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Craft and the Becoming of Agency: Developing EMBER-S³ to Illuminate Pedagogical Potential

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**Craft and the Becoming of Agency: Developing EMBER-S³ to Illuminate Pedagogical
Potential**

Matthew Ciaran Briggs

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam University
for the degree of Doctor of Education

January 2026

Candidate Declaration

I hereby declare that:

1. I have not been enrolled for another award of the University, or other academic or professional organisation, whilst undertaking my research degree.
2. None of the material contained in the thesis has been used in any other submission for an academic award.
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Ethics review reference number	Title of research study	Approval date	Date of any post-approval amendments (if applicable)
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Abstract

'Craft and the Becoming of Agency: Developing EMBER-S³ to Illuminate Pedagogical Potential'

Craft has long served as a profound mode of learning and becoming. This thesis investigates how craft pedagogy shapes what I conceptualise as 'the embodied becoming of agency', with a central analytic focus on the cultivation of executive functions (EFs) within sensory–modal–spatial engagements in situated craft practice. It introduces EMBER-S³: Embodied Multimodal-Based Experiential Research (Sensory, Spatial, Situated), as a bespoke hybrid framework designed to illuminate these embodied dynamics in ways that are analytically visible and pedagogically meaningful.

The study was situated within a specialist Further Education SEND provision in the UK, focusing on a green-woodworking session involving a student and an experienced craft practitioner (tutor) whose guidance formed an integral part of the pedagogical interaction. Adopting an interpretivist stance, the study develops and validates EMBER-S³, integrating phenomenology, multimodality, ethnographic resources, and affordance theory. The framework is applied in an ethnographically informed case study centred on a green woodworking pole-lathe (a body-powered device that spins wood back and forth so it can be shaped with hand tools) session, combining sensory-first multimodal matrices, annotated video-still storyboards, and sensory–modal density circles, triangulated with stimulated-recall interviews. This design enables fine-grained analysis of gesture, gaze, posture, movement, materiality, and spatial arrangements, and their orchestration toward increasingly complex actions, practices and EF capacities (e.g., working memory, initiation, self-monitoring, inhibition).

Analysis shows the workshop environment functions as an active pedagogical space rich in affordances, scaffolding autonomy and EF development through iterative body–material–space feedback loops. Student–tutor interactions leverage multimodal cues (gesture, gaze, rhythm, haptic guidance) to foster initiation, confidence, and agency. Student–material engagements reveal tactile, proprioceptive, and auditory feedback as real-time regulators of performance, supporting EF capacities, including: planning, initiation, working memory, inhibition, self-monitoring, and problem-solving, during skill acquisition on the pole lathe. Collectively, the study positions craft as a multimodal, embodied, and agentic practice, illuminating the pedagogical potential of craft to cultivate EFs and agency in inclusive education.

Methodologically, the thesis offers EMBER-S³ as a transferable tool for agency-centred pedagogy, capable of illuminating otherwise invisible sensory–modal–spatial dimensions of learning in craft and other body-based educational or therapeutic contexts. Substantively, it articulates the pedagogical affordances through which craft fosters executive functioning and agency, advocating a world-centred, embodied education that challenges outcome-driven models and supports person-centred flourishing.

Keywords: Craft; Multimodality; Embodiment; Sensory–modal–spatial synergy; Executive Functions; Agency; Affordances; Pedagogy; EMBER-S³.

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Publications, Outputs and Practice Impact Arising from This Research

Elements of the research presented in this thesis have been disseminated through research projects, conference activity, publications, and professional and pedagogical practice.

- **Erasmus+ Research Project (Project partner and chapter contributor)**

Briggs, M. (2024). Craft-based special education at Ruskin Mill Trust (pp. 11–12); Uniqueness of place in curriculum design (p. 23); Growing meaningful relationships (p. 24); Embodiment of self through the human senses (pp. 118–120). In M. Clemetsen, J. Barane, & A. Hugo (Eds.), *Cultural Innovation through Ecopreneurship: Handbook of Principles and Practices*. Erasmus+ / CULINECO. <https://culineco.alta.is/>

- **International Literacies Conference (2023; 2024)**

Paper presentation (2023): *Forging the self, through the pedagogical potential of craft*. Awarded the Postgraduate Research Prize. Workshop (2024): *The pedagogical potential of craft: An invitation to explore how we encounter and form meaningful dialogues between; self, world and others*. This workshop piloted and applied the sensory approach developed through the research. <https://sheffield.ac.uk/social-sciences/news/sheffield-literacies-and-language-conference-2024>

- **Biennial International Conference for the Craft Sciences (BiCCS), 2025**

Briggs, M. (2025) *The pedagogical potential of craft: A multimodal exploration of the embodied becoming of agency*. Extended abstract and paper presented at the Biennial International Conference for the Craft Sciences. Version 1. <https://biccs.dh.gu.se/2025/2025-60/1>. This conference paper informs a forthcoming special issue of *FormAkademisk* (anticipated 2026): www.formakademisk.org

- **Practice and Teaching Impact**

Findings from this research have informed updates to an organisational practitioner guide (<https://rmt.org/about-us/publications/>); contributed to MA PSTE course documentation (<https://rmcp.org.uk/ma-pste/>), teaching materials and lectures; and have been embedded within The Pedagogical Potential of Craft training programme (<https://www.thefieldcentre.org.uk/the-pedagogic-potential-of-craftwork>) and wider staff development focused on fostering learner agency and executive functioning through craft-based practice.

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Key Concepts and Terms

Affordance

Action possibilities offered by the environment, tools, and materials, perceived and enacted by learners. Affordances are relational and underpin agency formation in craft contexts (Gibson, 1979; Gibson & Pick, 2023).

Agency

The capacity to act intentionally and purposively within social and material contexts, including decision-making, self-regulation, and interdependence (Bandura, 2001; Emirbayer & Mische, 1998). In this study, agency is understood as an emergent, embodied, and relational process that develops through sensory–modal–spatial engagement with materials, environments, and others, reflecting the intercorporeal and ecological nature of lived action (Fuchs, 2017) and the dynamic, unfolding becoming of persons-in-relation (Ingold, 2013).

Becoming

A dynamic process of self-formation and transformation through embodied engagement with the world, materials, and others (Ingold, 2013; Barad, 2007).

Capacities

Emergent, dynamic potentials for action that arise through embodied engagement with materials, environments, and others. Capacities are not fixed internal traits but relational possibilities that unfold through doing, sensing, and interacting. In craft pedagogy, capacities develop as learners attune to affordances, coordinate multimodal actions, and participate in shared activity. This study uses the term to describe how learners' action-possibilities expand through situated practice, forming the conditions for agency, self-regulation, and EF processes to take shape (Ingold, 2013; Barad, 2007; Fuchs, 2017).

Executive Functions (EFs)

A set of interrelated regulatory processes that support purposeful, goal-directed, and adaptive engagement, including working memory, planning, inhibition, cognitive flexibility, initiation, and self-monitoring (Diamond, 2013; Zelazo, 2015). While used in varied, and

sometimes contested ways, this study draws on EFs as a pragmatic lens for understanding how embodied craft practice can foster agency and self-regulation.

Embodiment

The principle that cognition and learning are rooted in the sensing, moving body, and enacted through dynamic interaction with environments and others (Merleau-Ponty, 1945/2012; Fuchs, 2017).

4Es of Embodiment

A contemporary framework for understanding cognition and learning as distributed processes: Embodied (rooted in the sensing, moving body), Embedded (situated in material and cultural contexts), Enactive (knowledge enacted through purposeful engagement), and Extended (cognition extended through artefacts and tools) (Groth, 2024).

Modal Density and Complexity

Analytic constructs referring to the intensity of one mode (density) and the co-presence of several modes (complexity) during interaction, useful for identifying critical pedagogical moments in craft learning (Norris, 2004).

Multimodality

The integration of multiple semiotic resources: gesture, gaze, posture, spatial arrangement, material engagement, within communication and learning. In craft pedagogy, multimodality foregrounds embodied meaning-making beyond linguistic modes (Jewitt, 2014; Kress, 2010).

Sensory–Modal–Spatial Orchestration

The dynamic interplay of sensory modalities (touch, proprioception, vision, hearing), semiotic modes (gesture, gaze, posture), and spatial arrangements during embodied learning. Central to the EMBER-S³ framework (Jewitt et al., 2025; Norris, 2004).

Intersubjective Scaffolding

Pedagogical support provided through multimodal cues: gesture, gaze, rhythm, haptic guidance, within tutor–student interactions, enabling learners to enact agency and develop EF capacities (Vygotsky, 1930–1934/1978; Doak, 2018).

Practical Skills Therapeutic Education (PSTE)

An educational approach integrating craft, ecology, and therapeutic principles to foster holistic development through “hand, head, and heart” (Gordon & Cox, 2023).

Self-Generated Conscious Action (SGCA)

The ability to initiate purposeful action out of intrinsic motivation, aligned with educational aims of freedom and responsibility (Gordon et al., 2012; Gordon & Cox, 2023).

Chapter 1

1.0 Introduction to Chapter 1

Craft has shaped human existence for millennia, serving not only as a means of survival but as a profound mode of learning, meaning making, and becoming. This study begins from the premise that craft is more than a technical skill; it is an embodied, multimodal practice through which individuals engage with materials, environments, and others in ways that cultivate agency, autonomy, and self-directed purpose. In an era where education is increasingly dominated by abstract, outcome-driven models, this research foregrounds the pedagogical potential of craft as a vehicle for holistic development. By exploring how sensory–modal–spatial engagements within craft-based education foster executive functioning and agency, the chapter introduces the rationale for the study, situates it within personal and professional contexts, and outlines the conceptual and methodological foundations that guide the inquiry.

1.0.1 Structure of the Chapter

This introductory chapter establishes the foundation for the study by outlining its rationale, research questions, and objectives, and situating the inquiry within personal, professional, and theoretical contexts. It begins by presenting the background and rationale for exploring the relationship between craft and the embodied becoming of agency, highlighting the methodological and conceptual gaps that the study addresses. It then introduces the research questions, aims, and objectives, tracing their evolution and refinement in dialogue with literature, theory, and emerging data. Following this, I explain the overarching research framework in Section 1.3 (figure 1) and clarify how its layered design informs the organisation of the thesis, before providing an overview of the thesis structure in Section 1.4. Section 1.5 offers a concise overview of how the study addressed the refined research questions and objectives, and Section 1.6 reflects on my positionality and reflexivity, ensuring transparency regarding the values and experiences that shaped the design and interpretation of the study. Collectively, these sections prepare the reader for the theoretical and methodological foundations developed in Chapters 2–4 and the multimodal analysis presented in Chapters 5–7.

1.1 Introduction to Thesis

This thesis explores the relationship between craft and the embodied becoming of agency, situating the study within both personal experience and broader theoretical contexts. This section provides the rationale for the research, outlines the gap in existing knowledge, and explains the approach adopted.

1.1.1 Background and Rationale

Craft has been seen as a defining feature of human existence, shaping how we interact with and adapt to our environments (Ingold, 2013). Human practices such as craft are inseparable from the material and ecological worlds we inhabit (Haraway, 2016; Bennett, 2010). Through making, humans have negotiated their place in the world, participating in the mutual co-creation of entangled agencies, influencing both internal dimensions of consciousness and external engagements with material reality, in ways that resonate with Barad's (2007) notion of intra-action. These processes have guided collective endeavours and individual freedoms across time (Ingold, 2000).

