision that this would be more than sufficient both in operational terms for the Open University, and in research terms for the PhD.

As described in the Methodology and illustrated in Figure 14, the iterative procedures of Grounded Theory Method provide systematic and rigorous methods for extending and verifying a proposed conceptual framework to further contexts. These procedures primarily consist of *theoretical sampling*, to guide where to sample from next, which is on analytical grounds, and *constant comparison*. The overall *iterative conceptualisation* process of GTM means that the theory can be systematically extended beyond its original bounded context or scope to other Higher Education and/or wider contexts (Urquhart, 2019). The issue of extending the scope of a grounded theory was discussed in 3.1.3 What is theory?.

The GTM *theoretical sampling* and *constant comparison* procedures are designed to continue to verify the categories and relationships, to ascertain if any further open codes, or properties of categories, become apparent. In this way the ULTIMATE conceptual framework could become increasingly verified, by sampling like and unlike groups, and searching for saturated and unsaturated codes and categories (Urquhart, 2019). This approach provides the route towards generalisability identified in the Isaksson *et al.* (2020) diagrams which have been used to illustrate the roadmap of the research journey throughout this thesis, such as in Figure 40.

The GTM procedures provide the systematic means to progress from a substantive theory in a particular bounded context (in this case a particular module at the OU), to a substantive area, and then to multiple contexts in which the categories are becoming more formalised (Urquhart, 2019). This provides a clear procedure for verifying and extending ULTIMATE in further research work. A helpful summary diagram of the relationship between scope and the conceptual level of a theory is provided by Urquhart (2019) and illustrated in Figure 43.

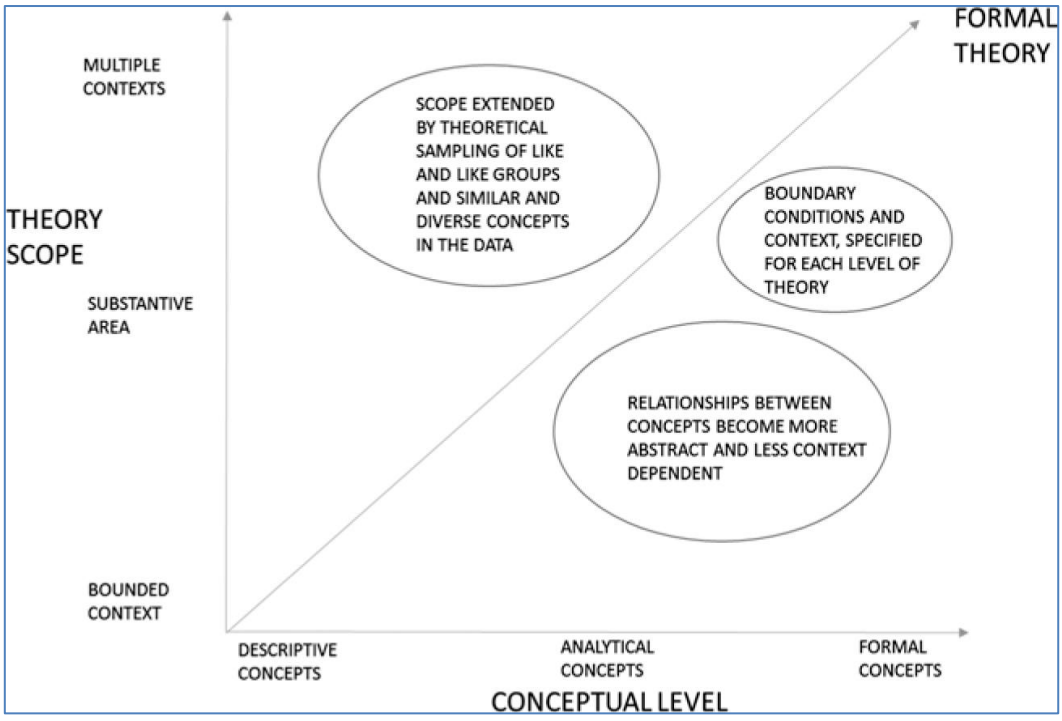

Figure 43. Relationship between theory scope and conceptual level

Source: Urquhart (2019, p.15)

When considering extending and verifying a new conceptual framework, it is worthwhile noting the temporal considerations involved in theory development. This is most likely to take place over several years. All of the comparator frameworks in this research project are built on years of established theoretical development and tradition, resting on the shoulders of those who have gone before. The same scenario would be likely with the development of ULTIMATE.

Normalisation Process Theory (NPT) is a theory that was developed by originally by Carl May and Tracy Finch (May and Finch, 2009), and then by multiple contributors over a ten year period from 1998 – 2008 (May *et al.*, 2009). This theory is a cogent example of a framework being developed using grounded theory. May *et al.* (2009, p.6) draw attention to the fact that despite all the different streams of writing in grounded theory and in social science theoretical development more generally, 'we actually have few factual accounts of the development of theories themselves'. Thus the article describes the process by which the theory was built, culminating in a formal middle-range theory. Normalisation Process Theory (NPT) has been developed in healthcare settings and 'explains how new technologies, ways of acting, and ways of working become routinely embedded in everyday practice' (May *et al.*, 2009, p.1). Although NPT has been developed as a series of *entitative* categories and how these relate together – in contrast to the unfolding flow of a learning process theorised in ULTIMATE – the steps taken in the development of the theory are clearly and transparently articulated and documented (May and Finch, 2009; May *et al.*, 2009). These accounts demonstrate the complex and collaborative series of steps taken to gradually develop a theory over several years, and embrace the input of many different stakeholders across the globe. As a fledgling conceptual framework, future research work to develop ULTIMATE might follow a similar trajectory. This trajectory would need to follow the GTM procedures outlined earlier and illustrated in Figure 14 and Figure 43, for systematic and rigorous continued theory development.

As noted in the discussion above, a theory in development can be extended to multiple substantive contexts. Wood (2017) outlines some of the barriers which constrain sustainable change in schools and universities, and considers whether NPT – developed in a healthcare setting – could be transferable to support the implementation of organisational change in educational contexts. (Wood, 2017, p.38) reflects that

> *One of the problems of 'educational transformation' is the all too often assumed need for speed, and public demonstrations of radical change. However, true transformation is a quiet, evolving and communal process located in complex contexts.*

This reflection illustrates the tension between 'top-down' and 'bottom-up' driven change. In top-down driven change, 'teachers can feel remote from the decision-making process, seeing themselves as merely the individuals who must carry out pre-determined plans over which they have little agency or voice' (Wood, 2017, p.34). It is arguable that remote OU tutors feel the same way in their teaching and student support activities, using centrally developed module materials. Indeed the practical problem being investigated and driver for this research was the perennial organisational need to close a feedback loop between multiple remote module tutors, students and campus based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions.

NPT aims to bridge the gap in healthcare settings between top-down policy intention and proposed practice change, and that change being routinely embedded or 'normalised' into daily practice. It is apparent that the challenges of implementing policy intentions or strategically driven top-down initiatives have some similarities in the highly complex contexts of both healthcare and education. The current work of Howson and Kingsbury (2021), described under Criteria 8 in Section 7.2, addresses this issue of the engagement and transformational learning required with the strategic policy intention of curriculum reform.

Therefore NPT may be a candidate for transferring to educational contexts. However it is an *entitative* framework as previously identified by Elkjaer and Simpson (2011) in Section 2.3. Accordingly it is described by its originators as an 'explaining' and 'understanding' theory (May *et al.*, 2009). It tends to be used as an evaluation tool in the health sector (Wood, 2017).

In contrast ULTIMATE is an 'enacting' theory, in the typology proposed by Sandberg and Alvesson (2020). ULTIMATE is *prehensive*, and is designed to support an unfolding collaborative action research process, within a *becoming* as opposed to a *being* ontology. ULTIMATE therefore may be an 'enacting' candidate to develop a theory in education that 'helps to instil a greater sense of agency across the organization, and locates the change process within the team rather than positioning teachers as mere participants in someone else's project' (Wood, 2017, p.37).

This aspect ties in with the ethical considerations and values discussed in Section 4.7.1. *Second-person* ethical action research practice shares the values of mutual and equitable respect, and collaboration and agency amongst disparate practitioners. As discussed, evidence and values can otherwise become 'reduced to data' in an 'outsider' perspective (Simpson and den Hond, 2021,p.13). Evidence and values can therefore become separated from meaningful action by practitioners in their local context.

Newton, Da Silva and Berry (2020) support this notion by offering a rationale for adopting a Pragmatic approach to evidence-based Higher Education. They offer a conceptual model which integrates 'useful evidence' and 'educator judgement' within a 'local context', to empower educators when making contextual decisions about local practice (Newton, Da Silva and Berry, 2020, p.5). ULTIMATE provides one approach to enact this aim.

8.2 Limitations and future research work

This research is currently limited by having been successfully completed in one module only. The combined insider action research and theory building nature of the research work meant that it was at the limits of that which can be accomplished in a PhD. The successful module is relatively small in Open University terms, although it plays a pivotal part in its qualification pathway. Its tutors were already familiar in working online with one another, and had close working relationships with the module team. One of the less successful modules in Phase 1 was a large intake module, with an extensive network of remote tutors. It would be sensible to conclude that the working relationships and culture in such a module will differ from those who are more tight-knit.

The future directions of this research will depend on identifying further possible modules or working groups internal or external to the OU, who are facing *indeterminate situations* or challenging learning design and delivery situations.

Then the aim is to start to build up *capabilities* for the type of systematic, structured but flexible collaborative problem-solving that is conceptualised by ULTIMATE, within a variety of contextual parameters. As a fledgling conceptual framework, future research work to develop ULTIMATE might follow a similar trajectory to theories such as NPT, evolving over several years. As already identified, this trajectory would need to follow the GTM procedures outlined earlier and illustrated in Figure 14 and Figure 43, for systematic and rigorous continued theory development. The proposed practical guidelines associated with this research will provide detailed guidance on how this might be achieved in a structured but flexible manner.

A further possible development of this research is in the general field of learning analytics. This research has highlighted the collaborative sharing of specialised learning design analytics with a module team and remote distance learning tutors. In their recent review of the learning analytics field and its literature, Guzmán-Valenzuela *et al.* (2021, p.1), noted that 'it seems that the focus is more on analytics than on learning'. They highlight the crucial and widely acknowledged requirement for input from teachers and students.

As just discussed at the end of the previous section, a Pragmatist approach such as ULTIMATE could assist practitioners to make more informed judgements by providing interpreted analytics data within a collaborative and equitable problem-identification and problem-solving process. The analytics would be used to support mutual learning about the problematic or *indeterminate situation.* This would contrast with any predominantly data-driven approaches in which the agency of practitioners is limited, and would also contribute towards their professional development.

Finally, there is a future stream of work to share, reflect on and build up the ethical considerations discussed in Section 4.7.1. This would strengthen the emerging ethical framework associated with *prehensive* and transformational collaborative Inquiry projects. It could be shared within the proposed practical guidelines associated with this research.

8.3 Personal reflections

When I was 17, I raised my own sponsorship money and joined an all girls' crew on the then Sail Training Association schooner *Sir Winston Churchill.* It was 1979, which some may recall was the year of the tragic events in high winds and severe storm conditions during the Fastnet yachting race. Just before our trip, many yachts were lost or capsized, and sailors lost their lives. It was also the year of the Isle of Man 'Manx Millenium' celebrations, and our voyage set sail from Fowey in Cornwall to the Isle of Man, and then round the Isle of Man in a special commemorative race. The winds were extremely high, and I happened to be one in our watch who had to climb up the mast to the highest yardarm, and out to the furthest edge to bring the sail in, in a Force 8 gale. Needless to say, I will never forget the experience, and what the deck of the schooner looked like from that far up while I was clamped on in the gale. We went on to win the race round the Isle of Man as the all girls' crew - if my memory serves me correctly – and we all had to sail and keep going for a full 24 hours to do it. I think that kind of extreme transformational and scary experience has stayed with me throughout my life. It has helped in the journey of this research work, which has also been transformational and at times scary.

In reflecting on my journey, I return to the quotation at the beginning of the thesis:

> **"Courage is not the absence of fear, but rather the assessment that something else is more important than fear."** ***Franklin D. Roosevelt***

This research work and the writing of the thesis has indeed been a journey of transformation. The perspective of insider action research as an integration of *first-person, second-person* and *third-person* Inquiry provided by Coghlan and Brannick (2014) is fundamental. These authors observe that successful *second-person* and *third-person* transformation cannot take place if the *first-person* has not also transformed. I agree that this aspect of action research, which is an intrinsically ethical approach, bound up in researching *with* to make improvements and the lives of others that little bit better, is one reason why I am so passionate about it.

Action research requires that the researcher is bound up in the process. In being so, the researcher gives of themselves, takes a risk, perhaps even steps out on the yardarm in a gale. The researcher does not remain passive, or a neutral, somewhat separated observer, or specialised interpreter. My fascination in discovering Pragmatism after John Dewey, and the promise of a Pragmatic alternative to the way that contemporary research is carried out, has spurred on my journey.