My own life has been profoundly shaped by craft. From childhood through professional practice and parenthood, making has offered a way of understanding and engaging with the world. As a neurodivergent individual (dyslexic), I came to realise that my ways of learning and making meaning often differed from those around me. Traditional modes of learning, words, books, classrooms, felt disconnected from the rich, interconnected nature of lived experience. In contrast, crafting in diverse environments, wastelands, woodlands, workshops, provided a sense of agency and belonging. These experiences fostered my capacity to seek, question, and co-create, grounding my belief in the transformative potential of craft.

1.1.2 Professional and Personal Context

As an educator and craft practitioner, I have worked with learners aged three to seventy-three across early years, school, further and higher education settings, locally and internationally, including many neurodivergent learners and learners with Special Educational Needs and Disabilities (SEND). These learners often engaged with the world through embodied, multimodal practices. Craft emerged as a powerful context for cultivating agency, enabling learners to express, adapt, and flourish. This reinforced my conviction that craft holds significant pedagogical potential.

Parenthood deepened this perspective. Observing the emergence of consciousness from birth illuminated the dynamic interplay between person and world in shaping agency. It is no coincidence that this research began alongside the birth of my first child. My children and family, alongside colleagues and students, have deeply influenced this journey, a debt of gratitude I acknowledge here.

1.1.3 Research Gap and Purpose

While existing literature affirms the educational and developmental value of craft, a gap remains in connecting theory, practice, and lived experience to understand how craft contributes to the embodied becoming of agency. There is currently no established methodology that integrates these dimensions, and limited research involving craft practitioners, neurodivergent learners and learners with SEND, and practitioner-researchers in this context.

This study addresses these gaps by developing a hybrid, multimodal methodology and presenting findings through an ethnographically informed case study. The research offers a nuanced exploration of how agency emerges and evolves through craft, contributing to both theoretical understanding and practical application.

To situate this contribution clearly, it is important to outline how agency is conceptualised within this thesis. Agency is understood not as a fixed trait but as an emergent, embodied and relational process that unfolds through ongoing sensory–modal–spatial engagement with the world. It reflects a dynamic mode of becoming, shaped through iterative feedback

loops between body, material, environment and others, rather than a purely internal capacity or a marker of individual independence. This view aligns with the EMBER-S³ properties by emphasising that agency arises through situated, multimodal action (gesture, gaze, movement, haptics, spatial orientation) through which learners enact intentionality, regulate impulses, and cultivate practical judgment. Within this study, agency is therefore treated as a lived, emergent phenomenon, continually co-constructed through embodied participation in craft practice and supported by pedagogical, material and ecological affordances.

1.2 Research Questions, Aims and Objectives

This section traces how the research questions, aims, and objectives evolved over the course of the study, culminating in the title: Craft and the Becoming of Agency: Developing EMBER-S³ to Illuminate Pedagogical Potential. It first presents the original research design, then explains the rationale for its refinement in dialogue with literature, theory, and data, and finally sets out the refined questions and a brief overview of how the study addressed them.

1.2.1 Original Research Design

Original Research Question

What pedagogical opportunities arise from engaging in craft for SEND 16–25 students?

Aim

Observe and analyse the pedagogical affordances of holistic craft practices using a hybrid multimodal methodology.

Objectives

Identify and research models of skills/capacities that may be facilitated through craft processes.

Define and create an appropriate method of observation and analysis (a hybrid multimodal methodology) for this study, in order to observe how:

- a. movements contribute to the transmission and acquisition of skills/capacities and meaning-making;
- b. the materiality of the craft environment, workshop, and craft materials plays pedagogical roles;
- c. student–tutor relationships and scaffolding shape pedagogical processes;
- d. different crafts provide distinct pedagogical affordances.
- e. Analyse whether and how the above forms of scaffolding and relationships facilitate the development of the identified capacities.

1.2.2 Evolution of Focus and Rationale

As the study progressed, the research design was refined through iterative engagement with the literature, theoretical frameworks, and data generated via the hybrid multimodal approach. Although the research was conducted with SEND learners, the primary contribution of this thesis lies in the development of EMBER-S³ and in advancing theoretical and pedagogical understandings of embodied agency. These contributions extend beyond SEND contexts, and therefore the revised title reflects the broader relevance and applicability of the work. Given the broader relevance of the phenomena under investigation to human learning and experience, the specific SEND reference was removed from the title, with the scope and reasoning for this decision articulated within the thesis.

While the research was situated within a SEND provision, SEND functions here as the context rather than the construct under investigation. The dynamics explored throughout the thesis (embodied feedback loops, spatial orientation, sensory–modal–spatial orchestration, and the cultivation of agency) are not SEND specific phenomena but universal features of human learning. The SEND context amplified and clarified these dynamics, making them analytically visible, yet the methodological and conceptual contributions of EMBER-S³ do not rely on diagnostic categories and are applicable across a wide range of craft-based and body-based learning environments. For this reason, retaining SEND in the

title would have artificially narrowed the perceived scope of the framework, misrepresenting its broader relevance to embodied pedagogy and multimodal learning.

In response to Objective 1, dialogue between existing scholarship and the emerging dataset sharpened the analytical lens onto executive function (EF) and agency as central capacities cultivated through craft. The principal question therefore developed into; How does craft shape agentic becoming? This was expanded to: How do the elements of pedagogical craft practice, its materiality and our sensory–modal–spatial engagements, shape the cultivation of executive functioning, and agency?

Initial analysis suggested that a range of executive functions were being cultivated concurrently through the learning and enactment of craft actions and skills. These functions appear integral to the emergence of agency, fundamental to human development and experience, and align with both educational aims and SEND purposes (see Chapters 2 and 3). The inquiry then moved from that they occur, to how they occur. The hybrid multimodal analysis and transcription, supported by relevant literature (see chapter 2) and theory (see chapter 3), indicated that sensory–modal–spatial dynamics are crucial in enabling the actions and capacities (EFs) required to learn, enact, and reflect upon craft skills. The focus thus narrowed to the roles of sensory–modal–spatial interactions in affording executive functioning and agentic acts.

In response to Objective 2, the study designed, explored, and formalised a unique hybrid multimodal methodological framework (see chapters 4 and 5): EMBER-S³ (Embodied Multimodal-Based Experiential Research - Sensory, Spatial, Situated). This framework constitutes a key methodological contribution and provided the analytic means to address Objectives 2a–d and Objective 3. However objective 2.d was dropped due to the thesis scope and limitations and refined focus (but later discussed in chapter 7 in relation to future directions for research).

1.2.3 Refined Research Questions, Aims, and Objectives

Refined Overarching Title

Refined Main Research Question (RQ)

How does craft shape agentic becoming?

Expanded RQ

How do the elements of pedagogical craft practice, its materiality and our sensory–modal–spatial engagements, shape the cultivation of executive functioning, and agency?

Refined aim:

To investigate how holistic craft-based education, through its materiality, pedagogy and the individual’s sensory–modal–spatial engagements, contributes to the cultivation of executive functioning and agency.

Refined objectives:

1. Design and validate a hybrid multimodal methodology (EMBER-S³) that integrates sensory, spatial, and situated dimensions for analysing craft-based pedagogy and its materiality.

2. Apply the methodology to a case study of a pole-lathe craft session to analyse how the following (a, b, c) afford and shape sensory-modal-spatial engagements, executive functioning and agency.
 - A. the workshop environment
 - B. the student–tutor interactions
 - C. the student–materiality interactions
 - D. Evaluate how these affordances align with Student D’s Education, Health and Care Plan (EHCP) aspirations and needs

3. Interpret and synthesise findings to identify and articulate the pedagogical affordances of craft for fostering executive functions and agency and the broader implications for theory and practice.

4. Highlight how the hybrid multimodal methodology (EMBER-S³) can be adapted and applied in other contexts.

These objectives operationalise the main research question by focusing on the phenomena (materiality, pedagogy, sensory–modal–spatial engagements) identified in the expanded RQ. Objectives 1 and 2 address the methodological and analytic requirements for exploring these phenomena, while Objectives 3 and 4 extend the findings to pedagogical implications and methodological transferability.

1.2.4 Rationale for Aims and Objectives

There was no existing research framework or methodology capable of observing, analysing, and foregrounding the sensory–modal–spatial dimensions of craft-based pedagogy. To address this gap, this study developed a bespoke hybrid multimodal methodology (outlined in Chapters 4 and 5), representing a significant methodological contribution to embodied multimodal enquiry (Groth, 2017; Nimkulrat & Groth, 2024).

The overarching intention behind the aims and objectives is to illuminate and evidence the pedagogical potential of creative, practical, and body-based education. Such approaches enable situated engagement between self, world, and others, fostering meaningful connections, belonging, purpose, and self-generated agency (Biesta, 2021; Gordon & Cox, 2023). These modalities are often marginalised in favour of policy-privileged subjects (e.g., Mathematics and English). By making these embodied modes of learning visible and legible through rigorous analysis, this study seeks to provide evidence that challenges reductive educational priorities and supports a more balanced curriculum (Groth & Gulliksen, 2024).

The creation of the hybrid methodology offers a transferable tool for educators and researchers to expand the use of creative, embodied practices in diverse contexts in order to reveal what these practices afford for human development and their value for individual and collective flourishing (Huotilainen et al., 2018; Mäkelä, 2007). A key principle underpinning the methodology is the collaboration and empowerment of student and tutor voices, ensuring that pedagogical insights are co-constructed (Gordon & Cox, 2023). While

fully emancipatory research may not always be feasible, this study strives for approaches that are practical, inclusive, and widely applicable to benefit the greatest number of people.

1.2.5 Field Site and Context of the Study

The research is situated within a specialist Further Education college in the UK offering a predominantly holistic craft- and land-based curriculum underpinned by Practical Skills Therapeutic Education (PSTE). Grounded in inclusive principles, this approach supports learners across diverse profiles, neurodivergent, neurotypical, and SEND, by nurturing individual aspirations, freedoms, and holistic development. This setting provides a rich environment for examining how craft-based pedagogical practice, and its material–sensory–spatial engagements, contribute to the cultivation of executive functioning and agentic becoming. Further detail on the field site’s context, demographics, and educational setting is provided in Section 5.1, where the specific features of the provision, the workshop environment, and its pedagogical practices are discussed in greater depth. While the research was situated within a specialist SEND context, its primary contribution lies in developing EMBER-S³ and advancing theoretical and pedagogical understandings of embodied agency. These insights have broad applicability across diverse educational contexts, which is reflected in the revised title and its emphasis on inclusive, agency-centred pedagogy.