The *first-person* journey has been a complete personal transformation, travelling a road of embracing academic interdisciplinarity, facing directly into the 'black hole' of working without the comfort and familiarity of an existing conceptual framework, 'going against the grain' of accepted practice in order to do something new in which I passionately believed, and embracing action as a fundamental part of research. In following this "road less travelled by" I have achieved a personal goal of underpinning practical consultancy skills and experience with academic investigation and rigour. It has taken courage, guts and a lot of sweat and tears. Building theory and proposing a new conceptual framework that is critically juxtaposed against those from seminal thought leaders in their fields is not a task for the faint hearted. At the same time, the road has been fascinating, exciting, often frustrating, but intensely rewarding and has changed everything for ever. There has been an ever present series of threshold concepts to cross, with all of the emotions associated with traversing liminal spaces. Understanding that they were in fact liminal spaces has afforded me time and endurance to navigate them.

The time associated with undertaking this PhD has been unusual. It did not fit into the mould of a 'traditional' research study at this level. There have been many profound obstacles to overcome including interdisciplinarity, deep philosophical questioning, continuous navigation of the tensions between academic research and work-based practice, working collaboratively in a 'live' practice area, and the deep uncertainty of developing theory and of embracing emergent and unpredicted mutual learning.

In addition, the time taken to pursue unfolding and emergent action research cycles during successive annual presentations of Module S was challenging but indicative of this type of research, and the length of time required to achieve practical improvement outcomes and measurable impact. I have willingly devoted the extended time period to support and explore a growing passion - the achievement of this type of Pragmatic, action oriented and theory building approach. It sets the stage for future possible research, and extension and application of the ULTIMATE framework. I have taken the initial steps.

Finally, I have been thrilled to have worked in such a great *second-person* environment, with my practical, convivial and collegiate Open University colleagues, to facilitate something that has had real impact and has already made an exciting and interesting difference. By combining and integrating our *first-person* and *second-person* experiences, we have together produced *actionable knowledge* for a *third-person* audience within the Open University, which could be rigorously extended to other distance learning HE contexts and other *indeterminate situations.*

The 'integrative pedagogy' (IP) model (Tynjälä, Häkkinen and Hämäläinen, 2014, p.993), conceptualises the development of professional expertise of an individual as an integration of their conceptual/theoretical, practical/experiential, self-regulative and sociocultural knowledge. This model is useful in summarising aspects in the further development of my own professional expertise and creation of new knowledge. The model emphasises the importance of problem solving and integrative thinking; two key threads running throughout my work. Indeed, 'it can even be said that problem solving is the core process in the development of expertise' (Tynjälä, Häkkinen and Hämäläinen, 2014, p.993). Sociocultural knowledge, that is contextual insider knowledge that is embedded in social practices and the 'way things are done around here', brings everything together in the reflections for this particular research project.

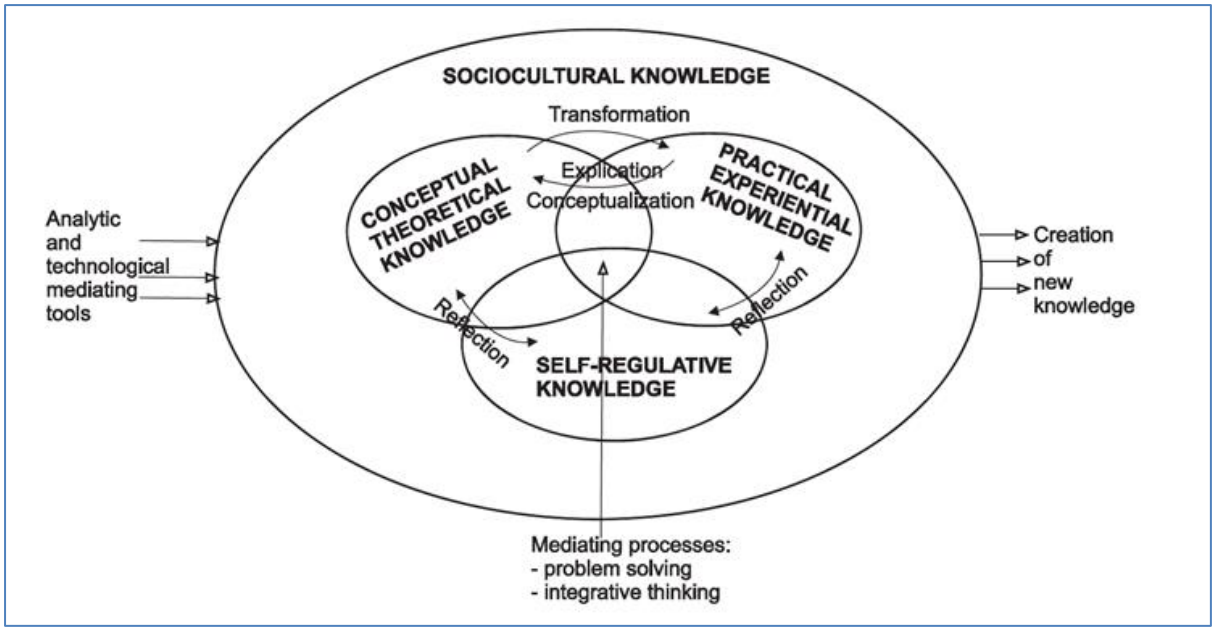

Figure 44. The integrative pedagogy' (IP) model.
Source: Tynjälä, Häkkinen and Hämäläinen, 2014, p.993.

The 'ultimate' take home message from this PhD research is that in these times of great uncertainty and unprecedented global challenges, there is an opportunity to review the manner in which traditional academic research is carried out: to cross the disciplinary divides and hierarchical structures; to empower practitioners as active agents in situations for which they are responsible and have an active problem-solving capacity; and thereby to increase organisational and inter-organisational *capabilities* to problem-solve and learn from each other in a respectful, collaborative and equitable manner.

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Appendices

Appendix A. Initial comparison of the three frameworks

Nicolini *et al*. (2012) highlight that consideration and comparison of multiple theoretical perspectives in a pluralist approach may yield novel insights and conclusions. Table A1 indicates the initial comparison of the three originally identified frameworks (Boyd, 2017).

	Value Creation Matrix (VCM) Wenger *et al.* (2011)	Cultural Historical Activity Theory (CHAT) Engeström (2001)	Activity centred analytic framework (ACAD) Carvalho and Goodyear (2014)
Object (in the sense of purpose; what is being aimed for)	Not explicit; implicit in 'resolution' as 'potential value' and 'implementation of resolution' as 'applied value'.	Object foregrounded as mutual aim of the activity, and motivation for joint effort to achieve an outcome.	Task driven, as a set of suggestions of things to do.
Social relationships	Identified in Cycles 1& 2 as 'immediate value' and 'potential value'	Explicit; identified via rules, community and division of labour	Explicit; identified as dyads, groups, teams, communities, roles and division of labour

Table A1. Initial comparison of the three frameworks

	Value Creation Matrix (VCM) Wenger *et al.* (2011)	Cultural Historical Activity Theory (CHAT) Engeström (2001)	Activity centred analytic framework (ACAD) Carvalho and Goodyear (2014)
Role of artefacts	Identified in Cycle 2 as 'potential value'	Explicit; identified as tools or mediating artefacts	Explicit; identified as artefacts, tools or texts
Identification of improvement	Explicit; identified in Cycle 3 as 'applied value'	Not explicit; identified in narrative after application of model	Not explicit; identified in narrative after application of model
Outcome	Achieved in Cycle 4 as 'realised value'	Explicit; what is achieved as a result of activity to pursue the object	Explicit; tasks lead to emergent activity which produces outcome
Unit of analysis	Community or network	The activity system, or multiple interrelating activity systems	The network, as 'not all its qualities can be defined as aggregates of the actions or preferences of individuals'.

Table A1. Initial comparison of the three frameworks (continued)

Appendix B. HREC approval

Human Research Ethics Committee (HREC)

From Dr Louise Westmarland
The Open University Human Research Ethics Committee
Email louise.westmarland@open.ac.uk
Extension (6) 52462
To Lesley Boyd
Project title Tricky Topics Pilot Projects in the OU
HREC ref HREC/2017/2480/Boyd
AMS ref N/A

Memorandum

Date application submitted: 26/01/2017
Date of HREC response: 15/02/2017
This memorandum is to confirm that the research protocol the above-named research project, as submitted to the OU HREC for ethics review, has been given a favourable opinion by Chair's action.

Please note the following:

1. You are responsible for notifying the HREC immediately of any information received by you, or of which you become aware which would cast doubt on, or alter, any information contained in the original application, or a later amendment which would raise questions about the safety and/or continued conduct of the research.

2. It is essential that any proposed amendments to the research are sent to the HREC for review, so they can be recorded and a favourable opinion given prior to any changes being implemented (except only in cases of emergency when the welfare of the participant or researcher is or may be effected).

3. Please include your HREC reference number in any documents or correspondence, also any publicity seeking participants or advertising your research, so it is clear that it has been reviewed by HREC and adheres to OU ethics review processes.

4. You are authorised to present this memorandum to outside bodies such as NHS Research Ethics Committees in support of any application for future research clearance. Also, where there is an external ethics review, a copy of the application and outcome should be sent to the HREC.

5. OU research ethics review procedures are fully compliant with the majority of grant awarding bodies and where they exist, their frameworks for research ethics.

6. At the conclusion of your project, by the date you have stated in your application, you are required to provide the Committee with a final report to reflect how the project has progressed, and importantly whether any ethics issues arose and how they were dealt with. A copy of the final report template can be found on the research ethics website - http://www.open.ac.uk/research/ethics/human-research/human-research-ethics-full-review-process-and-proforma#final_report

Best regards
Dr Louise Westmarland
The Open University Human Research Ethics Committee

Appendix C. Tricky Topic Consent Form for Staff and ALs

TT Pilot Projects

Dear Module Teams and ALs

Thank you for reading the Staff Information Sheet which explains the details of the Tricky Topics pilot projects in the OU. Please complete the following section to indicate if you are willing for your anonymised data to be used in PhD research and evaluation reports. You do not have to provide this consent and it does not affect your participation in the project, or your ability to contribute to the discussion forum. However it will be very helpful in evaluating the project and learning lessons to help assess whether to implement this approach across other OU modules in the future.

Your name

Email address

Module code

1. The details of this project have been explained to me, and I have been provided with a written statement in plain language to keep.

2. I understand that my participation will involve the use of discussion forums in a 'learning network' website for my module, in conjunction with an optional face-to-face or OU Live Tricky Topics workshop, which will use the Juxtalearn Tricky Topics Tool. By using the discussion forum I consent to participate in the project.

3. I acknowledge that:

a. the possible effects of participating in this research have been explained to my satisfaction;

b. I have been informed that I am free to withdraw from the project without explanation or prejudice and to request the destruction of any data that have been gathered from me until it is anonymized at the point of transcription on [date to be supplied]. After this point data will have been processed and it will not be possible to withdraw any unprocessed data I have provided;

c. the project is for the purpose of research and improvement in the OU;

d. I have been informed that the confidentiality of the information I provide will be safeguarded

1. The details of this project have been explained to me, and I have been provided with a written statement in plain language to keep.

2. I understand that my participation will involve the use of discussion forums in a 'learning network' website for my module, in conjunction with an optional face-to-face or OU Live Tricky Topics workshop, which will use the Juxtalearn Tricky Topics Tool. By using the discussion forum I consent to participate in the project.

3. I acknowledge that:

a. the possible effects of participating in this research have been explained to my satisfaction;

b. I have been informed that I am free to withdraw from the project without explanation or prejudice and to request the destruction of any data that have been gathered from me until it is anonymized at the point of transcription on [date to be supplied]. After this point data will have been processed and it will not be possible to withdraw any unprocessed data I have provided;

c. the project is for the purpose of research and improvement in the OU;

d. I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements;

e. I have been informed that with my consent the data generated will be stored in the learning network website for my module;

f. If necessary any data from me will be referred to by a pseudonym in any publications arising from the research;

g. I have been informed that a summary copy of the research findings will be forwarded to me, should I request this.

- (●) Yes, I provide consent
- ( ) No, I do not provide consent for the use of my data in PhD research but still wish to contribute to the discussion forum

- ( ) Yes, I would like to receive a summary report about the project
- ( ) No, I would not like to receive a summary report

Send your responses

What will happen next?

Your responses will be emailed to me by the system, so that I can keep a log of informed consent by all participants.

Appendix D. Staff Information Sheet

Tricky Topics Pilot Projects in the OU

Staff Information Sheet for Module Teams and ALs

HREC Approval Ref: 2017/2480

What's it all about?

Welcome to the Tricky Topics pilot projects and thank you for your interest in participating!

The purpose of this information sheet is to explain the details of the project, its proposed methodology and what you can expect from it. You will also be asked to provide your consent to participate in the project, as your contributions may be used in research and evaluation reports, in addition to providing input direct to each module team on topics that students find tricky.

These pilot projects have arisen from a variety of different recent developments. A team in the Institute of Educational Technology (IET) have been working with the Teaching Tricky Topics Process for some time in STEM subjects in schools. See http://tricky-topics-guide.ac.uk/ for an introductory guide all about the process.

There is now an opportunity to apply this project experience for us to understand what topics students find tricky in OU modules, what the stumbling blocks are, and what possible interventions may be made to better support students. The process is normally carried out in a face-to-face Tricky Topic workshop. However the complexity of the OU, and the numbers and scattered locations of ALs who hold vital experience and insight into topics and aspects of module materials that students find challenging, mean that something more than a face-to-face workshop is required.

We are therefore also teaming up with Lesley Boyd, a PhD research student in IET. Lesley's background is in quality improvement and consultancy; with an emphasis on facilitating teams to collaboratively learn how to evaluate and improve whatever it is they are doing. Her research is focused on the collaborative use of technology for organisational learning, and how learning networks can be implemented to achieve practical improvement outcomes. This means using the same collaborative technology that we all use for academic and professional learning, and applying it to organisational learning; ie learning together how to improve and how to do things differently.

What's a learning network and how would it work with the Teaching Tricky Topics Process?

Koper (2009) defines a technology-enabled learning network as 'a technology supported community of people who are helping each other to better understand and handle certain events and concepts in work or life'. A learning network is collaborative; all participants work together along a process of identifying issues, planning, taking action and evaluating, which can be mapped onto the Teaching Tricky Topics process stages. The networks will therefore capture views on Tricky Topics via discussion forums before the face-to-face or OU Live workshops, at which a selection of ALs will attend, and also allow all participants to feed into evaluation activities afterwards. Lesley has produced the learning networks, hosted in standard VLE course sites, so

that they are completely familiar to everyone, secure, confidential and can be provided at very low cost.

How is this different to the way we work at the moment, and why is it research?

The learning networks would pilot a new way of working in the OU, where scattered participants or stakeholders in a defined problem area can learn together online about how to improve it, in a structured problem-solving process. Lesley will be analysing the data produced, for her research about collaborative organisational learning. However the most vital aspect for you all as participants is the ability for ALs and module teams to learn together about Tricky Topics and challenges, in a more fluid and continuous discussion than has been previously possible.

What do I need to do?

To build up a representative discussion before the workshops take place please provide your feedback in the discussion forum in each site. You may contribute as little or often as you wish before the date of the workshop. You may upload examples of problem areas, or refer directly to the module materials if you would like to highlight a particular aspect.

When you **first** visit the site, please click on the **Informed Consent** section so that Lesley may use your anonymised contributions in her PhD research. You do not have to provide this consent and it does not affect your participation in the project, or your ability to contribute to the discussion forum. However it will be very helpful in evaluating the project and learning lessons to help assess whether to implement this approach across other OU modules in the future.

What will happen after that?

We will let you know when the initial discussion will be closed in preparation for the workshop, which is currently scheduled for late May. We will then create further discussion threads in order to discuss, implement and evaluate possible interventions as a result of the Tricky Topics identified.

Thank You

Tricky Topics in the OU Project Team

3rd March 2017

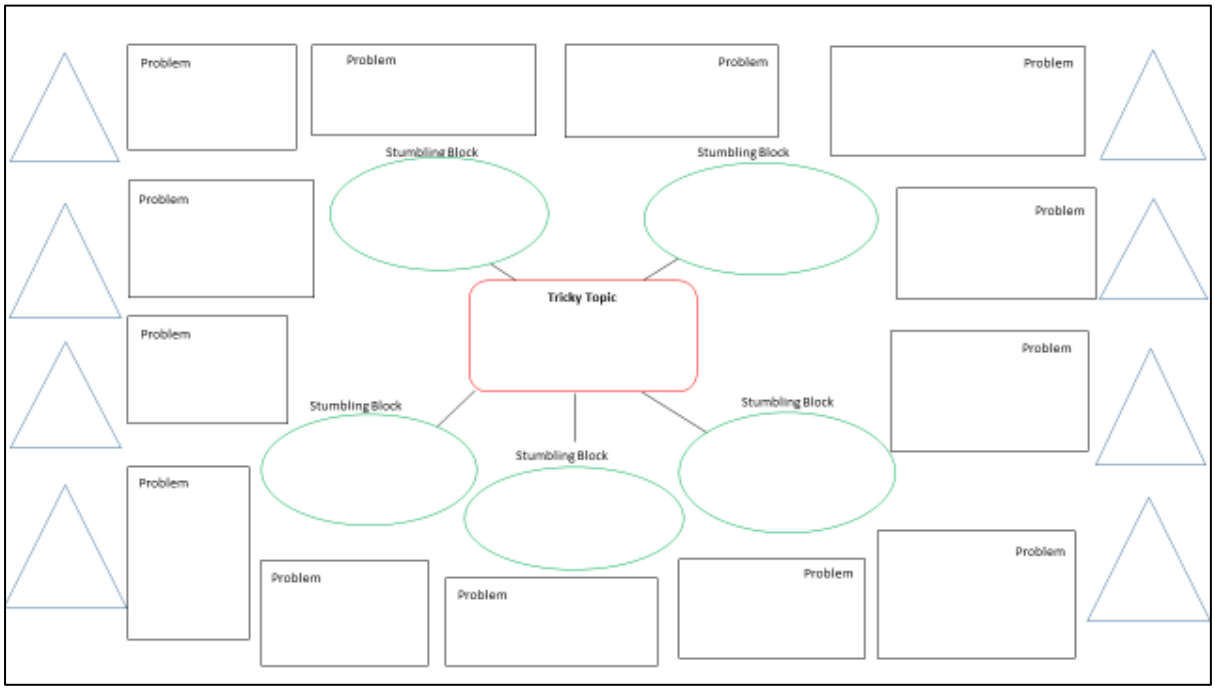
Appendix E. Summary of Module H / Module H V2 Tricky Topics online workshop - 21 March 2018

What happened during the workshop?

The Module H/Module H V2 Tricky Topic (TT) workshop was facilitated by Anne Pike, the Tricky Topic specialist. Two ALs attended, plus the Module H module chair, a Project Leader for the funded eSTEeM project of which this is part, and the PhD researcher who is attached to the project. This is the third in a series of workshops for three pilot modules; the other two being a chemistry and a maths module which ran in 2017.

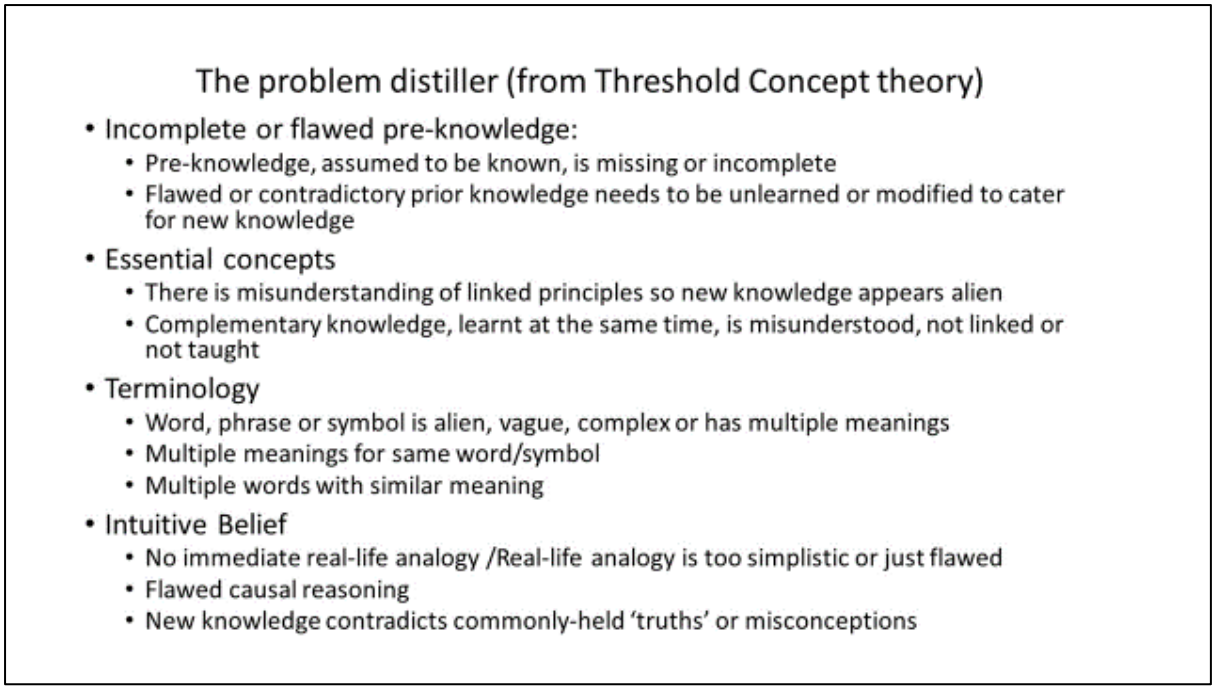
Anne started by introducing the agenda, recapping the idea of Tricky Topics, and showing some examples of completed Tricky Topic structure charts. These charts contain space to enter in the chosen Tricky Topic, and the stumbling blocks and problems associated with it. The chart provides a systematic tool with which to tease out issues that students find tricky. It can be completed from the inside outwards (from TT towards associated problems), or the outside inwards (evidence of problems then clustered around a TT). It can also be used to indicate possible solutions, which can be noted in the blue triangles.

A blank structure chart is shown below.



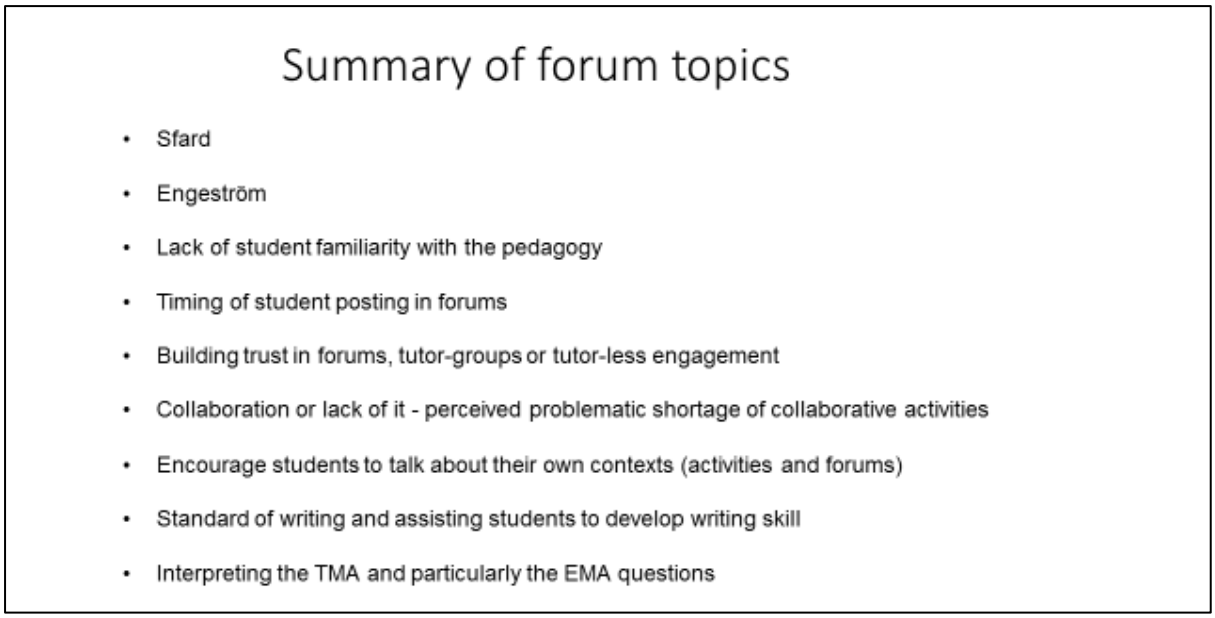
Blank structure chart

Anne showed a couple of example charts which were completed by the Module S module in an earlier workshop, and then introduced the Problem Distiller, which is a set of categories offering possible explanations as to why a problem exists. This can be used alongside the structure chart to guide thinking about TTs. The problem distiller is shown below.



Problem distiller

Anne then introduced the summary of issues which had been raised in the discussion forum in the learning network site, and included the link to the site so that the discussion could be referred to during the workshop if necessary:

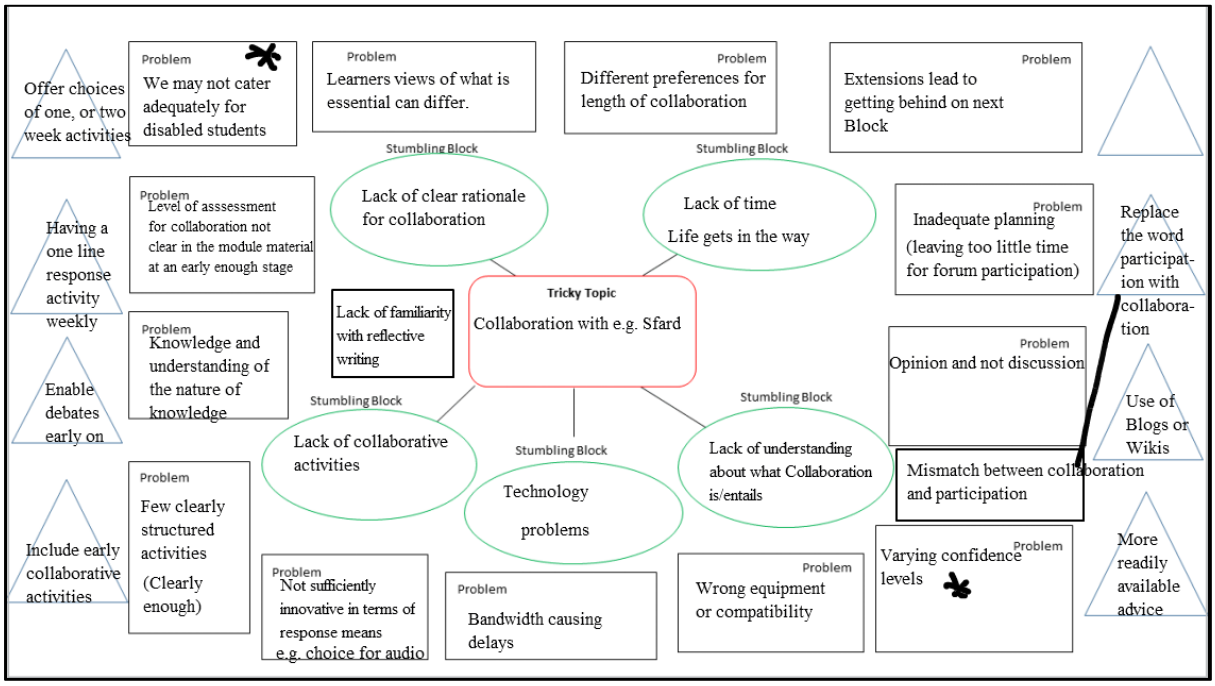


Summary of discussion forum issues

There followed a discussion on which one or two of these topics could be selected as a Tricky Topic to work on during the workshop. The ALs agreed that 'Collaboration' should be the most suitable TT to discuss, which was likely to bring in several of the other issues, such as lack of student familiarity with the pedagogy, and aspects of forum participation. It was decided to combine the issue of collaboration with the Sfard paper, but the issues might well be applicable across other 'Tricky' or challenging papers.