1.3 Introduction to the Research Framework

Figure 1 Research framework

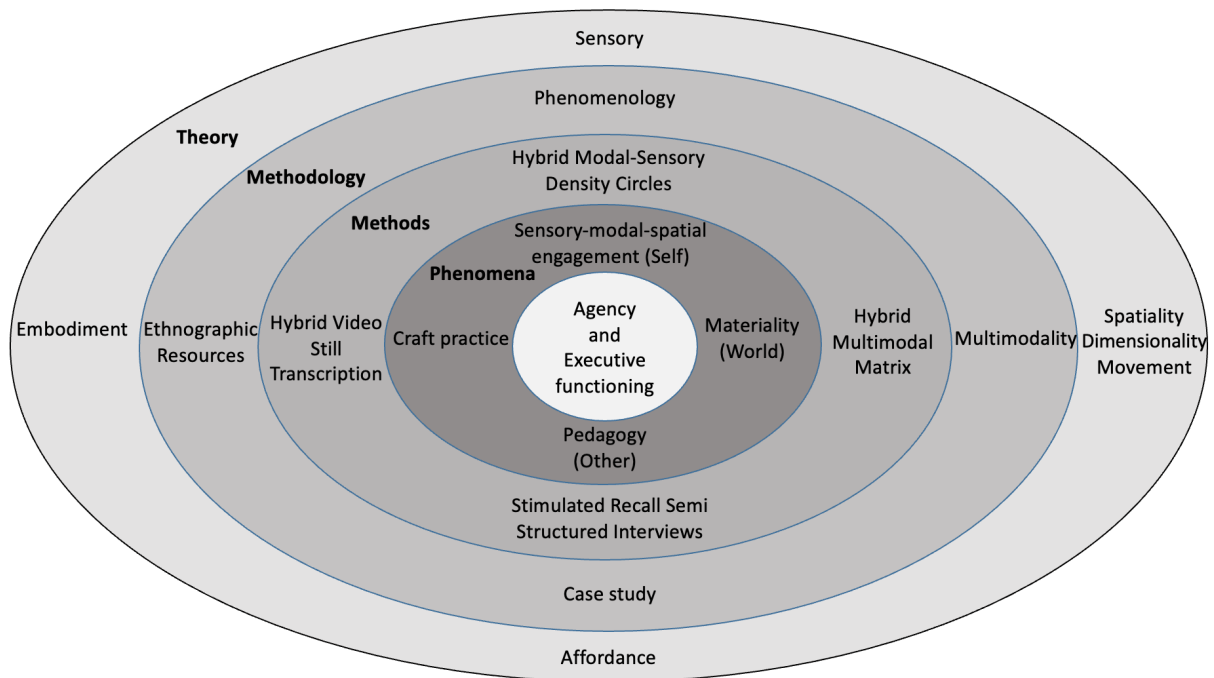


Figure 1 above illustrates the research framework developed for this study, which provides a layered conceptual and methodological structure for investigating the embodied, multimodal processes underpinning agency and executive functioning within craft-based pedagogy. At its centre, the framework positions agency and executive functioning as the core phenomena under study. Surrounding this are concentric layers that represent the interconnected dimensions of the research design: phenomena, methods, methodology, and theory.

The inner layers foreground the immediate phenomena of interest, craft practice and its sensory–modal–spatial engagements, alongside materiality and pedagogy. Moving outward, these are examined through methods such as hybrid video-still transcription, multimodal matrices, modal-sensory density circles, and stimulated recall interviews. The methodological layer foregrounds how this is supported by ethnographic resources, case study design and phenomenology and multimodality, which also inform and justify the study’s epistemological stance. The outermost theoretical layer situates the study within broader theoretical constructs, integrating embodiment, affordance theory, movement and

sensory integration, providing the analytic lens for interpreting interactions between self, world, and others.

This layered design demonstrates how theory informs methodology, which in turn shapes methods and analytic focus. By synthesising these dimensions, the framework enables a holistic inquiry into how sensory–modal–spatial orchestrations within craft environments afford opportunities for agency formation and the development of executive functions. It also serves as a visual representation of the study’s hybrid approach, illustrating the synergy between theoretical foundations and practical tools that underpin the EMBER-S³ framework.

Having introduced the research framework and its layered design, it is helpful to provide readers with a clear roadmap of how these conceptual and methodological commitments are operationalised throughout the thesis. The following section therefore outlines the overall structure of the thesis, showing how each chapter corresponds to the concentric rings of the framework illustrated in Figure 1 and how this progression moves from theoretical foundations to methodological design, analysis, and implications.

Before outlining the chapter structure, it is important to introduce EMBER-S³, the bespoke methodological framework developed for this study and integrated throughout the layers of the research design. EMBER-S³ (Embodied Multimodal-Based Experiential Research: Sensory, Spatial, Situated) is introduced in this thesis as a hybrid methodological framework developed to address the absence of tools capable of systematically observing and analysing the sensory–modal–spatial dimensions of embodied learning. Its origins lie in the intersection of phenomenology and embodiment theory, multimodal interaction analysis, sensory theory, and affordance-based ecological perspectives, synthesised to make visible the micro-dynamics through which agency and executive functioning are enacted. As a craft practitioner, when an existing tool cannot accomplish the task, I create a new one; EMBER-S³ was developed in this same spirit, not only to enable finer-grained analysis, but to offer a transferable tool, ‘the net rather than the fish’, to practitioners, researchers, and wider communities of practice. In this sense, EMBER-S³ also functions metaphorically like an ember: when carefully cultivated, it illuminates pedagogical practice and potential, revealing

dynamics that may otherwise remain unseen. EMBER-S³ circulates throughout the thesis as both an analytic lens and a pedagogical force: it foregrounds the sensory and spatial conditions that scaffold becoming, and it enables fine-grained insight into how craft-based environments support learners to initiate, regulate, adapt, and act with increasing agency and intentionality. As such, EMBER-S³ is offered not only as a methodological innovation within this study, but as a transferable framework for wider pedagogical and research contexts. EMBER-S³ and the study's conceptualisation of agency operate in tandem, each informing and reinforcing the other.

1.4 Structure of the Thesis

This section provides an overview of the thesis structure and explains how each chapter contributes to addressing the research questions and objectives introduced in Section 1.2. The organisation of the thesis mirrors the concentric layers of the Research Framework illustrated in Figure 1, moving from conceptual foundations through methodological design to analysis and implications. In doing so, it illuminates the middle ring of the framework, which bridges the outer theoretical layer and the inner methodological and analytic layers, ensuring coherence between philosophical stance, research design, and practical implementation. The thesis is structured as follows:

Chapter 1: Introduction

Establishes the rationale for the study, outlines the research questions, aims, and objectives, and introduces the bespoke research framework. It situates the inquiry within personal and professional contexts and clarifies positionality and reflexivity.

Chapter 2: Literature Review

Critically examines the educational, policy, and theoretical landscapes relevant to the study, including disability and SEND discourse, agency, executive functioning, and craft pedagogy. It synthesises these strands to identify the research gap and justify the need for a hybrid multimodal methodology.

Chapter 3: Theoretical Framework

Explores embodiment, sensory integration, spatiality, and affordance theory as conceptual lenses underpinning the study. These frameworks inform the methodological design and analytic focus developed in subsequent chapters.

Chapter 4: Methodology

Details the epistemological and ontological stance, interpretivist and phenomenological commitments, and explains how these informed the development of the bespoke hybrid framework EMBER-S³. It integrates multimodality, ethnographic resources, and ecological perspectives into a coherent methodological approach.

Chapter 5: Methods

Operationalises EMBER-S³ through practical steps for data generation, transcription, and analysis. It introduces the multimodal tools: sensory-first matrix, annotated video stills, and sensory-modal density circles and outlines ethical considerations and strategies for ensuring trustworthiness.

Chapter 6: Analysis, Findings, and Multimodal Interpretation of Embodied Craft Practice

Applies EMBER-S³ to the selected case study, presenting multimodal analysis of embodied craft practice. It examines the workshop environment, student-tutor interactions, and student-material engagements, interpreting how sensory-modal-spatial orchestrations foster executive functioning and agency.

Chapter 7: Discussion and Implications: Advancing Embodied, Multimodal Pedagogies for Agency

Synthesises findings to articulate the pedagogical affordances of craft-based education, evaluates the methodological contribution of EMBER-S³, and explores implications for inclusive, agency centred pedagogy. Reflects on limitations and proposes directions for future research.

Chapter 8: Conclusions

Summarises the study's contributions to theory, methodology, and practice and foregrounds the implications contributed by the study.

This roadmap ensures transparency and supports reader navigation by showing how each chapter builds on the previous one to address the research questions and illuminate the pedagogical potential of craft-based education.

1.5 Overview of How the Study Addressed the Refined Research Questions and Objectives

The research questions and objectives introduced and refined in Section 1.2 are addressed throughout the thesis. They are theoretically grounded in Chapters 2 and 3, operationalised through the methodological framework in Chapter 4 and the methods in Chapter 5, examined through multimodal analysis in Chapter 6 (Analysis, Findings, and Multimodal Interpretation of Embodied Craft Practice), and further discussed and evaluated in Chapter 7 (Discussions, Evaluations, Implications and Recommendations). Finally, they are synthesised and summarised in Chapter 8 (Conclusions, Contributions and Implications).

To provide clarity for the reader, this section offers a concise overview of how the study addressed these research questions and objectives. It outlines the methodological steps taken, the analytic focus applied, and the ways in which findings respond to the overarching aim: to investigate how holistic craft-based education, through its materiality, pedagogy, and sensory–modal–spatial engagements, contributes to the cultivation of executive functioning and agency

Objective 1: Design and validate a hybrid multimodal methodology

The study created and operationalised the EMBER-S³ framework, integrating embodied, sensory, spatial, and situated dimensions into a coherent analytic approach. This bespoke methodology enabled systematic multimodal transcription and analysis of craft practice, capturing movements, materiality, and relational scaffolding between student, tutor, and material.

Objective 2: Apply the methodology to explore sensory–modal–spatial interactions and their relationship to executive functioning and agency

Using observations, video recordings, interviews, and multimodal analysis, the study examined how sensory–modal–spatial interactions within craft learning environments supported the development of executive functions, such as working memory, initiation, self-monitoring, and inhibition, and facilitated the emergence of agency.

2.a. Workshop environment

The craft workshop operated as an active pedagogical space rich in sensory-modal and spatial affordances. Hybrid multimodal analysis revealed how these affordances enabled embodied dialogues between learners, tools, and materials. These interactions scaffolded higher-level actions (Norris, 2004) such as planning, sequencing, and self-regulation, core components of executive functioning. Iterative feedback loops between body, material, and space supported the emergence of agency, aligning with theoretical perspectives on executive function (Diamond, 2013) and embodiment (Fuchs, 2017).

2.b. Student–tutor interactions

Intersubjective scaffolding and multimodal communication, through gesture, gaze, rhythm, and other embodied cues, played a pivotal role in fostering agency. Tutors leveraged pedagogical affordances by attuning to learners' sensory preferences and orchestrating multimodal cues, creating rich dialogic interactions beyond verbal instruction. This resonates with Gibson's affordance theory (Gibson, 1979) and multimodal interaction analysis (Norris, 2004), highlighting how embodied teaching practices enable learners to enact agency through diverse multimodal repertoires.

2.c. Student–materiality interactions

Direct engagement with tools and materials was central to fostering embodied learning processes. These interactions facilitated sensorimotor coupling and iterative feedback loops,

enabling learners to integrate perception and action in ways that promoted embodied cognition and executive functioning. The findings align with theories of enskillment and thinking-through-making (Ingold, 2000; Mäkelä, 2007), showing how tactile and rhythmic engagements afford opportunities for developing capacities such as planning, inhibition, and problem-solving.

2.d. Alignment with learner needs

Personalised craft encounters were closely aligned with the students EHCP aspirations, fostering confidence, independence, and self-generated conscious action (Gordon & Cox, 2023). The hybrid multimodal analysis revealed how sensory-modal-spatial orchestration supported Student D's preferred modes of interaction, enabling progress toward identified aspirations and goals. These findings underscore the pedagogical potential of craft for meeting person-centred educational objectives.