What was the result?

After much interesting discussion, this completed TT structure chart was produced by the ALs:



Completed Module H / Module H V2 structure chart

The two hand-drawn stars represent two problems which are connected, and the hand-drawn line a connection between a problem and proposed solution. The 'readily available advice' in the bottom RH triangle refers to IT, equipment or technical compatibility advice.

What are the next steps?

It was agreed that the structure chart represents a useful summary of issues around the Tricky Topic of student collaboration in Module H, which could be productively taken forward into the learning design of Module H V2. The first action should be to share the chart for comment with the remaining ALs who were unable to attend the workshop. This will be done via another discussion forum thread in the learning network site. This link will also be shared in the Module H AL forum by the module chair. The learning network site keeps all the data and discussion on Module H / Module H V2 Tricky Topics and module design issues in one dedicated space. Secondly, the structure chart, additional comments and the recording of the workshop should be shared with the design team for Module H V2. Thirdly, ALs may wish to contribute to further design discussions, and will bear the identified issues in mind if they are acting as critical readers for Module H V2. The entire workshop recording (approx. 2 hours) is available here.

Appendix F. Phase 1 Progress notes for Module S tutors and module team

Using learning networks and Tricky Topics to drive module improvements – June 2018
PhD project summary - What has happened so far?

The project aim of the eSTEeM Tricky Topics pilot was to address the OU organisational need for 'closing the feedback loop' between ALs, campus-based module teams, and LTI. Analysis and final eSTEeM evaluations are still underway for the three pilot modules which were chosen for the original funded project. Lesley's PhD research on learning networks forms a part of this project. This summary records the notable progress made in Module S and the plans for further collaborative research as a part of the PhD work.

The ALs were very engaged, identified a range of detailed Tricky Topics and provided useful feedback to the module team. The prior learning network discussion, in a dedicated VLE site in early 2017, enabled ALs to discuss topics, provide examples, and corroborate and verify their understanding of student conceptual difficulties with each other. In the Tricky Topics workshop they then efficiently progressed to group work on two selected topics, which both concerned essential prerequisite knowledge before commencing the module. As a result, four innovative videos and a revised 'Are You Ready For' quiz were suggested and produced by the Module S ALs and the module team in the Open Science Lab, and implemented for the 17J presentation.

In Lesley's analysis, initial open codes have been allocated to all the Module S discussion forum posts, and an 'integrative diagram' (shown overleaf) produced indicating how they all relate together, in an unfolding and collaborative process of constructing issues about the module. So every comment has been taken note of and coded. Each box in the diagram represents a code for which the relevant excerpts from the learning network data can be provided.

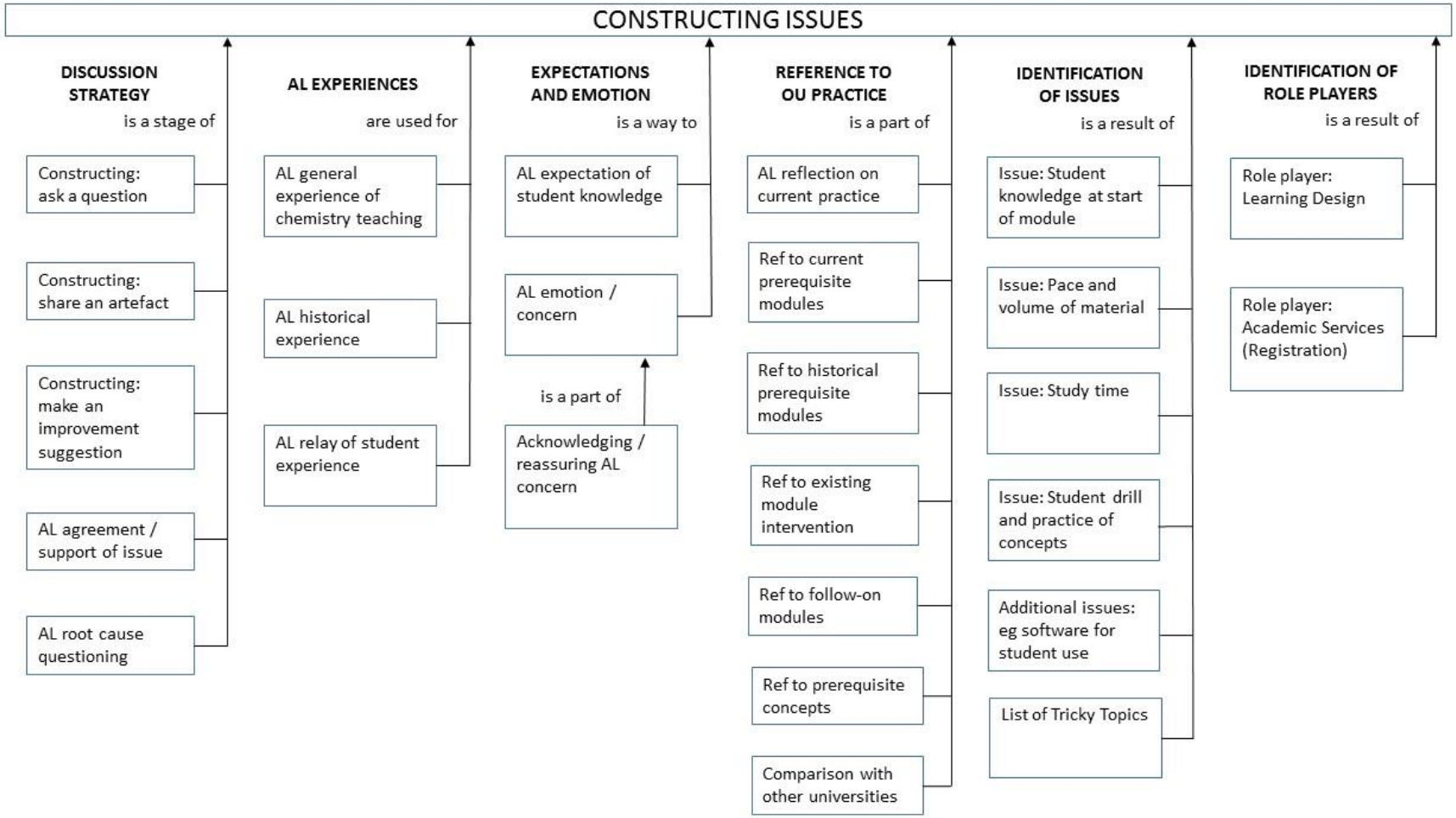
The diagram also illustrates that ALs identified a series of issues and student challenges in addition to the list of conceptual Tricky Topics. These issues were:

a) Student knowledge at start of module
b) Pace and volume of material
c) Study time
d) Student drill and practice of concepts
e) Additional issues: e.g. software for study use

What will happen next?

Further work is now being planned for the beginning of the 18J presentation, to interpret the various quantitative data being produced on Module S by the OU, such as Learning Design mapping and analytics data, in order to gain AL feedback and insights on its relevance and usefulness. Suggestions for teaching improvements or adjustments, particularly in the light of concerns about pace and volume of material, will be sought. The planned work forms a unique opportunity at the OU for ALs to be engaged in collaborative research using this data.

The integrative diagram also illustrates some components of a successful learning network which have been identified so far, as spearheaded by Module S. These aspects support the collaborative discussion and action required to achieve the project aim, which is to close the feedback loop between ALs, module teams and LTI, in order to improve student retention and satisfaction, and help to develop students' understanding of difficult or tricky concepts.



Integrative diagram of open codes using Spradley's (1979) semantic relationships (Constructing issues stage for Module S)

Appendix G. Phase 2 Approved RTSF questionnaire for end of Module S - May 2019

See following pages.

REAL TIME STUDENT FEEDBACK

Purpose: "Capturing feedback from students during their study to help shape support or change the students' learning experience"

Title: (module code/presentation date/description	**Module S 18J eSTEeM project Phase 2**
Module Team Chair:	
Module code and presentation:	**Module S 2018J**
CAU:	**STEM**

Introduction to questionnaire:

Dear Module S 18J Student

We are looking for your feedback on various aspects on Module S, in order to understand more about evolving student study behaviour and study experience. Aspects on which we would particularly value your feedback are:

- *how well prepared you felt for Module S*
- *pace and volume of the study material*
- *how long you spend studying Module S on average each week*
- *whether you prefer to study using the online module virtual learning environment (VLE) or study offline using downloadable resources or different formats*
- *how helpful you find the downloadable resources, including the 'Tricky Topics' videos*
- *your reactions to the 'signposting' documents that we have been trialling, for Blocks 9 and 10.*

Responding to this questionnaire is completely voluntary. Please be assured that your responses will be completely anonymous and you will not be identifiable at any point. Your responses will never affect any of your assessment or examination marks.

The questionnaire should take approximately 15mins to complete. The last question asks whether you may be interested in working with us after the examination to provide further feedback, and some instructions to let us know if this is the case. Thank you very much for your time, we appreciate your assistance.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q1. Prior knowledge	**Please indicate your level of knowledge and experience at the start of the module.** a) Have you studied any modules at Level 2 *before* (exclude concurrent study)? b) Is this the first time you have attempted Module S? c) Have you passed [prerequisite module 1] before Module S? d) Have you passed [prerequisite module 2] before Module S?	18th May to 7th June - equates to weeks 30, 31 and 32 on the Study Planner.	**Answer option** Yes / No response for *each* question. Hence we anticipate using a grid structure for this question.	**Feedback response:** No automated response to student for this question. If "yes" to d) did you choose the chemistry assessment options in [prerequisite module 2]?	**Intended student behaviour:** This question aims to acquire direct feedback from students regarding their preparedness for Module S. This has been identified as a major issue in both Phase 1 (17J) and Phase 2 (18J) of the eSTEeM project, and 'getting worse, year on year'. Feedback from ALs indicates that some students are arriving 'woefully unprepared' for study at Chemistry Level 2. The recent *Study Pathway Analysis* reports produced by a STEM Data Wrangler for the project, indicate an extremely scattered picture of previous study pathways, taken over many years. In 18J, 32%, or 51/160 students followed the recommended route of [prerequisite module 1] + [prerequisite module 2]. There is also anecdotal evidence that some students studying the recommended pathway are *not* choosing the chemistry assessment options in [prerequisite module 1] and [prerequisite module 2], as these are not mandatory.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
	e) Have you passed *any* of the previous OU chemistry Level 1 modules: [list of historical prerequisite modules] f) Did you complete the *Are You Ready For* quiz for Module S before you started this module? g) Have you passed chemistry at University First Year (Level 1) at another institution? h) Are you working in a job which requires any knowledge of chemistry?				There is also evidence in separate data provided by Learning Design of a very low rate of interaction with the AYRF quiz, despite this having been developed further by the module team to address the lack of preparedness issue. **Success measure and method:** A more comprehensive picture of student preparedness will facilitate the formulation of appropriate interventions before the commencement of 19J.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q2. Pace and volume of study material	**Please indicate your experience of the pace and volume of study material in Module S, compared to your expectations before the module started.** Please choose *one* of the three listed options that you think most applies to you:		3 options: I found it to be paced rather fast and would like more time to consolidate concepts. I found it to be paced about right and had enough time to understand and practice concepts. I found I had more than sufficient time to understand and practice concepts.	**Feedback response:** *"Thank you. Please feel free to add a note about your experiences with pace and volume of study material, in the free text box at the end of the questionnaire".*	**Intended student behaviour:** This question aims to acquire a more comprehensive student view on pace and volume of material, which has also been identified as a major issue in both project phases. It will also build on informal feedback obtained by the MTC at the recent Residential School. **Success measure and method:** This has been an ongoing issue in Module S. Its effects may be becoming more pronounced in combination with other evolving issues such as student preparedness. Achieving a more comprehensive understanding will help to provide evidence for a mid- term review and possible adjustments to the learning design.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q3. Study time	**Your overall study time. For how many hours *on average each week* would you say you have studied Module S?** ***Please estimate as accurately as you can, as it helps us to understand the experience of our students better and make appropriate interventions.***		Choose *one* of the seven listed options: • 0-4 hours • 4-8 hours • 8-12 hours • 12-16 hours • 16-20 hours • 20-24 hours • More than 24 hours	**Feedback response:** No automated response to student for this question.	**Q3 & Q4** **Intended student behaviour:** A question has been raised in Phase 2 regarding the lack of data on how much time students *actually spend studying Module S,* including offline study. The visualisation used in Phase 2 indicates an average on no more than 8 hours per week engagement with the VLE. Additional insight is required as to why this engagement is so low, especially for an online only course. **Success measure and method:** A more comprehensive understanding of this aspect is important to inform possible future interventions. Both Q3 and Q4 aim to achieve this, including understanding how students divide their time between online and offline study.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q4. Division of online/offline study time	**We would like to understand how you divide your study time between working directly on the module website, using module downloadable materials, other online chemistry resources, or your own notes.** Looking back at your *average weekly hours* in Q3, how many of these would you say you studied by interacting directly with study materials on the module website, and how many by looking at		Choose one of the seven listed time bands as per Q3, for *each* of the four listed options. Hence we anticipate using a grid structure for this question.	**Feedback response:** *"Thank you. Please feel free to add a note about how you divide your online and offline study time in the free text box at the end".*	

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
	materials that you have downloaded, printed or used as print on demand? If you have used other generally available online chemistry resources, please try to estimate an average time for those. • time spent online directly on the module website • time spent offline studying module downloadable materials on paper, a mobile				

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
	device or print on demand • time spent offline looking at and consolidating from your own notes • time spent looking at other generally available online chemistry resources eg Kahn Academy Videos or YouTube tutorials				
Q5. Use of downloadable module resources	**Please indicate from this list below which downloadable module resources you have *downloaded or used at any time during your study.***		Choose *any* of the applicable options.	**Feedback response:** *"Thank you. Please feel free to add a note about your experiences with downloadable module resources, in the free text box at the end".*	**Intended student behaviour:** This question aims to achieve a more comprehensive student view on which module downloadable resources they have used, and their views on their helpfulness. **Success measure and method:** The module team will be able to use this data to provide interventions for the downloadable resources, if necessary.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
	• Are You Ready For Module S? (quiz) • Module S Primer materials (pdf) • Tricky Topics videos • Maths Help (pdf) • Block Summaries (pdf) • Data book (pdf) • Specimen Examination Paper (pdf) • Exam Survival Guide (pdf) • Practice Exam Questions (pdf) • Tutorial recordings				

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q6. Trial 'Signposting' documents	**Please indicate your reactions to the trial 'Signposting' documents for Blocks 9 and 10.** a) Did you use the signposting document for Block 9? b) On a scale of 1 to 5 how helpful did you find it? c) Did you use the signposting document for Block 10? d) On a scale of 1 to 5 how helpful did you find it?		Yes/No response to *each* option. For b) and d) Scale option where 5 = Very helpful and 1 = Not very helpful.	**Feedback response:** *"Thank you. Please do add a note on what you felt about the signposting documents, in the free text box in the next question".*	**Intended student behaviour:** This question aims to acquire student feedback on the recently introduced trial signposting documents, which were produced as a result of the issues raised in Phases 1 and 2, particularly with regard to pace and volume of material.

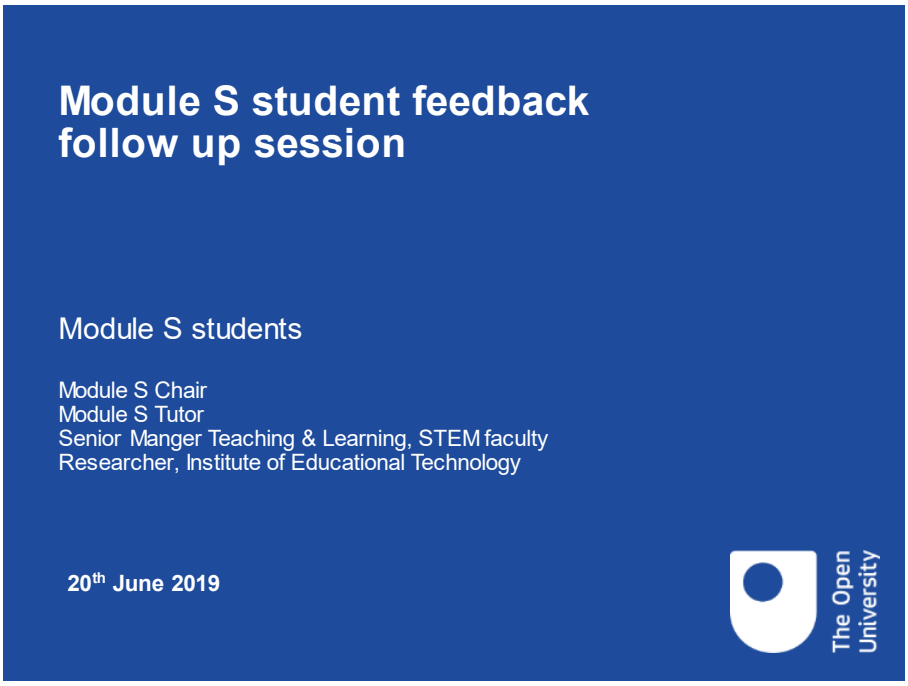
Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q7. Any additional comments	**Please do let us know any additional feedback on your experiences with any of the aspects covered in this questionnaire, or any other issues associated with your study of Module S.**		Free text response	**Feedback response:** No automated response to student for this question.	**Intended student behaviour:** This question encourages the student to provide additional qualitative feedback on any aspect covered in the questionnaire, or any other issue or concern about their Module S study that they would like to express.
Q8. Further feedback	**Your interest in providing further feedback.** Would you be interested in helping us by providing more detailed feedback on an individual basis, or joining in an online discussion group after the exam? We will select some students on a first come first		Yes/No response	**Feedback response Yes:** *"Thank you for your interest shown in helping us with more detailed feedback. Please email the Module Chair, [contact details provided], to put your name put forward. <u>This will not affect your anonymity</u> for the questionnaire responses in any way. The module team*	This question aims to gain some student volunteers for richer and more detailed feedback. The further feedback activity will build on the informal student feedback obtained by the Module Chair at the Residential School, and the questionnaire responses.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
	served basis, and will be able to offer an Amazon voucher as a thank you for your time (max one hour).			*will then contact you to discuss the next steps, which will be scheduled after the examination".* **Feedback response at end of questionnaire:** **"***Thank you very much for your time, we appreciate your assistance and feedback".* Student returns back to Study Planner on completion of the questionnaire.	

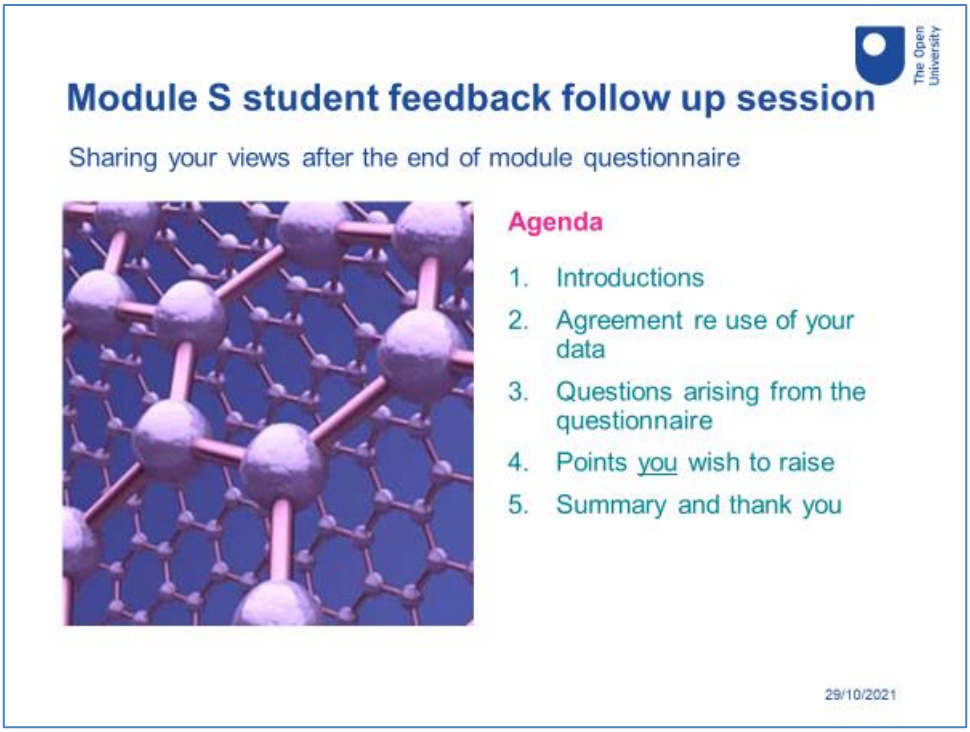
Appendix H. Phase 2 Summary notes from Module S Student Feedback follow up session - 20 June 2019

See following pages.

Summary notes from Module S Student Feedback follow up session – 20 June 2019



The RTSF questionnaire ran for the last two weeks of the presentation. Four students who volunteered for the follow up session attended; one gave apologies but still wished to contribute. In the follow up session, a series of 7 questions were posed for discussion. These were based on the questionnaire responses, which are analysed in the boxes, with follow up feedback underneath.



Question 1

Did you feel your chemistry background was adequate to prepare you for studying Module S – do we assume too much?

Questionnaire responses. N=18.

	Your knowledge and experience at the start of the module	Yes
1	Have you studied any modules at Level 2 before (exclude concurrent study)?	33% (6)
2	Is this the first time you have attempted Module S?	89% (16)
3	Have you passed [prerequisite module 1] before Module S?	33% (6)
4	Have you passed [prerequisite module 2] before Module S?	28% (5)
5	Have you passed any of the previous OU chemistry Level 1 modules: [historical prerequisite modules]?	28% (5)
6	Did you complete the Are You Ready For quiz for Module S before you started this module?	83% (15)
7	Have you passed chemistry at University First Year (Level 1) at another institution?	22% (4)
8	Are you working in a job which requires any knowledge of chemistry?	61% (11)
9	As you have indicated that you passed [prerequisite module 2] before Module S did you choose the chemistry assessment options in [prerequisite module 2] ?	60% (3/5)

29/10/2021

Feedback:

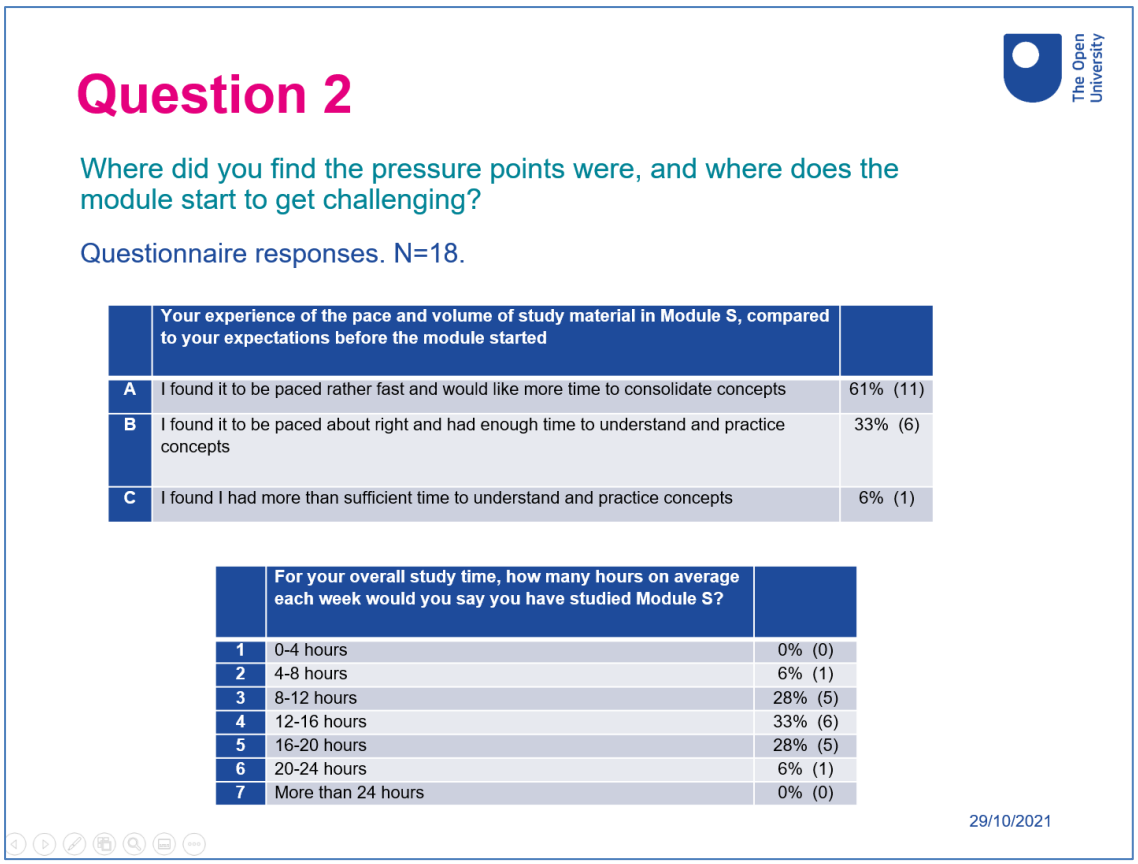
- Even doing [prerequisite module 1] and [prerequisite module 2] didn't give adequate preparation for Module S
- A Level Chemistry really helped
- [prerequisite module 2]/[prerequisite module 2] felt to be more basic than A level, even GCSE or slightly above
- Whereas Module S similar to A level and then progresses beyond
- Student who has done [prerequisite module 1]/[prerequisite module 2] would not have been as prepared without A level
- [historical prerequisite module] also wasn't sufficient.