Objective 3: Interpret findings and articulate pedagogical implications

The analysis synthesised how the materiality of crafts, encompassing tools, materials, and workshop configurations, created distinct affordances that shaped the progression from sensory engagement to increasingly complex actions and practices. These affordances were conceptualised through Gibson's theory of affordances, which illuminates how material properties and environments invite action and learning opportunities (Gibson, 1979; Gibson & Pick, 2023; Nimkulrat & Groth, 2024). Findings informed strategies for designing inclusive, agency-centred pedagogical approaches within craft education and related contexts, foregrounding the pedagogical potential inherent in the dynamic interplay between learners, tools, and materials (Groth, 2017; Mäkelä, 2007; Ingold, 2000). Furthermore, the discussion situates these insights within existing theoretical frameworks, demonstrating how the study extends and refines current theory and research on embodiment (Fuchs, 2017; Gallagher, 2005), sensory integration (Ayres, 1979; Schaaf & Davies, 2010), and executive functioning (Diamond, 2013). By synthesising these strands, the study contributes to a conceptual understanding of how embodied, multimodal, and spatial engagements

within craft pedagogy can cultivate capacities essential for learners to become agentic beings in and with the world (Biesta, 2015; Gordon & Cox, 2023).

Objective 4: Highlight methodological transferability

The study examined the adaptability of the EMBER-S³ framework beyond its original context, demonstrating its potential for application in diverse educational and therapeutic settings. By providing a structured approach to foreground embodied, sensory, spatial, and multimodal dimensions of learning, the framework offers researchers and practitioners a transferable tool for analysing and enhancing pedagogical practices that prioritise agency and inclusion.

How the Study Addressed the Refined Research Questions

Main Research Question (RQ): How does craft shape agentic becoming?

Expanded RQ: How do elements of pedagogical craft practice, its materiality and our sensory–modal–spatial engagements, shape the cultivation of executive functioning and agency?

The study addressed these questions through sub-analyses focusing on the workshop environment, student–tutor interactions, student–materiality interactions, alignment with learner aspirations, and the broader pedagogical potential of craft. Collectively, the findings position craft as a multimodal, embodied, and agentic practice, and establish the EMBER-S³ framework as a methodological innovation for revealing these dynamics.

Collective Significance of the Findings

The findings indicate that craft-based pedagogy provides a uniquely powerful context for fostering agency and executive functioning through embodied, multimodal engagement. By orchestrating sensory–modal–spatial elements within craft environments, combined with interactive, relational, and multimodal pedagogical practices and direct material

engagement, the study demonstrates how iterative feedback loops scaffold capacities such as planning, self-regulation, and problem-solving.

Personalised craft encounters amplify these benefits by aligning with individual aspirations and needs, promoting confidence, independence, and self-generated conscious action (Gordon & Cox, 2023). Beyond these practical outcomes, the research positions craft as a multimodal, agentic practice and introduces the EMBER-S³ framework as both a methodological innovation and a practical tool for educators and researchers. Collectively, these insights advocate for a paradigm shift toward embodied, agency-centred education, challenging deficit-based models and informing inclusive pedagogical practices across SEND and wider educational contexts.

Key Contributions to Knowledge

This research makes three key contributions to knowledge (further outlined in section 7.4):

- Case-Based: A situated example of how multimodal craft interactions promote agency and executive functioning (Doak, 2018; Norris, 2004).
- Theoretical: A conceptual model integrating sensory integration, embodiment, multimodality, and executive function theory (Ayres, 2005; Merleau-Ponty, 1945/2012; Taylor and Trott, 1991; Thompson & Varela, 2001; Diamond, 2013).
- Practical: Pedagogical insights for designing craft-based learning environments that enhance agency and self-directed development (Gibson & Pick, 2023; Nimkulrat & Groth, 2024).

1.6 Positionality and Reflexivity

1.6.1 Researcher Positionality

To situate this research within my professional practice and its broader context, in this section I critically reflect on my positionality, including the values, experiences, and commitments that shape my work in SEND and craft-based education. This reflection aims

to clarify how these factors shaped the research design and interpretation, while identifying strategies to mitigate potential bias. Further discussion of positionality and its ethical implications is provided in Chapter 4.

1.6.2 Reflexivity

Reflexivity is integral to rigorous research (Hertz, 1997). Throughout this study, I adopted a reflexive stance, critically questioning my assumptions and practices to minimise blind spots (Finlay, 2002). I employed Gibbs' (2013) reflective model to develop analytical skills and learn experientially from practice, ensuring transparency in how my identity influenced the research process.

While traditional paradigms advocate neutrality (Christians, 2000), contemporary scholarship recognises that research cannot be disembodied from the researcher (Sikes & Goodson, 2003). As Wellington et al. (2015) note, positionality is shaped by biography, social position, and assumptions, which influence research questions, paradigms, and writing style. Acknowledging this, I interrogated how my background informed my approach.

1.6.3 Personal and Professional Context

My early diagnosis of dyslexia, now framed as neurodivergence (Walker and Raymaker, 2021), shaped my preference for practical, embodied modes of learning over text-based approaches. Traditional classroom practices often felt disconnected from lived experience, whereas creative and outdoor activities such as craft, camping, and mountain biking fostered my confidence and identity. These formative experiences, alongside high achievement in design and technology and arts, and challenges in language-based subjects, align with research on dyslexic profiles (Taylor & Vestergaard, 2022).

Professionally, I have worked across inclusive and SEND educational contexts for over 20 years, including 18 years within the organisation hosting this research. Roles spanning workshops, landscapes, and leadership have deepened my "professional knowledge landscape" (Clandinin, 2022). These experiences, while invaluable, risked reinforcing

institutional narratives. To counterbalance this, I actively sought alternative perspectives through conferences, research networks, and visits to diverse educational settings in England, Wales, Norway, Sweden and China. This process helped me “make the familiar strange” (Erickson, 1986) and adopt a more critical lens.

1.6.4 Influence on Research Design

My positionality informed the choice of a phenomenological and multimodal methodology, aligning with my conviction that craft-based education offers rich opportunities for agency development. This design foregrounds lived experience and meaning-making (Van Manen, 1990; Merleau-Ponty 1945/2012) and draws on multimodal principles (Kress, 2010).

Previous research, including my Master’s dissertation on executive functioning via craft (Briggs, 2014), reinforced this belief and aligns with evidence on the role of embodied learning in supporting executive functions (Diamond, 2013). The emphasis on craft pedagogy reflects perspectives on agency and material engagement (Sennett, 2008; Ingold, 2013).

1.6.5 Benefits and Risks of Insider Status

Insider status afforded unique access to participants, environments, and tacit practices, enabling nuanced interpretation (Brannick & Coghlan, 2007). However, this proximity risked bias. To mitigate this, I employed strategies such as member checking and critical friends (Lincoln & Guba, 1985; Costa & Kallick, 2000) alongside reflexive journaling (Finlay, 2002), further defined in chapters 4 and 5.

1.6.6 Commitment to Transparency

My positionality reflects a commitment to inclusive, embodied education and to challenging deficit-based models (Florian, 2014; Thomas & Loxley, 2012). This includes amplifying student voice as a principle of participatory pedagogy (Cook-Sather, 2006; Fielding, 2004). By acknowledging both the advantages and limitations of my standpoint and maintaining an audit trail to ensure trustworthiness (Lincoln & Guba, 1985), I aimed to ensure that this research contributes meaningfully to SEND pedagogy and wider educational discourse.

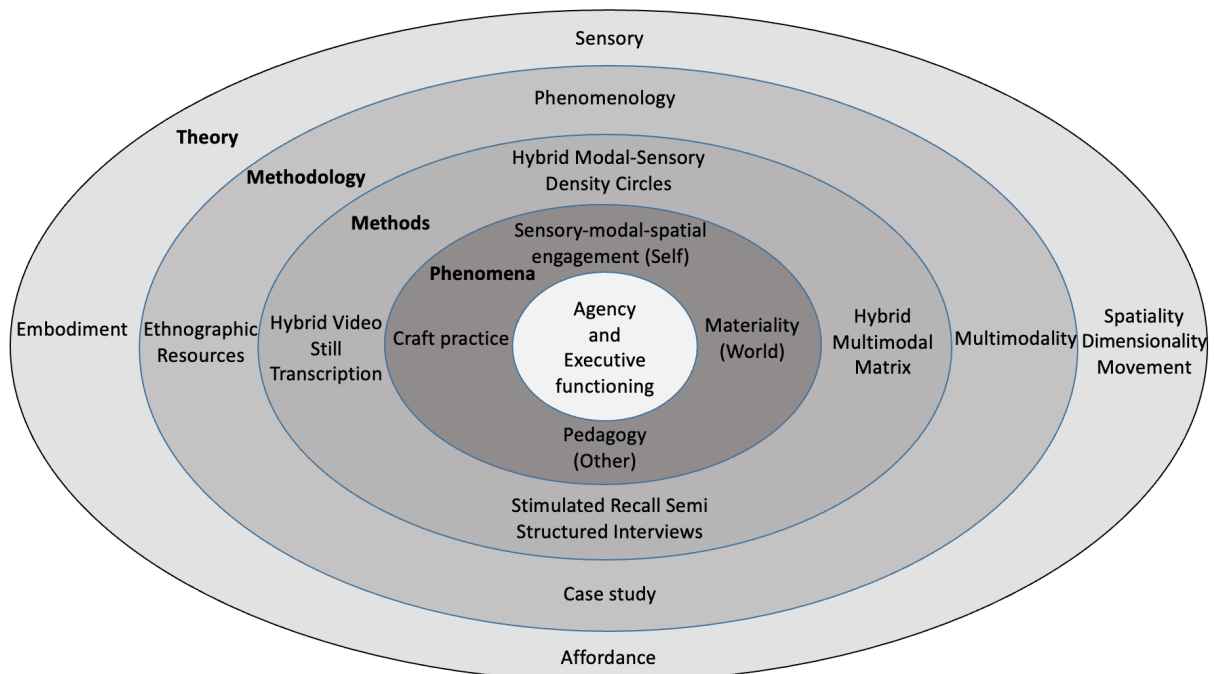
In summary, Chapter 1 has introduced the study by outlining its purpose, context, and research aims, and by explaining how the thesis is structured. Chapter 2 then situates the study within existing educational, policy, and theoretical literature, while Chapter 3 develops the study's own theoretical underpinning. Together, these chapters provide the conceptual basis for the methodological design presented later in the thesis.

Chapter 2 Literature Review

2.1 Introduction

This chapter establishes the conceptual foundations for the study by critically examining the research and theoretical landscapes that inform its focus on craft-based pedagogy, agency, and executive functioning, corresponding to the centre of the framework (figure 2). It situates the inquiry within broader educational, policy, and disability discourses, before narrowing to the specific intersections of craft, embodiment, and multimodality. This illustrates how this chapter corresponds to the second ring of the framework, providing the theoretical and contextual grounding for the methodological and analytic layers developed in Chapters 3–5. In doing so, the literature review illuminates the middle ring of the framework, which represents the conceptual and theoretical constructs that bridge the outer theoretical layer and the inner methodological and analytic layers, ensuring coherence between the study’s philosophical stance and its practical design.

Figure 2 Research framework



The chapter begins by outlining the purpose and approach to the literature review (Section 2.1–2.2), explaining its relevance-driven orientation and selective strategy across multiple

fields. It then contextualises the study within wider and SEND educational landscapes (Section 2.3–2.4), critically examining prevailing paradigms, policy drivers, and systemic challenges that constrain inclusive, agency-centred practices. Building on this, Section 2.5 frames SEND through social, neurodiversity, and capabilities-based lenses, clarifying the theoretical and linguistic stance adopted and introducing a reflexive account of personal positionality to ensure transparency regarding the researcher’s standpoint.