Example questionnaire free text responses:

I felt that Module S was fast pace and a lot of information in one go. It was a huge step up and at times I have felt massively out of my depth! (FT7)

I found that there was a huge jump from level 1 ([prerequisite module 1] and [prerequisite module 2]) which required considerably less than 20 hours per week. It would be great to have more detail in level 1 to prepare for level 2. (FT8)

FT = Free text response no.



Some pressure points are:

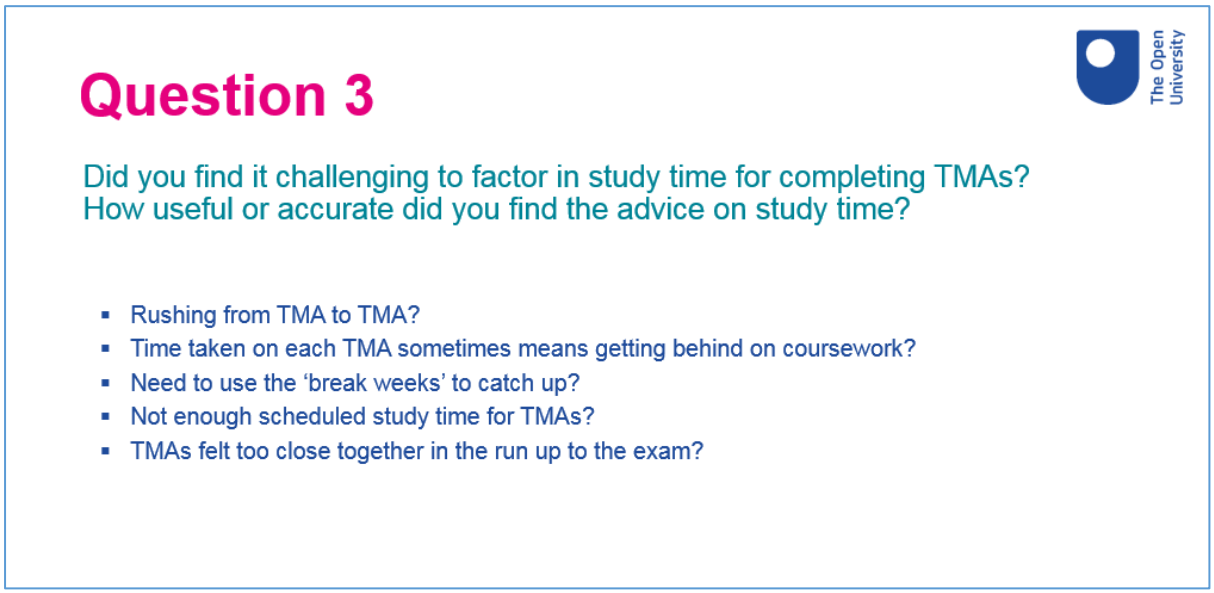
- aromatics, TMA04
- Molecular Orbital Theory (for some)
- Materials
- TMA weeks generally
- Just before Christmas “ready to quit”
- April onwards fast paced and getting worse towards the end of the module
- TMA05 and TMA06 are 3 weeks apart

All 4 participants in the follow up session were putting in about the right amount of study time.

Example questionnaire free text responses:
This has been a very difficult module. There has been a lot of content to cover over what has felt like not enough time and it was very easy to fall behind on the weekly content because of the TMAs which required a large amount of time to complete. This happened every time for me as I put a lot of effort into each TMA. It also seemed that the closer we got to TMA05 and the exam, the closer together the TMAs got and that has added to the stress of keeping up with this module. (FT12)

I was working full time during the Module S and so I did find the course tight to pack into a working week but manageable, the course itself and the help from tutors on the forum was fantastic and I really did enjoy the work, it was presented in a good format although the final TMA was a little close to the final exam. (FT15)

Thoroughly enjoyed this first module with the OU, after suffering through a year of Physics elsewhere. The pace of study was spot on for me, working part-time as well. Not having any books to buy was also a very nice bonus. (FT4)



There was universal agreement with Q3.

- Workload appears to be skewed / too heavy / got all too much at the end of the module
- Too gentle at the beginning / room to put more in
- Felt 'sapped' in May, just before exam coming
- Especially with TMA05 and TMA06 so close together

Example questionnaire free text responses:

I feel that I have rushed from TMA to TMA, the time I took on each TMA meant that I got behind with the coursework. Because of this I had to use the "break weeks" to catch up. (FT3)

Sometimes for the 2nd week of a given topic, the material to read and understand was shorter to allow time for consolidation but not always. It would have been much easier to consolidate knowledge whilst going along had this been the case - 2-3 hours shorter to have time to re cover the material, do the quiz etc, maybe even look at the TMA questions as again this time to do the TMA's had to be found on top and wasn't factored in to the weekly study time. So in the two week topics, 16 hours material to study in week one and 12 hours in week two. The couple of break weeks were good, but they could not be taken as actual breaks, rather spent doing TMA's or completing part of the materials. (FT11)

The timing of TMA06 was slightly off for me, and I feel I better used my time to focus on completing the course rather than giving an effort for TMA06. (FT13)

The TMAs were a great way to test knowledge (FT13).

Question 4

Did you use any particular strategies if you felt under pressure to complete all the material in time?

	How you divide your study time	1	2	3	4	5	6	7	Total
A	time spent online directly on the module website	3 (17%)	2 (11%)	6 (33%)	3 (17%)	3 (17%)	1 (6%)	0	18
B	time spent offline studying module downloadable materials on paper, a mobile device or print on demand	12 (67%)	4 (22%)	1 (6%)	1 (6%)	0	0	0	18
C	time spent offline looking at and consolidating from your own notes	13 (72%)	4 (22%)	0	1 (6%)	0	0	0	18
D	time spent looking at other generally available online chemistry resources eg Kahn Academy Videos or YouTube tutorials	14 (78%)	3 (17%)	1 (6%)	0	0	0	0	18

1 = 0-4 hours
2 = 4-8 hours
3 = 8-12 hours
4 = 12-16 hours
5 = 16-20 hours
6 = 20-24 hours
7 = More than 24 hours

21/06/2019

	How you divide your study time	1	2	3	4	5	6	7	Total
A	time spent online directly on the module website	3 (17%)	2 (11%)	6 (33%)	3 (17%)	3 (17%)	1 (6%)	0	18
B	time spent offline studying module downloadable materials on paper, a mobile device or print on demand	12 (67%)	4 (22%)	1 (6%)	1 (6%)	0	0	0	18
C	time spent offline looking at and consolidating from your own notes	13 (72%)	4 (22%)	0	1 (6%)	0	0	0	18
D	time spent looking at other generally available online chemistry resources eg Kahn Academy Videos or YouTube tutorials	14 (78%)	3 (17%)	1 (6%)	0	0	0	0	18

[Text table above included for greater clarity]

Strategies if under pressure:

- Work from the TMA and then go back to the rest of the material in the Block if time (ie student 'signposting themselves')
- Use Khan Academy / YouTube / Crash Course
- Wide variety of online / offline study, eg 70% paper, 30% online
  Pretty much everything on paper
  100% online

Question 4 and 5

Did you use any particular strategies if you felt under pressure to complete all the material in time?

How did you use tutorials in your study, and could we be providing recorded materials in any alternative formats (e.g. MP4 audios)?

	Which downloadable module resources you have downloaded or used	
1	Are You Ready For Module S? (quiz)	83% (15)
2	Module S Primer materials (pdf)	50% (9)
3	Tricky Topics videos	45% (8)
4	Maths Help (pdf)	17% (3)
5	Block Summaries (pdf)	89% (16)
6	Data book (pdf)	89% (16)
7	Specimen Examination Paper (pdf)	89% (16)
8	Exam Survival Guide (pdf)	72% (13)
9	Practice Exam Questions (pdf)	78% (14)
10	Tutorial recordings	83% (15)

29/10/2021

Suggestions and feedback:

- Please have more interesting or engaging videos (seem to come from the 70s!!) – general agreement on this
- Can't access tutorial recordings on iPad; this is a problem of Adobe not supporting Apple
- Want to listen to tutorial recordings at own pace rather than turning up to tutorials
- Tutorial slides not always available as well as recording?
- Challenges with understanding the maths support, both tutorial and Maths Help pdf.
- Would very much like podcasts / MP4 to listen to whilst doing other things

Example questionnaire free text responses:
Revision tutorials have been amazing and explaining a lot. (FT1)

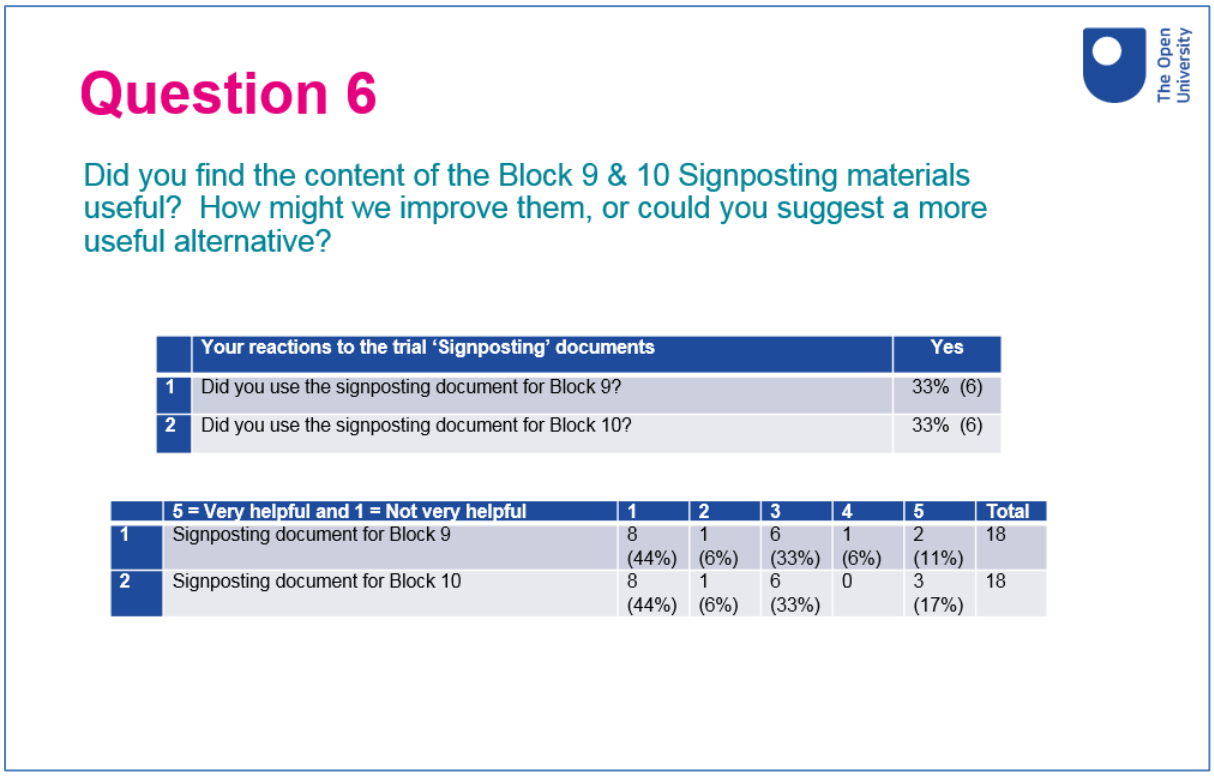
The Specimen Exam Paper (SEP), was really useful, because contained answers, which i could use to compare to my answers. I used this paper as my mock exam. (FT1)

I had to watch YouTube videos where VESPR theory was explained really clearly using some small balls. It is really difficult to imagine the abstract structures otherwise. (FT2)

I have mentioned this before, but a podcast or audio book would be very helpful. It isn't always possible to look at material but a podcast on key topics would help. (FT3)

I have found the recorded revision tutorials very helpful. (FT3)

For me It would be helpful to have some prerecorded tutorials that could be downloaded so that I can listen/watch them whilst doing other activities (cooking etc). For example I have an MP4 file Infrared Spectroscopy Tutorial by [name provided]. (FT10)



Question 6

Did you find the content of the Block 9 & 10 Signposting materials useful? How might we improve them, or could you suggest a more useful alternative?