Section 2.6 explores the purpose of education, drawing on philosophical and contemporary perspectives to justify the study’s emphasis on fostering freedom, responsibility, and self-generated agency. Sections 2.7 and 2.8 examine agency and executive functioning as interdependent capacities, reviewing research on their relevance for autonomy and inclusion, and synthesising evidence on the benefits of craft-based practices for cognitive, emotional, and social development. Subsection 2.8.6 introduces emerging scholarship on multimodal dimensions of craft pedagogy, highlighting current contributions and limitations. Finally, Section 2.9 outlines a research gap by showing that existing studies do not offer systematic ways to analyse sensory–modal–spatial dynamics in craft learning, including research involving learners with SEND. The chapter introduces the bespoke hybrid framework EMBER-S³ as a means of addressing this gap.

Collectively, this chapter provides the theoretical foundation for the study’s methodological design and analytic focus, preparing the ground for Chapter 3, which develops the theoretical frameworks: embodiment, sensory integration, spatiality, and affordance theory, that underpin the hybrid multimodal approach introduced later.

In keeping with this selective, relevance-driven approach to the literature, it is important to clarify how different theoretical perspectives were engaged and the rationale for prioritising certain frameworks over others.

While new materialist perspectives, particularly Bennett’s emphasis on vibrant matter (Bennett, 2010) and Barad’s account of intra-action (Barad, 2007), resonate strongly with this study’s interest in relational becoming, they were used selectively rather than adopted as primary theoretical anchors. Their value lies in foregrounding the entanglement of

humans, materials, and ecological forces, reinforcing why craft can be understood as a site of co-emergence between self, world, and matter. These insights informed the study's wider educational stance and contributed conceptually to the notion of becoming introduced in Chapter 1, as well as to the understanding that craft practices are inseparable from the material and ecological worlds we inhabit. However, given the need for theoretical precision and selectivity, the thesis ultimately prioritised embodiment theory, sensory integration, multimodality, and affordance-based ecological approaches. These frameworks aligned more directly with the methodological purpose of developing EMBER-S³, enabling systematic observation of sensory–modal–spatial dynamics in situated craft practice. New materialist ideas therefore underpin the philosophical orientation of the study but are not employed as its core analytic lenses. These insights inform the study's broader orientation toward becoming, while the theoretical foundations that directly support the analytic framework are developed in Chapter 3.

2.2 Approach to Literature Review

My approach to the literature review aligns with Locke et al.'s (2007) view that “the writer’s task is to employ the research literature artfully to support and explain the choices made for this study, rather than to educate the reader on the entire state of science in the problem area” (p. 69). Given the breadth of fields relevant to this research: disability, neurodiversity, craft, embodiment, anthropology, psychology, neurology, education, and therapy, an exhaustive review was neither feasible nor appropriate. Consequently, I prioritised relevance over completeness, focusing on concepts, methods, and findings that informed the study’s conceptual design and argument (Locke et al., 2007; Rudestam & Newton, 2001). While some scholars position systematic reviews as the gold standard for rigour (Boote & Beile, 2005; Finks, 2005), others critique this stance for overlooking relevance and conceptual utility (Maxwell, 2006). This study therefore adopts qualitative principles that privilege depth and contextual richness, drawing on Geertz’s (1973) notion of ‘thick description’ and Ponterotto’s (2006) extension to ‘thick interpretation,’ both of which foreground the importance of situating ideas within lived, cultural, and pedagogical contexts.

A systematic review was impractical due to the interdisciplinary scope of the research and the thesis word and time limits (60,000 words). As Maxwell (2006) argues, overemphasis on completeness can obscure what is most conceptually important. Instead, following Hart's (1998) "spirit of adventure" (p. 21), I adopted a relevance-driven, exploratory approach. Initial experimentation with systematic search terms proved restrictive and impeded the iterative processes of reading, synthesising, and shaping a coherent narrative aligned with the study's aims. I therefore employed snowballing techniques, using key search terms and tracing citations to identify connected work across domains (Hart, 1998). This iterative strategy enabled cross-fertilisation between fields and supported the identification of gaps and patterns that informed the study's conceptual and methodological design. The resulting review is therefore strategically selective rather than exhaustive, serving to illuminate the conceptual foundations of the study and justify the methodological and analytical decisions that follow.

Having outlined the rationale and approach for this review, the next section situates the study within the broader educational landscape, critically examining prevailing paradigms and policy drivers before presenting alternative perspectives that align with the research focus.

2.3 Educational Context

This section situates the study within the broader educational landscape by examining prevailing paradigms, their historical roots, and policy drivers shaping current practice. It critically evaluates the dominant neoliberal and performative orientation of education and its consequences for curriculum design, learner wellbeing, and inclusion. In contrast, it introduces alternative perspectives that advocate for holistic, person and world-centred approaches, aligning with the study's stance on education as enabling individuals to self-generate their own becoming and agency. Finally, it connects these ideas to the practical dimensions of SEND education and EHCP frameworks, providing the foundation for the study's pedagogical orientation.

This study's stance on the purpose of education is inviting and enabling individuals to self-generate their own becoming (Deleuze & Guattari, 1980/1987; Biesta, 2015; Ingold, 2013; Barad, 2007), towards being at home in their bodies, the world and with others. This perspective provides the foundation for the intended outcomes of the project and its research questions. The purpose of education, within the context of this study, is further discussed in section 2.6. To contextualise this stance, it is necessary to first examine the dominant view of education in the UK and its historical roots. Current policy, shaped by neoliberalism, performativity, and accountability, perpetuates a system originally designed for industrial economies, privileging repetition, memorisation, and recall as indicators of intelligence (Avis, 2009; Keep, 2006; Stronach, 1989). This orientation persists in recent strategies that prioritise a "knowledge-rich, academic curriculum" (Department for Education, 2016, p. 24), narrowing opportunities for learners and marginalising alternative pathways. Critics argue that such approaches have damaging consequences, including curriculum contraction, strained teacher–student relationships, and negative impacts on wellbeing (Hutchins, 2015). Hutchins concludes that this model fails to foster the skills and capacities needed for higher education or employment, raising questions about its ability to meet aspirations outlined in EHCPs.

Pring (2015) warns of the risk posed by economic and political interests in shaping policy without a clear vision of education's purpose, a concern that becomes particularly evident in SEND-related policy, where priorities can lean towards employability and cost reduction. The emphasis on STEM subjects and measurable outcomes has further eroded creative disciplines, distancing education from holistic aims (Hutchins, 2015). If education does not cultivate the capacities required for meaningful participation in life and work, priorities must be re-examined. It is within this context that counterarguments call for a broader curriculum and creative pedagogies that nurture qualities essential for flourishing, agency, problem-solving, discernment, creativity, resilience, and social literacies (Robinson, 2017; Coffield, 2011; Biesta, 2009, 2015, 2021).

These perspectives align with the capabilities approach (Nussbaum, 2011), emphasising learner autonomy and voice so individuals can become who they aspire to be, regardless of ability or disability. This study adopts this orientation, exploring how holistic craft practices

(Nimkulrat & Groth, 2024) and embodied approaches (Schilhab & Groth, 2024) can promote agency and empowerment. Such practices may foster self-awareness and capacities that enable individuals to meet personal aspirations while contributing to collective flourishing (Biesta, 2009; Nussbaum, 2011; Sennett, 2008).

Although the primary focus is on individual becoming, understood as developing one's unique identity, agency, and way of being in the world, these aims intersect with the practical realities of SEND educational practice, where EHCPs set legally defined targets. Within the provision studied, learners work towards personalised plans that include aspirations, barriers, and strategies for learning and communication. While this research does not analyse EHCP discourse, it acknowledges the complexity of working within frameworks shaped by multiple voices and sometimes conflicting terminologies. The next section explores these perspectives to clarify the study's position on SEND within the context of the research.

2.4 SEND Policy Context

In this section, I critically examine the current SEND policy landscape to highlight how challenging and problematic it has become for individuals, families, and educational provisions. These challenges stem from systemic underfunding, bureaucratic complexity, and neoliberal policy agendas that prioritise cost-cutting over inclusion and equity. This critique provides essential context for understanding the constraints within which this research is situated and underscores the urgency of exploring alternative pedagogical approaches. Given that this study is located within a provision that predominantly supports young people under SEND frameworks, it is essential that the literature review engages directly with the policies and pressures shaping their educational experiences. This focus ensures that the analysis remains grounded in the realities of the setting and responsive to the specific challenges faced by the young people who participate in this research.

2.4.1 Historical and Ideological Roots

SEND policy has historically drawn on ideals of human rights, equality, and entitlement. These principles shaped frameworks intended to ensure care and educational access for individuals with additional needs. While historical analyses of policy evolution have been explored elsewhere (Borsay, 2011), this section focuses on the current situation in England, where these ideals have been increasingly undermined by economic and political priorities.

2.4.2 Major Reforms and Their Intended Outcomes

The most significant reforms occurred with the Children and Families Act 2014 and the SEND Code of Practice (Department for Education & Department of Health, 2015), which introduced EHCPs for individuals aged 0–25. EHCPs were designed to identify educational, health, and social needs and outline the support required to meet them (UK Government, 2024). Initially, these reforms were welcomed for expanding eligibility and raising parental expectations (Brighouse in Weale, 2023).

However, responsibility for provision was placed on Local Authorities (LAs), and chronic underfunding soon led to adversarial practices (Education Committee, 2019). Tribunal processes became commonplace, creating financial and emotional strain for families and councils alike. For example, councils spent approximately £100 million contesting parental appeals over four years, losing nine out of ten cases (Whittaker, 2020). A government inquiry concluded that poor implementation had left schools struggling and families in crisis (Education Committee, 2019).

2.4.3 Systemic Failures and Financial Pressures

What is commonly known as the SEND system now faces severe scrutiny due to real-term funding cuts of £3 billion by 2020 (National Audit Office, 2016) and government targets to reduce EHCP numbers by 20% to curb costs (Jayanetti, 2023). Meanwhile, demand continues to rise: the number of EHCPs has increased annually since 2010, reaching 517,000, alongside 1.5 million pupils identified with SEND (Department for Education, 2024a; 2024b). Local authorities report deficits at “unmanageable levels,” with an average

of 182 new EHCPs issued daily in 2024 compared to fewer than half that number in 2015 (Weale, 2023).

2.4.4 The 2022 SEND Review and Green Paper Critique

The government's SEND Review, delayed until 2022, acknowledged widespread failure:

“...the system was failing to deliver improved outcomes for children and young people, that parental and provider confidence was in decline, and, that despite substantial additional investment, the system had become financially unsustainable” (UK Government, 2022, p. 9).

Despite this admission, the Green Paper, Right Support, Right Place, Right Time, framed cost-cutting as a solution, proposing reforms that risk further reducing funding without clear mechanisms for improvement (Department for Education, 2022). Pluquailec and O'Connor (2023) offer a critical analysis, revealing how subtle shifts in language naturalise neoliberal principles, presenting cuts as “virtuous” and prioritizing system needs over those of pupils (p. 184). They argue that policy discourse remains one of the greatest challenges for Disability Studies in Education (Connor & Gabel, 2013), calling for vigilance against these tactics.

2.4.5 Implications for Practice and Research Orientation

Pluquailec and O'Connor (2023) urge practitioners and academics to act as “demanding social critics and creative inventors of new ways of living and learning together in diverse communities” (Gabel & Danforth, 2008, p. 1). This study responds to that call by exploring alternative pedagogical approaches that resist deficit-driven models and neoliberal constraints. By situating this research within these tensions, it aims to contribute to inclusive practices that prioritise agency, empowerment, and flourishing over compliance and cost-efficiency.