	Your reactions to the trial 'Signposting' documents	Yes
1	Did you use the signposting document for Block 9?	33% (6)
2	Did you use the signposting document for Block 10?	33% (6)

	5 = Very helpful and 1 = Not very helpful	1	2	3	4	5	Total
1	Signposting document for Block 9	8 (44%)	1 (6%)	6 (33%)	1 (6%)	2 (11%)	18
2	Signposting document for Block 10	8 (44%)	1 (6%)	6 (33%)	0	3 (17%)	18

Various feedback:

- 'fantastic resource'
- both 'loved and hated' them
- Didn't find them (they were supplied in a News item and Block forum)
- What is background / what will be tested (this is what they were aiming to do)
- Instead of signposting, could there just be less content please?
- Or a link to the extra content for those who want to go on to do [follow on module]

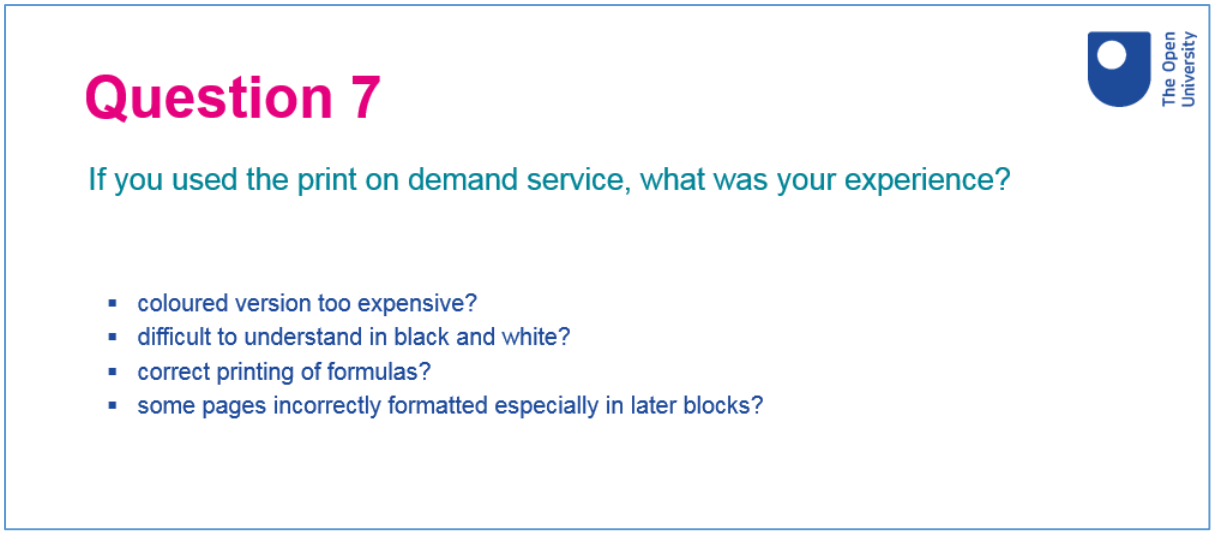
Example questionnaire free text responses:

I'm sure the signposting would have been useful, but I wasn't able to find it..... (FT5)

I did not see what the signposting was trying to add. (FT6)

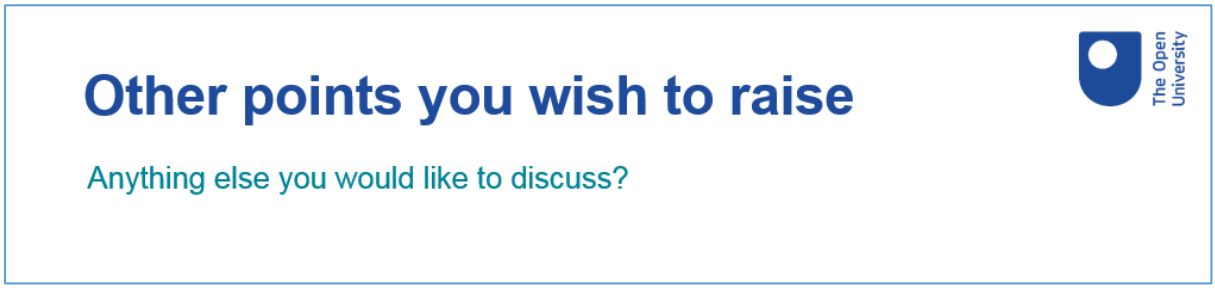
I also found the signposting materials fairly unhelpful as I was expecting them to highlight more topics that wouldnt be essential for revision, rather than just 2 or 3 pages that werent really needed. (FT9)

Found the tricky topics and tutorials helpful. Signposting material was fantastic and helped reduce the workload. (FT10)



Didn't use print on demand. One student has printed materials as part of accessibility arrangements.

Example questionnaire free text response:
I ordered a paper print but the coloured version was really expensive. I regretted ordering black and white version immediately as it is very difficult to understand in monochrome colour and I ended up colouring with pencils. Most headings come out depressingly grey. Some formulas did not print out at all. Some pages were wrongly formatted especially in later blocks. I find it difficult to constantly study online, I prefer to be occasionally disconnected and study using the real books. (FT2)



Suggestions:

- Why not have pinned posts in one forum page for general Q and A, so students can pose questions and share answers

- If students 'not getting it', find different way or alternative explanation to make it clear, in contrast to just being referred back to module materials.

Students all volunteered some positive feedback at the end:

- 'Just want to say I've REALLY enjoyed Module S'
- 'Me too! it was hard, but great!'
- 'I've enjoyed it too'
- 'Engaging content and (I found to be) well communicated, good stuff'.

Appendix I. Phase 2 Project update document – September 2019

See following pages.

Using technology-enabled learning networks to drive module improvements in STEM - Module S

eSTEeM project update for ALs, the module team and other stakeholders – September 2019

This is an update for you all on the 18J eSTEeM project, which has been co-led by MT2 and Lesley Boyd. This project built on and consolidated from the earlier eSTEeM Tricky Topics project in 17J that resulted in the four Tricky Topics videos. LD1, Senior Manager Leaning and Teaching in STEM has also been a team member. The project is a collaboration between the STEM faculty, and Lesley's PhD research on using 'learning networks' within the OU for collaborative problem solving involving ALs and students.

1. Aims and outcomes sought

The initial aim of the 18J project was to engage ALs with learning design analytics visualisations, especially in the light of concerns and issues which were identified in the first project. These included pace and volume of material, student preparedness and knowledge at the start of the module, overall study time spent including whether studying online or offline, and opportunity for consolidation or practice of concepts.

Outcomes sought:

- provide evidence for module interventions or in-presentation adjustments in light of concerns raised
- pilot an integrated online discussion which will be visible and accessible to other stakeholders such as other modules or Learning Design
- inform future collaborative projects using learning networks to evaluate whether the approach is transferable.

2. Progress in 18J

An online Adobe Connect session facilitated by LD1 took place on October 30th and was followed up with an asynchronous learning network discussion during October and November 2018. The discussion was based around three learning design analytics visualisations that included student workload, activity types and VLE engagement data, all developed for Module S. The learning design student workload mapping data underscored the qualitative feedback from ALs that several blocks were overloaded and fell significantly outside of institutional guidance. There were no identifiable interventions immediately after the initial discussions using the visualisations; instead these yielded a series of issues for further investigation and possible action, which were then managed by the project team until progress could be fed back to all participants. ALs effectively articulated some additional questions plus barriers to their own individual agency in taking improvement actions or changes to teaching practice.

The four issues for further investigation and their respective progress, were:

	Issue	**Possible action**	**Progress**
1.	Workload / content / Tricky Topics / getting behind from early Dec onwards	Signposting most efficient way through module to help students navigate through Blocks, especially if they are feeling pressed for time. Breaks down content into: pre-requisite knowledge and conceptual understanding required to study the Block, key points regularly examined, material that is crucial to	[Module S tutor] has developed signposting materials for Block 9 and 10 as a trial, which were implemented in 18J as separate documents and highlighted in the Block forum and using a news alert. [Module S tutor] is also now working on Block 8, integrating student feedback.

		learning but not directly tested, and material written for interest only. Feedback from ALs and Learning Design that it would be better/easier for students to embed the signposting into module content if possible.	Signposting of all Blocks recommended for 2020 in Module Mid Life Review.
2.	Study behaviour	Find out more re: a) study behaviour online / offline b) study choice motivations before Module S (informed by Study Pathway analysis, see item below) c) reactions to the signposting docs Possible routes to achieve this: Run an RTSF (Real Time Student Feedback) questionnaire to get direct in-presentation feedback from students, tailored specifically to the jointly identified issues. Also ask for volunteers for a follow up online focus group session. MT2 to talk to students informally at the 18J residential school and note their feedback.	RTSF questionnaire was designed and approved by Student Research Project Panel. Live on Study Planner for last two weeks of presentation. 18 responses were received. The follow up focus group ran on 20th June, with 4 student attendees, plus one unable to attend who provided written feedback afterwards. Separate attached document details for the RTSF and focus group feedback and analysis. Variety of feedback re signposts, and not all students found them. MT2 gained useful informal feedback at the residential school.
3.	Pre-requisite knowledge / not being sufficiently prepared for Module S	Get data on previous modules studied. Commission two Study Pathway analysis reports from a STEM Data Wrangler, for 17J and 18J. These reports list all the previous study routes, i.e. modules and presentations, taken by students.	Analysis shows an extremely scattered picture of previous study pathways before Module S, taken over many years. In 18J, for 160 total students there were 71 different pathways. 32% of students (51/160) on 18J took the recommended [prerequisite module 1] – [prerequisite module 2] - Module S path. Focus group feedback suggests that students feel this path did not adequately prepare them, with too much of a 'step up'. Those who have studied A Level Chemistry felt better prepared. ALs have noted a reduction in preparedness year on year. Data provided by Learning Design illustrates a very low rate of interaction with the AYRF quiz.
4.	How can the EAI dashboard better help ALs: confusing analytics due to offline study behaviour?	LD1 to do an analysis using VLE behaviour data in the EAI [Early Alerts Indicator] Dashboard to identify whether a significant number of successful Module S students are studying offline.	Of top 40 students (top 25%, of 160 at the time), only 6 students were identified using agreed parameters for studying 'offline'. Therefore inconclusive but more questions posed for further work if required.

3. Dissemination

The project has been presented by the project team at the eSTEeM conference in May 2019, and by Lesley and [Module S Tutor] at the Horizons in STEM Conference at Kingston University in July. LD1 also facilitated a workshop at the European Distance E-Learning Network (EDEN) Conference in Bruges in June 2019, using the Module S learning design analytics visualisations as a case study. Lesley has just published a work-in-progress paper in the Journal of Interactive Media in Education (JIME) for her PhD research. She also presented at the UFHRD (University Forum for Human Resource Development) at Nottingham Trent in June, in the scholarly practitioner research stream.

If you are interested, all of these items give further background information and several can be found on our eSTEeM project page.

4. Summary of project so far

The project has been able to effectively support the collaborative and equitable identification of issues, and to integrate views on these issues from tutors, the module team and students. The feedback from tutors and students has provided a key part of the evidence for module interventions and adjustments in the Mid Life Review, which was carried out in July 2019. A module re-write is already beginning, supported in part by evidence from the project.

An integrated online discussion has been piloted in the learning network site, which will be visible and accessible to other stakeholders such as other modules. The Learning Design unit have collaborated by providing support for the RTSF questionnaire design and feedback on the signposting material, and we are most grateful for their assistance. We are also very grateful to our eSTEeM project mentor for her support with the questionnaire design.

We would like to record our thanks to [Module S tutor] for all her work in the project, and to the eSTEeM office for all their funding and infrastructure support.

If you are interested in the analysis process, there is additional supporting information in the learning network site. This includes the most recent version of the interactive analysis spreadsheet which underpins the research into the unfolding process of learning how to collaboratively identify issues and make improvements. It codes up, organises and illustrates the qualitative feedback from tutors in a rigorous manner. If you participated, you can be assured that all your comments were recorded and analysed.

5. Evaluation

We would like to carry out an evaluation after everyone has had a chance to reflect on the project progress, especially including your views on this way of working, and to carry out student and tutor evaluations of the signposting interventions. We will then be able to assess whether the approach is transferable to other modules or to inform future collaborative projects using learning networks. If you would like to raise any questions or make observations in the interim, please do email [email addresses inserted].

With our sincere thanks for your participation and interest in this project.

September 2019

Appendix J. Phase 2 Approved RTSF single question questionnaire for Module S before Block 8 - December 2019

See following pages.

REAL TIME STUDENT FEEDBACK

Purpose: "Capturing feedback from students during their study to help shape support or change the students' learning experience"

Title: (module code/presentation date/description	**Module S eSTEeM project Phase 2**
Module Team Chair:	
Module code and presentation:	**Module S 19J**
CAU:	**STEM**

Once you have completed this form please email it to IET-SRPP for Student Research Project Panel (SRPP) approval and copy in:

Introduction to questionnaire:

Dear Module S 19J Student

We are running a trial to introduce 'signposting' material into several Blocks in Module S. This may help you if you need support with the pace and volume of study material. The first trial is for Block 8. Please do have a look at the following short question, and provide us with your feedback. Your responses will help to provide us with a more accurate picture of student concerns during the module presentation, in addition to seeking your views at the end. If you indicate that you are finding the pace rather fast, you will be pointed towards some sources of additional support.

Responding to this question is completely voluntary. Please be assured that your response will be anonymous, and you will not be identifiable at any point. Your response will never affect any of your assessment or examination marks.

Thank you for your feedback, and best wishes from

Module S Module Team

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
Q1. Pace and volume of study material so far. (Note that this is a repeat of the question and development of the responses, from Q2 in the 18J RTSF questionnaire).	**How are you feeling so far about the pace and volume of study material in Module S, compared to your expectations before the module started?** Please choose *one* of the three listed options:	Block 8 19J: 9th – 23rd Dec.	3 options: I'm finding it to be paced rather fast and would like more time to consolidate concepts.	**Feedback response to first option:** We're sorry to hear this but appreciate the feedback. Here are some options that you can try: 1. Have a look at this signposting document, [insert link to document which has been included on Block 8 Study Planner, or in the Block 8 Forum]. This will give you more information about: • prerequisite knowledge/conceptual understanding required to study the Block • key points regularly examined • material that is crucial to learning but not directly tested • material written for interest only. 2. Try having a chat to the 'Study Buddies', in the dedicated forum on the module website, These are all students who have successfully studied Module S before and can encourage you that there is an end in sight!!	**Intended student behaviour:** This question aims to provide a more nuanced response to student and tutor concerns regarding pace and volume of material, to acknowledge those concerns *during* as opposed to *at the end of* the presentation, and to provide students with a list of possible actions including using the new trial Block 8 signposting document, which has been prepared for 19J. At the end of 18J, we ran the RTSF questionnaire plus an online follow-up focus group session with 5 students. One aspect of the feedback was that some students didn't find the signposting material, even though it was publicised via a News item, and posted in the Block 8 forum. A single question RTSF in the Study Planner is a very prominent way to advertise the signposts and reduce the likelihood of them being missed, before they are fully integrated into module materials.