In summary, the current SEND policy landscape reveals deep systemic challenges, underfunding, adversarial practices, and neoliberal agendas, that constrain inclusive

education and marginalize learner voice. These tensions underscore the need for pedagogical approaches that resist deficit-driven models and prioritise agency, empowerment, and flourishing. Responding to this call, the next section (2.5 Framing SEND within this Study) critically examines the prevailing disability discourses, models, and language, and establishes the theoretical and ethical stance adopted in this research. This framing is essential for situating the study's orientation toward promoting self-generated agency and alternative educational practices within the complex realities of SEND provision.

2.5 Framing SEND within this Study

Purpose and Orientation

This section critically frames the study within current disability discourse and SEND landscapes, establishing the theoretical, ethical, and linguistic stance adopted. It examines dominant and emerging models of disability, critiques deficit-based paradigms, and clarifies the language choices that underpin this study's orientation toward agency and empowerment. By doing so, it ensures the research aligns with inclusive practices and responds to contemporary challenges in Disability Studies in Education (DSE).

2.5.1 Disability Models

To critically frame this study within contemporary disability discourse, it is essential to examine the dominant and emerging models that shape understandings of difference and inform educational practice. These models, medical, social, neurodiversity, specialisation, capabilities, and relational perspectives, offer contrasting interpretations of disability, each carrying distinct implications for policy, pedagogy, and research. By reviewing these frameworks and their critiques, this section establishes the theoretical stance underpinning the study's orientation toward agency, inclusion, and empowerment.

Medical Model

Historically, the medical model has dominated, framing disability as an inherent deficit and a negative condition to be avoided (Dobusch, 2021). While this study contests such views, it

acknowledges their prevalence in SEND contexts due to diagnostic requirements for EHCP funding. Medical terminology can also empower individuals by enabling access to rights and resources (Goodley & Runswick-Cole, 2016). However, critics argue that the medical model perpetuates deficit-based thinking, reinforcing ableist assumptions and positioning individuals as passive recipients of care rather than active agents (Oliver, 1996; Shakespeare, 2004). This approach risks obscuring environmental and structural barriers, shifting responsibility onto individuals rather than society (Shakespeare & Watson, 2001). Consequently, relevant medical research is incorporated critically, without endorsing deficit perspectives.

Social Model

The social model shifts focus from individual impairment to structural barriers: environmental, educational, and legal, that restrict participation (Oliver, 1996; Shakespeare, 2004). While widely influential, counterarguments highlight that the social model can oversimplify lived experience by neglecting the embodied realities of impairment (Shakespeare, 2006). As Thomas (1999) argues through the concept of “impairment effects,” bodily realities, such as pain, fatigue, or sensory differences, can significantly shape everyday life and interact with, rather than exist separately from, social structures. Critics argue that ignoring biological dimensions risks creating a false dichotomy between body and society, failing to address the embodied aspects of impairment that shape daily life (Watson, 2012). This study draws on social model principles while integrating embodied and ecological perspectives to avoid these limitations.

Neurodiversity and Neurodivergent Paradigms

The neurodiversity paradigm refers to the conceptual stance that neurological variation is a natural and valuable dimension of human diversity, challenging deficit-based interpretations of difference. By contrast, the neurodivergent paradigm foregrounds the lived experiences of neurodivergent people, emphasising how difficulties often arise from social mismatch rather than intrinsic impairment.

The neurodiversity paradigm challenges deficit narratives, viewing neurological differences as natural human variation (Fenton & Krahn, 2007; Robertson, 2010). However, some researchers caution that some neurodiversity discourse may romanticise difference, potentially obscuring the real challenges and impairments individuals face, and warn that framing all neurological variation as “strengths” risks minimising support needs and perpetuating inequalities (Kapp et al., 2013). Complementing this, the neurodivergent paradigm builds from lived experience, emphasising that many difficulties arise not from impairment itself but from mismatched social expectations. Milton’s “double empathy problem” highlights the mutual misunderstandings between neurotypes, and empirical research shows that neurodivergent-to-neurodivergent interactions can be more naturally attuned (Milton, 2012; see also Crompton et al., 2020). This study acknowledges these critiques while emphasising multimodal approaches that validate diverse ways of learning and being. It is also noteworthy that, within neurodivergence research, Bailey (2022, 2023) calls for inquiry that attends to sensory, spatial, and movement dimensions, areas central to this study’s multimodal methodology and its commitment to fostering agency through embodied, inclusive pedagogical practices.

Specialisation Perspective

Emerging research reframes conditions such as dyslexia as specialisations rather than disorders, highlighting unique strengths in creativity and problem-solving (Taylor & Vestergaard, 2022). Yet, critics argue that focusing solely on strengths risks ignoring systemic barriers and the need for accommodations (Goodley, 2016). This study aligns with the specialisation perspective but situates it within inclusive pedagogies that balance recognition of strengths with structural support.

Capabilities Approach

Building on the broader foundations of Sen’s work, Nussbaum’s (2011) capabilities approach advocates for expanding individual freedoms and agency, enabling people to become who they aspire to be. While compelling, some argue that operationalising capabilities in policy can be challenging and risks imposing normative ideals of “flourishing” (Walker &

Unterhalter, 2007). This study adopts the capabilities lens critically, ensuring that agency is co-constructed rather than externally prescribed.

Feminist and Ecological Perspectives

Feminist disability theory challenges notions of the autonomous, self-contained subject, emphasising interdependence (Shildrick, 2015; Kittay, 2019). Ecological perspectives (Haraway, 2003; Fuchs, 2017) conceive humans as dynamically entangled with environment and others. However, critics note that these relational models can underplay individual autonomy or practical needs for independence (Vehmas & Watson, 2014). This study adopts these lenses while maintaining a balance between interdependence and personal agency.

The review of disability models highlights the complexity and diversity of perspectives that shape contemporary SEND discourse. While the medical model remains influential in policy and practice, its deficit-based assumptions are increasingly challenged by social, neurodiversity, and capabilities approaches that foreground agency, inclusion, and human flourishing. Emerging perspectives such as specialisation, feminist, and ecological models further expand this discourse by emphasising interdependence, relationality, and embodied ways of being. Collectively, these frameworks inform this study's stance: resisting deficit narratives and advocating for pedagogical practices that empower individuals to self-generate their own becomings through multimodal, embodied, and craft-based education. The next section builds on this foundation by examining how these theoretical orientations shape the language and terminology adopted within this study.

2.5.2 Language and Terminology in Disability Discourse

Language as Performative

Language is not merely descriptive but performative, shaping identities and ideologies (Botha et al., 2023; Fairclough, 2010). Through language, we produce versions of ourselves and others, influencing future discourses and practices. As Fairclough (2010) argues, discourse is a form of social practice that both reflects and constructs reality. This study

therefore attends carefully to terminology to avoid perpetuating deficit-based narratives and to promote inclusivity. Language choices are not neutral, they carry ethical weight and can either reinforce or challenge ableist assumptions (Bottema-Beutel et al., 2021).

Person-First vs Identity-First Language

Debates persist over whether to use person-first language (e.g., “person with autism”) or identity-first language (e.g., “autistic person”). Person-first language aims to separate identity from condition (Maio, 2001), but critics argue it can reinforce stigma by implying that disability is something external or undesirable (Botha et al., 2023; Gernsbacher, 2017). In contrast, identity-first language affirms autism as integral to identity and is increasingly preferred by advocacy groups such as Autistica (Sterry, 2023). Sinclair (2013) argues that saying “person with autism” implies autism is something negative and an appendage that can be detached from the individual. This study adopts identity-first language while respecting individual preferences (Kenny et al., 2016), acknowledging that linguistic choices must remain flexible and participant-led.

Understanding Autism: Historical and Social Dimensions

The meaning of “autism” has shifted dramatically over time, from Bleuler’s early pathological framing (see Evans, 2013) to contemporary views of autism as identity, assemblage, or way of being (Evans, 2013; Fletcher-Watson & Happé, 2019; Deleuze & Guattari, 1980/1987; Chapman, 2020). Deleuze and Guattari’s (1980/1987) concept of assemblage helps us to see autism not as a fixed category but as a dynamic constellation of relations and practices. Increasingly, autism is understood as a socio-material assemblage, a shifting constellation of relations, practices, and meaning-making, reflecting both the evolution of autistic literacies (Bailey, 2022) and broader moves toward relational understandings of neurodivergence (Evans, 2013; Fletcher-Watson & Happé, 2019; Chapman, 2020). This study does not seek to define autism but to foreground lived experience and multimodal ways of being, resisting reductive definitions and embracing complexity.

This Study's Approach to Language

In agreement with Robison (2019), this study recognises that language acceptable to one person may offend another. Therefore, it prioritises individual preference wherever possible and adopts inclusive, empowering terminology to resist ableist narratives (Bottema-Beutel et al., 2021; Woods, 2017). This approach aligns with participatory principles, ensuring that linguistic choices reflect the voices of those most affected. As Woods (2017) argues, inclusive language is not merely a stylistic choice but a political act that shapes possibilities for agency and belonging.

Implications for Research Design and Ethics

The theoretical and linguistic stance outlined here informs the study's methodological choices, ensuring alignment with participatory and inclusive principles. Participants were invited to express their preferred terms and were acknowledged as contributors and, to some extent, co-researchers through their involvement in multimodal analysis and follow up interviews. While power differentials cannot be eliminated, the study strives to amplify participant voice and agency within its design, recognising that language is a key site of empowerment.

Building on these ethical and participatory principles, it is important to consider how my own lived experience and positionality as a neurodivergent individual and researcher shaped these methodological choices. The following section reflects on this personal dimension, situating it within the broader discourse on SEND and linking to the reflexive considerations discussed in Chapter 4. Including this reflection within the literature review situates my standpoint alongside the theoretical and discursive frameworks under discussion, ensuring transparency about how lived experience informs the interpretation of SEND-related scholarship and shapes the conceptual lens of this study.

2.5.3 Personal Positionality Lived Experience of SEND

This reflection provides the context for the study's stance on SEND and connects directly to the methodological considerations discussed in Chapter 4, where I critically examine how my positionality shaped both the research design and the interpretation of findings.

Bailey (2022) offers an insightful discussion on the challenges and rewards of receiving a new diagnosis, highlighting the time it can take to assimilate a new identity. These perspectives resonate with my own experience of being diagnosed with dyslexia, which has profoundly shaped how I think, research, and write about SEND. Initially, the label evoked feelings of difference and alienation; however, it ultimately enabled access to support and helped me understand both my challenges and strengths. This duality reflects the complexity of identity formation within neurodiversity discourse and underscores the need for inclusive, person-centred approaches.

Professionally, over 18 years in SEND education, I have observed shifting discourses and the fluidity of identity negotiation, particularly among learners aged 16–25. My involvement in neurodiversity panels further revealed the diversity, and at times polarisation, of views on diagnosis and terminology, reinforcing the need for flexible, participant-led language practices.

While some view labels as empowering, others regard them as burdens requiring ongoing support. These debates highlight the importance of adopting flexible, participant-led language practices, which this study embraces. This stance informed ethical decisions, such as prioritising individual preference in terminology and amplifying participant voice through member checking and collaborative interpretation. Further discussion of how this positionality shaped methodological choices and reflexivity is provided in Chapter 4.

2.5.4 Summary and Conclusion

This section has critically framed the study within contemporary disability discourse, drawing on the social model, neurodiversity and neurodivergent paradigms, and capabilities-based perspectives to resist deficit-driven models and promote agency, inclusion, and flourishing. By adopting inclusive, participant-led language practices, the

study aligns with best practice in Disability Studies in Education and foregrounds the ethical imperative to amplify learner voice. These commitments inform both the conceptual stance and methodological design, ensuring that the research challenges reductive narratives and embraces diversity as a source of strength.

The intention behind the terminology and language choices in this study is rooted in inclusivity, contextual sensitivity, and ethical responsibility. While medical literature is referenced where relevant, the study does not perpetuate medicalised or deficit-based models of difference. Instead, it seeks to destabilise taken-for-granted social, economic, and political systems that reproduce inequality, interrogating policies and practices to re-orient pedagogy toward human flourishing. This involves extending research and practice-based approaches to include a broader spectrum of modalities and senses through which individuals understand, communicate, and make meaning, connecting self, environment, and others.

By situating these debates within the literature review, the study moves beyond a narrow focus on disability toward a richer emphasis on ways of being and fostering capacities that are meaningful to both individuals and the wider world. This orientation underpins the pedagogical lens of the research and prepares the ground for the next section (2.6), which explores the broader educational purpose guiding this study and positions craft as a vehicle for self-generated becoming and meaningful engagement with the world.

2.6 Purpose of Education

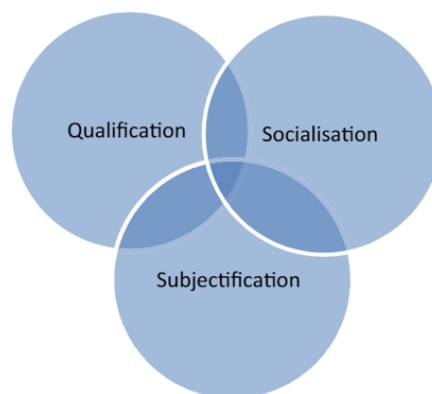
2.6.1 Defining Educational Purpose

Understanding the purpose of education is vital to this study, as differing views shape how learning, agency, and development are interpreted. Because this research explores holistic craft practices as a way of supporting autonomy and becoming, it must be positioned within wider debates about what education is for. Clarifying these differing educational aims, economic, social, or personal, helps explain why this study adopts a framework centred on

learner agency and subject formation. This section therefore outlines key perspectives on educational purpose to ground the study's analytical approach.

This study conceives the purpose of education through Biesta's (2015) three domains: qualification, socialisation, and subjectification, and aligns its analytical emphasis with subjectification. While the three domains interact in practice, our focus is on how education can contribute to learners' freedom and agency, understood as the cultivation of initiative, judgment, responsibility, and autonomy. In this respect, holistic craft practices are treated as a pedagogical vehicle through which learners encounter materials, environments, and cultures, and thereby form relations that support becoming subjects in and with the world.

Figure 3 Biesta's three domains of educational purpose (Biesta, 2015, p.78).



Several philosophical traditions illuminate an education directed toward the formation of free and responsible persons. In Aristotelian terms, praxis refers to action whose end lies in living well, linked to eudaimonia, a life of flourishing realised through meaningful activity (Aristotle, ca. 350 B.C.E./1980). In the German tradition, Bildung denotes self-formation and cultural formation, foregrounding the learner's active role and the freedom to develop without subjection to predetermined models; Bildung aims at the harmonious development of intellectual, spiritual, and physical dimensions through engagement with the world, not solely through formal instruction (Horlacher, 2016; Sorokin, 1983). Relatedly, Steiner's educational approach emphasises self-cultivation and freedom, proposing that education should nurture imagination, responsibility, and truthfulness so individuals can impart purpose and direction to their own lives (Steiner, 1919/2004). Rousseau, with the addition

of the capacity to love, contends that education ought to equip the learner to grow into a free, loving, and responsible adult (Noddings, 2016).

Collectively, these perspectives orient education toward freedom, agency, identity, responsibility, and wellbeing, for self and others. They also suggest that such qualities arise through active, meaningful interactions between the learner, the world, and other people, precisely the kinds of engagements that craft practices afford through their material, cultural, and environmental embeddedness.

2.6.2 Being at Home in the World

Following Arendt, Biesta (2021) articulates an existential purpose of education as learning to be at home in the world. This reframes the pedagogical gaze around the learner's evolving relationship with the world and others, and counters purely utilitarian orientations by re-centring judgment and understanding. For Arendt, judgment concerns creating the space in which relation to the world becomes possible; understanding is the ongoing activity by which we reconcile ourselves to reality, that is, how we come to dwell meaningfully in the world (Arendt, 1978).

Taking this as an educational purpose shifts emphasis away from instrumentalism (such as economic or productivity goals) toward equality and plurality, recognising diverse trajectories of becoming while sustaining a shared endeavour of inhabiting the world together. In this light, meaning-making and understanding become processes of reconciliation through which learners find and confirm their place in relation to self, others, and world.

Freire (1968/2017) similarly argues that learning cannot be separated from being: human becoming is always accompanied by an unfinished reality, calling education to balance attention to the learner's needs with attention to the world's needs (Freire, 1968/2017). Overemphasis on either, risks obstructing the other. Accordingly, the educator's role extends beyond the transmission of skills and knowledge to the curation of encounters in

which learners can form relations with materials, places, and communities, and exercise initiative and responsibility in their making.

From this standpoint, sensory, embodied meaning-making is central: through dialogue with materials, environments, and others, learners ask and answer existential questions; What are my needs and how might the world meet them? What are the world's needs and what might I offer? The aspiration (rather than utopian claim) is a reciprocal educational dialogue that integrates individual and world needs, fostering mutual co-becoming.

2.6.3 Education Towards Self, World and Others

The purpose of education, viewed through a world-centred lens, is to support people to exist in and with the world (Biesta, 2021) via processes implicated in both personal development and world development. Through such processes, moral knowledge and moral identity may arise as mediators between the individual and society (Zhao & Biesta, 2012). Morality, on this view, emerges from agentic participation in worldly existence with others: the freedom to discern what is good or bad in concrete situations and the motivation and capacity to choose to take part, or not.

Accordingly, a key educational focus should be on prioritising inner human qualities (agency, morality, ethics, freedom) over external amoral or immoral agendas narrowly tailored to egocentric, economic, or ecological ends. Rather than privileging one domain, the educational task is to learn how to create balance, harmony, and symbiosis among all three. From this perspective, such outcomes must be fostered through the freedom of each individual's relationship with the world and others, not imposed as strategic deliverables of political, commercial, or economic programmes and policies (e.g., SEND policy or United Nations Sustainable Development Goals [SDGs], adopted in 2015; UNESCO's Education for Sustainable Development). An over-focus on outcomes can lack recognition of learners as subjects in their own right (Biesta, 2021), and risk treating people as objects via standardised "interventions" (Biesta, 2015), thereby perpetuating forms of ableism, particularly problematic in SEND contexts and often associated with the medical model of disability, which this study contests.

While policy frameworks such as SEND and the SDGs may orient toward economic and ecological ends, they rarely stimulate the inner attributes and capacities required to form personal meaning, connection, morality, or motivation toward such goals. Steiner's alternative is enlightening:

“The question should not be: what does a human being need to know and be able to do for the existing social order? but rather: What capacities are latent in this human being, and what lies within that can be developed?” (Steiner, 1919/1985, p. 71)

This standpoint positions the purpose of education as both holistic and equitable, beginning from the learner's becoming and attuning pedagogy to capacities relevant to their aspirations and to how they may choose to become at home in the world. Thus, pedagogical practice is the curation of meaningful, embodied encounters that afford, encourage, and enhance such capacities. It re-orientates education away from viewing capacities as limits (as in deficit framings) toward the human as a being of open potential. In this spirit, the study seeks to redefine capacities as modes of interaction, functions that afford richer, more meaningful, and more creative connections to self, world, and others.

Gordon further articulates freedom and agency as core educational purposes through Self-Generated Conscious Action (SGCA): the ability to generate personal initiative out of the motivation to contribute positively to the world (Gordon et al., 2012). Gordon and Cox (2023) elaborate:

“This means being able to experience an adult's freedom as far as possible, choosing for themselves what to do and how to go about doing it, aware of the challenges and the benefits for self and other.” (p. 35)

Here the emphasis is on recognising one's unique challenges and proficiencies, and understanding how these affect one's own life, the lives of others, and the world, thereby enabling free, responsible contribution through one's distinct modalities, actions, and deeds.

2.6.4 Situating this Study's Educational Purpose and Pedagogical Standpoint

Taken together, the ideas in this section suggest that education's universal purpose extends beyond developing prescribed capacities for neoliberal agendas. Instead, education aims to nurture the whole human being by promoting conditions that enable individuals to self-generate the qualities and attributes needed for meaningful wellbeing. This holistic orientation arises through active, meaningful encounters with the world that foster ethically conscious understanding and generative dialogue between self, others, and environment. By empowering people to identify and develop the capacities they need, while sustaining responsibility, motivation, and initiative, education becomes a path toward personal and collective flourishing.

A comprehensive approach to educational purpose must therefore balance fostering individual capabilities with broader world flourishing, as suggested by meta-perspectives (Taylor et al., 2022) and modern frameworks such as the capabilities approach (Nussbaum, 2003, 2009, 2011). This aligns with Biesta's (2021) conception of world-centred education while acknowledging diverse paths to personal flourishing. It differs from functionalist agendas that prioritise economic utility or state-defined competencies (Noddings, 2016), recognising that contribution to world flourishing can take many forms, not all quantifiable or economically measurable, and that individuals vary in capacities, desires, and modes of engagement. By synergising research from disability studies, SEND and neurodiversity practices, and broader educational theory, we can envision an educational purpose that encompasses both human and world flourishing without imposing standardised expectations or reducing education to economic preparation. This framework acknowledges that meaningful contribution to collective flourishing arises from honouring individual differences rather than conforming to predetermined functional outcomes, an orientation with which this study aligns and advocates.

While the primary focus of the study is to enable each individual to develop their unique potential in the world, it is also relevant to explore how such capacities and qualities, encouraged through pedagogical craft practice, may inadvertently contribute to current

SEND and educational priorities. In practice, this may be observed in meeting identified needs set out within an individual's EHCP, the legally binding plan issued by the local authority specifying outcomes and provision for the child or young person. Communicating the potential benefits of these approaches to a broad audience, including multiple stakeholders and regulators (e.g., Ofsted, CQC, and local authorities), is therefore part of this study's dissemination strategy.

Implications for this study

This study privileges subjectification within Biesta's framework (figure 3) while acknowledging interplay with qualification and socialisation. In the context of holistic craft practices, we will attend to indicators such as learner initiative, judgment, responsibility, and agency (e.g., self-directed design decisions; reflective evaluation of processes; responsiveness to materials; ethical considerations toward self, people, places, and environments). Methodologically, the study's theoretical commitments inform the design of learning encounters and the analysis of world-relation: how learners constitute meaning with materials and others, and how such relations contribute to becoming at home in the world.

2.6.5 Summary and Conclusion

In summary, the purpose of education, as framed in this study, extends beyond instrumental aims and predetermined outcomes. It seeks to cultivate freedom, agency, and moral responsibility through meaningful encounters with self, others, and the world, an approach grounded in subjectification and world-centered education. By prioritising inner human qualities and fostering plurality, education becomes a process of co-becoming rather than mere preparation for economic or social utility.

Building on this foundation, the next section explores Agency and Executive Functioning, key capacities that enable learners to exercise initiative, make autonomous decisions, and engage purposefully with the world. Understanding these situated embodied capacities is

essential for operationalising the educational ideals outlined above within practical pedagogical contexts.