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
				3. Talk to your tutor and let them know how you are feeling.	**Success measure and method:** Pace and volume of material is a major and ongoing issue in Module S. Its effects may be becoming more pronounced in combination with other evolving issues such as [lack of] student preparedness. The feedback from 18J students, achieved by the RTSF questionnaire and follow-up online focus group session, helped to provide key evidence for the module mid-life review, and for a future module re-write. We now want to provide the students with an intervention at one of the 'pressure points' that they identified in 18J, namely '*Materials'* [Block 8] and '*Just before Christmas "ready to quit" '.* We are considering another RTSF question after Block 8, to obtain and evaluate student feedback on the usefulness and presentation format of the signposting document before the next planned signposting intervention for Blocks 9 and 10, which were also
			I'm finding it to be paced about right and have enough time to understand and practice concepts.	**Feedback response to second option:** That's great to hear that you feel the pace is about right so far. If you do start to get concerned as the module progresses, then try having a chat to the 'Study Buddies' in the dedicated forum on the module website. These are all students who have successfully studied Module S before and can encourage you that there is an end in sight!! Also talk to your tutor and let them know how you are feeling.	
			I'm finding I have more than sufficient time to understand and practice concepts.	**Feedback response to third option:** Great stuff. If you do start to get concerned as the module progresses, then try having a chat to the 'Study Buddies' in the dedicated forum on the module website. These are all students who have successfully studied Module S before and can encourage you that there is an end in sight!! Also talk to your tutor and let them know how you are feeling.	

Question Name	What is the question?	Go live dates (Start and finish dates for questionnaire)	Question answer options (e.g. Student selects multiple choice option if applicable)	What is the response to the students selected answer: A: any automated response to student? B: Intended intervention?	Intended student behaviour and how will it be measured? (e.g. VLE engagement data, TMA submissions etc.)
					trialled in 18J. [Note that the Blocks no longer run sequentially. Block 9 is scheduled 9th – 29th Feb, and Block 10 for 10th – 25th April]. This supplementary question after Block 8 could be used to further refine the signposting format and presentation if necessary, before Blocks 9 and 10 are presented. We will make another SRPP application if we wish to go ahead with this question, within an unfolding and experimental process where we are learning as we go along.

Appendix K. Phase 2 Final project update document – June 2020

See following pages.

Using technology-enabled learning networks to drive module improvements in STEM

eSTEeM final project update for ALs, the module team and other stakeholders – June 2020

This is an update for you all on the eSTEeM project co-led by MT2 and Lesley Boyd. LD1 ,Senior Manager Leaning and Teaching in STEM has also been a team member. This project built on the earlier eSTEeM Tricky Topics project. It is a collaboration between the STEM faculty, and Lesley's PhD research on using 'learning networks' within the OU for collaborative problem solving and integration of views from tutors, module teams and students.

1. **Aims and outcomes sought**

   The initial aim of the 18J project was to engage ALs with learning design analytics visualisations, especially in the light of concerns and the issues which were collaboratively identified in the Tricky Topics project. These included pace and volume of material, student preparedness and knowledge at the start of the module, overall study time spent including whether studying online or offline, and opportunity for consolidation or practice of concepts.

   Outcomes sought:

   - provide evidence for module interventions or in-presentation adjustments in light of concerns raised
   - pilot an integrated online discussion which will be visible and accessible to other stakeholders such as other modules or Learning Design
   - inform future collaborative projects using learning networks to evaluate whether the approach is transferable within the OU and further afield.

2. **Progress in 18J and 19J**

   After the learning network online discussion facilitated by LD1 in early 18J, based on the three learning design analytics visualisations, the project team managed four separate actions. The learning design mapping data had indicated that several Blocks were overloaded. This underscores feedback from tutors that pace and volume of material and student preparedness remain significant and ongoing challenges, and a reduction in preparedness year on year.

   The project has now implemented trial signposting material in 18J and 19J, for three 'pressure point' Blocks - 8, 9 and 10. Signposts break down content into: pre-requisite knowledge and conceptual understanding required to study the Block, key points regularly examined, material that is crucial to learning but not directly tested, and material written for interest only. They have been developed by [Module S tutor] in conjunction with the module team.

   Signposts are not yet integrated into the module materials, but were highlighted to students for Block 8 19J via a single question RTSF which asked them about their experiences of pace and volume of material, and offered support options accordingly. The invitation message communicated to students that this issue is frequently experienced in Module S, that they are not alone in their perception, and that the module team is trialling the signposts as additional help. The other support options highlighted were the Study Buddies, and speaking to their tutor. The results were:

Results from 19J RTSF before Block 8		
69%	(27/39) -	felt paced rather fast; would like more time to consolidate
26%	(10/39) -	felt paced about right; had enough time
5%	(2/39) -	felt they had more than sufficient time

Another RTSF was run just before Block 10, to further highlight the Block 10 signposting material. The aim was once again to acknowledge students concerns and how they might be feeling, to support the current cohort during the presentation, encourage them that an end is in sight, and evaluate from the students' point of view. There were 25 responses overall. The results were as below; of those who saw and read the signposts, on a scale of 1 to 5:

Question	Scale 1 (not very helpful) to 5 (very helpful)
How helpful did you find the signposting materials for Block 8? (N=21)	Average rank 4.0
How helpful did you find the signposting materials for Block 9? (N=20)	Average rank 3.8

However some students are still not finding the signposts when they are advertised in Block forums and via News items, and some are not reading them all the way through.

Some highlights from the free text responses were:

Example free text responses from 19J RTSF before Block 10
'I found the Signposting for Block 8 very helpful but missed the ones for Block 9 as I was behind schedule and trying to catch up. They would be much more helpful posted in the Study Guide for the block'.
'I found the signposting material very useful, especially because I was falling behind in December. I didn't see the material until I was already partially through block 8 - probably my own fault for not reading the forum more frequently. Perhaps the signposting material could be highlighted a bit earlier, in an email from our tutors? Thanks!'
'Easy to read. Clear and concise. I think it's useful as a guide by showing which areas to cover when revising for exams and tmas'.
'Only suggestion would be that similar signposts be made available for the organic topics too!'
'Great idea and I felt I should have made more use of them! I probably studied these blocks in the same way I did the others, and then used the signposting materials retrospectively to make sure I had grasped the most important parts, rather than in advance to prioritise certain areas.'

There were two other additional free text responses regarding the jump from [prerequisite module 2] to Module S. All the relevant data and feedback from this project has now been shared with the [prerequisite module 2] module team. A [prerequisite module 2] eSTEeM project has identified that [prerequisite module 2] pass students are almost twice as likely to withdraw from Module S as from any other level 2 module. The [prerequisite module 2] module team have been looking closely at the chemistry option, with a new 'Taking it Further' activity.

This is related to previously reported feedback from the Module S student follow up group at the end of 18J, that they felt this path did not adequately prepare them, with too much of a 'step up'. Those who have studied A Level Chemistry felt better prepared. However Study Pathway Analysis reports showed an extremely scattered picture of previous study pathways before Module S, taken over many years. In 18J, for 160 total students there were 71 different pathways. Only 32% of students (51/160) on 18J took the recommended [prerequisite module 1] + [prerequisite module 2] - Module S path.

3. **Summary of project**

The project has been able to effectively support the collaborative and equitable identification of issues, and to integrate views on these issues from tutors, staff tutors, the module team and students. The feedback from tutors and students formed a key part of the evidence for module interventions and adjustments in the Mid Life Review, which was carried out in July 2019. A module re-write is already beginning, and work from this project is helping to feed into it.

A signposting intervention has been introduced and evaluated positively with students, who may find the materials helpful when they are feeling under time pressure. [Module S tutor] will now be working on signposts for Block 13 and Block 5, over the summer.

4. **Lesley's PhD work**

Lesley has been busy writing up her thesis and also had a work-in-progress paper published last September at https://jime.open.ac.uk/articles/10.5334/jime.529/.

Lesley also recently made a poster which is a personal and chatty account of the research, and is attached to this report. You may like to read more about the project research methodology and the associated grounded theory which is being produced as a result of the PhD research.

5. **Evaluation and thanks**

We would like to thank everyone for their involvement, ideas and feedback. If you participated, you can be assured that all your comments were recorded and contributed towards the entire process. The integration of contributions has achieved improvement impact for Module S.

We would be most grateful for your evaluation and reflections on the project. If you would like to do so, please complete the attached evaluation sheet and return to MT2 [email address inserted].

We would especially like to record our thanks to [Module S tutor] for all her hard work and contribution in the project, and once again to the eSTEeM office for all their funding, friendly encouragement and infrastructure support.

June 2020

Appendix L. Phase 2 Final project evaluation sheet

See following pages.

Dear

Using technology-enabled learning networks to drive module improvements in STEM

As this project, which you kindly contributed to at various points over the last couple of years draws to a close we would welcome feedback on your involvement, for which we are very grateful - this will form part of our evaluation for our STEM scholarship centre eSTEeM who funded it.

> Below are four short reflective questions – if you do have a moment to answer/comment on some/all of these that would be much appreciated and return to Rob and/or Lesley [email address inserted] by the end of July if possible.

As a reminder - you may recall the project built on the earlier 2017 **Tricky Topics** project and included:

An online workshop (Oct 2018) led by LD1 (STEM) on learning design analytics visualisations, in particular identifying concerns regarding:

- pace and volume of material, student preparedness and knowledge at the start of the module,
- overall study time spent including whether studying online or offline, and
- opportunity for consolidation or practice of concepts.

And the subsequent actions and interventions:

- Preparation of **signposting materials** for three Blocks and used in the 19J presentation
- Student questionnaire and follow up focus group (June 19)
- Student feedback on pace and volume of material and highlighting signposting at three points during the 19J presentation.

For more details, development of this project over the 18J and 19J presentations is covered in Lesley's report and poster attached. The previous Sept 19 progress report is also attached if you want a reminder.

So, here are the questions:

1. Personal reflections

What has been your experience of this Module S eSTEeM project? If you participated, how did you find it? Is there anything you would like to highlight to us, positive or negative?

Did you learn more about Module S, or did it help you build up a better picture about it?

Please feel free to answer whether or not you participated in the discussions and workshops.

2. Module reflections

Do you think this project was beneficial to Module S? Please explain further if you wish.
Do you have any comments or feedback about the signposting interventions?

3. Reflections on wider transferability

In the OU, it often reported that there is a perennial need to close a feedback loop between module tutors and campus- based teams, to develop a joint understanding of teaching and learning design challenges, and to put tutors as close as possible to the development of solutions.

Could you please reflect on whether this project facilitated your contribution in a collaborative and equitable way, to try to achieve the above?

4. Any other comments?

Is there anything else you would like to comment on that would help us to implement or improve projects like this in the future? Or any further questions you would like to ask?

Thanks very much for your thoughts, which will help us to evaluate the project and its transferability to other modules, other educational contexts or further afield.

Regards

Appendix M. List of conference presentations

- OU Professional and Digital Learning (PDL) Research Group, July 2021. Lesley Boyd: presentation on completion of the PhD research

- OU eSTEeM conferences 2021. Lesley Boyd: presentation on project completion

- OU WELS PGR Conference, 2021 and 2022. Lesley Boyd: presentation on the PhD research and project progress

- OU STEM Teaching Conference, Feb 2020. LD1 and MT2 (team member and co-leader): Project update focussing on learning design analytics

- OU Module Team Chair events, March 2019 and 2020. MT2 (co-leader): presentation on project from MTC perspective 'Working collaboratively in teams at the OU'

- Learning Design Cross Institutional Network (LD-CIN) Dec 2019. Lesley Boyd and LD1: presentation on the PhD research and eSTEeM project with learning design analytics workshop

- Work-in-progress published paper:
  Boyd, L. (2019) Using Technology-Enabled Learning Networks to Drive Module Improvements in the UK Open University. Journal of Interactive Media in Education, 2019(1), p.16. DOI: http://doi.org/10.5334/jime.529

- University Forum for Human Resource Development (UFHRD) 20th Anniversary Conference, Nottingham June 2019. Lesley Boyd: presentation on 'Using technology-enabled learning networks to drive module improvements in the UK Open University'

- Horizons in STEM Conference, Kingston University, July 2019. Lesley Boyd and [Module S tutor]: presentation on 'The search for collaborative improvements: using learning networks and learning analytics to drive module improvements in STEM at the Open University'

- OU eSTEeM conferences 2019. Lesley Boyd, MT2 and LD1: presentation on project progress

- OU Open TEL Show and TEL conferences 2018-2020. Lesley Boyd: presentations on research and project progress

- OU CALRG (Computers and Learning Research Group) conferences 2016-2022. Lesley Boyd: presentations on research and project progress