2.7 Situating Agency and Executive Functioning Within the Study

2.7.1 Introduction

Building on the preceding discussion of education's purpose as fostering freedom, autonomy, and meaningful engagement with the world, this section examines two interrelated concepts that operationalise these ideals: agency and executive functioning (EF).

Agency refers to an individual's capacity to act intentionally, make choices, and influence their own direction and journey in life, qualities central to subjectification and world-centred education. Executive functioning encompasses the capacities and processes that enable such agency, including planning, working memory, self-regulation, and flexible thinking. Together, these capacities form the foundation for learners to exercise initiative, respond to challenges, and engage in purposeful, self-directed activity.

As the development of agency, autonomy, and independence has emerged as a key theme within both SEND and general education paradigms, and therefore within this study, it is essential to define these concepts in context. Doing so clarifies how craft-based pedagogy may contribute to their emergence and development, supporting learners in becoming active, responsible participants in their own learning and in the wider world.

2.7.2 Agency

This study foregrounds agency as the central concept for operationalising the educational purposes outlined in Section 2.6. Unlike autonomy or independence, agency encompasses the capacity for intentional action, including decision-making, self-regulation, and purposive engagement within social and material contexts (Bandura, 2001, 2006; Emirbayer & Mische, 1998).

Whereas autonomy emphasises self-governance and independence suggests a binary of dependent versus independent functioning, agency recognises interdependence as the human norm. It includes collaborative action and help-seeking as agentic behaviours. This breadth makes agency a more nuanced and developmentally sensitive lens for examining how learners act in, with, and on their worlds.

2.7.3 Executive Functioning as Scaffolding for Agency

Executive functioning is commonly described as a set of interrelated regulatory processes, including inhibitory control, working memory, cognitive flexibility, planning, initiation, self-monitoring, and broader aspects of self-regulation, that provide regulatory scaffolds for agentic, purposeful, and adaptive engagement (Diamond, 2013; Zelazo, 2015). Research connects EF with goal-directed behaviour and early school readiness (Blair & Razza, 2007; Diamond & Lee, 2011), but these perspectives often frame EF as a discrete, internal skill set rather than a process emerging through embodied, practice-based interaction with materials and contexts. Although the construct is used in varied and sometimes contested ways, particularly in relation to reductionist measurement approaches, this study employs EF as a pragmatic lens for examining how embodied craft practice can support agency, self-regulation, and adaptive action. The conceptual tensions surrounding EF are explored further within this section, clarifying how the study engages with these debates and justifies its selective, situated use of the construct within relational, non-deficit perspectives on human difference, while also adopting EF pragmatically to examine agentic, embodied engagement.

The relationship between agency and EF is bidirectional: stronger EF capacities can facilitate more effective agentic action, while exercising agency within authentic, meaningful tasks can in turn strengthen EF over time (Diamond & Lee, 2011; Zelazo, 2015). This dynamic is examined further in relation to craft-based pedagogy later in the section.

2.7.4 Defining Executive Function and its Relevance

Executive function (EF) provides the foundation for agency, enabling individuals to plan, monitor, initiate and regulate thoughts, emotions, and actions in pursuit of meaningful goals (Diamond, 2013; Schreiber et al., 2014). Understanding EF and its diversity is essential for designing inclusive environments that foster autonomy, agency and subjectification.

Definition and Core Components

EF refers to a set of interrelated regulatory processes that enable goal-directed action, adaptive behaviour, and effective problem-solving. These functions underpin nearly all aspects of daily life, influencing learning, social interaction, and well-being (Diamond, 2013).

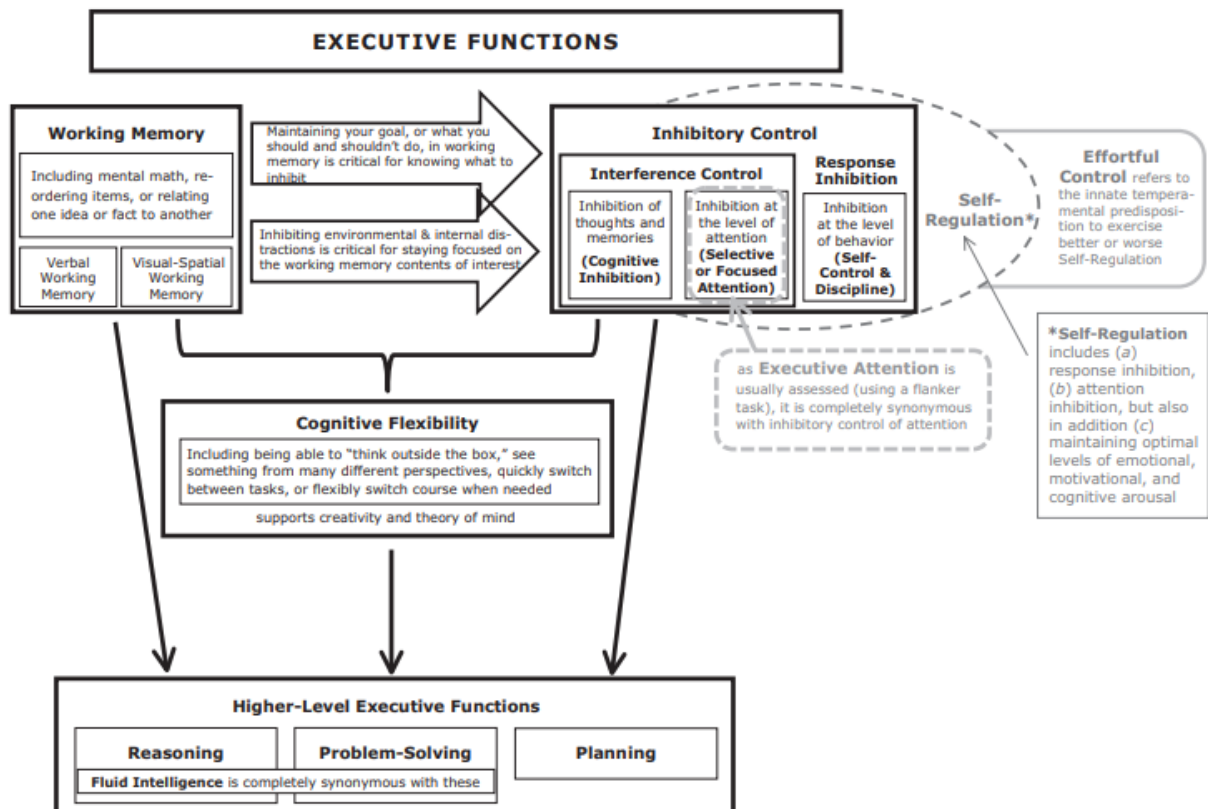
Table 1 summarises these domains and their relevance.

Table 1 Executive functions and their importance across life domains (Diamond, 2013, p. 137).

Aspects of life	The ways in which EFs are relevant to that aspect of life	References
Mental health	EFs are impaired in many mental disorders, including:	
	- Addictions	Baler & Volkow 2006
	- Attention deficit hyperactivity (ADHD)	Diamond 2005, Lui & Tannock 2007
	- Conduct disorder	Fairchild et al. 2009
	- Depression	Taylor-Tavares et al. 2007
	- Obsessive compulsive disorder (OCD)	Penadés et al. 2007
Physical health	Poorer EFs are associated with obesity, overeating, substance abuse, and poor treatment adherence	Barch 2005
Quality of life	People with better EFs enjoy a better quality of life	Crescioni et al. 2011, Miller et al. 2011, Riggs et al. 2010
School readiness	EFs are more important for school readiness than are IQ or entry-level reading or math	Brown & Landgraf 2010, Davis et al. 2010
School success	EFs predict both math and reading competence throughout the school years	Blair & Razza 2007, Morrison et al. 2010
Job success	EFs predict both math and reading competence throughout the school years	Borella et al. 2010, Duncan et al. 2007, Gathercole et al. 2004
Marital harmony	Poor EFs lead to poor productivity and difficulty finding and keeping a job	Bailey 2007
Public safety	A partner with poor EFs can be more difficult to get along with, less dependable, and/or more likely to act on impulse	Eakin et al. 2004
	Poor EFs lead to social problems (including crime, reckless behavior, violence, and emotional outbursts)	Broidy et al. 2003, Denson et al. 2011

Figure 4 illustrates the relationship between specific executive functions and related terms, highlighting how these capacities interact to support goal-directed behaviour (Diamond, 2013).

Figure 4 Executive functions and related terms (Diamond, 2013, p. 152).



The EF most relevant to this study include:

- Working memory: Holding and manipulating information for complex tasks
- Planning and organisation: Sequencing steps toward a goal
- Inhibitory control: Resisting impulses and distractions
- Cognitive flexibility (Shift): Adapting strategies when conditions change
- Organisation of materials: Managing physical and digital resources
- Initiation: Starting tasks independently and overcoming inertia
- Self-monitoring: Evaluating performance and adjusting strategies

Individual Differences and Neurodiversity

Executive function (EF) skills vary across individuals, shaping different strengths and challenges in daily life. Research identifies patterns of EF associated with diagnostic categories often linked to SEND and neurodivergence, such as attentional regulation in

ADHD (Rosello et al., 2020) or focused attention profiles described in autism research (Russell et al., 2019).

This study adopts a neurodiversity perspective, understanding such differences as natural expressions of human variation rather than deficits (Armstrong, 2010; Singer, 2017).

Craft-based pedagogy offers rich opportunities for EF development through embodied, sensory, and collaborative modalities, aligning with inclusive educational principles.

Critical Perspectives and Risks

Despite its utility, EF research has been criticised for reinforcing deficit-based medical models. Scholars argue that EF frameworks may embed normative assumptions about “correct” ways of thinking or behaving, often positioning autistic cognitive styles as inherently disordered (Milton, 2012), while also overshadowing strengths and alternative processing styles (Chapman & Veit, 2021) and neglecting cultural variability in executive functioning (Strand, 2017). Overemphasis on individual EF can obscure environmental barriers (Oliver, 1990), shift responsibility from society to individuals (Goodley, 2016), and risk internalised ableism (Walker & Raymaker, 2021). These critiques underscore the need for caution and contextual sensitivity when applying EF research within SEND and neurodivergent settings.

Benefits and Applications

Conversely, EF research offers significant benefits that counter these concerns. Neurodiversity communities use EF knowledge to challenge pathologising narratives (Chapman & Veit, 2020) and reframe differences as variation rather than deficit (den Houting, 2019). Understanding EF profiles supports self-advocacy (Rosello et al., 2020), reduces isolation and shame (Clouder et al., 2020), and informs personalised coping strategies (Russell et al., 2019). In education, EF insights justify flexible approaches (Woods et al., 2018) and accommodations across school, higher education, and workplace contexts (Wehmeyer et al., 2018; Armstrong, 2018). These applications foreground EF research as a tool for empowerment and agency rather than restriction.

Although executive-function frameworks are pragmatically useful, their categorised structure introduces a methodological tension within this study. Phenomenology invites a holding-back, a suspension of the impulse to judge, name, and categorise so that lived experience may reveal itself on its own terms. From a phenomenological standpoint, early conceptual closure risks obscuring the very qualities, relations, and processes that we seek to understand. Naming too quickly can “kill the phenomenon” by solidifying it into a concept before its dynamic, relational character has been attended to. This challenge is particularly acute in craft-based contexts, where meaning arises through pre-reflective, embodied engagement rather than through predefined constructs.

At the same time, abandoning conceptual tools altogether would limit the study’s capacity to explore how learners make meaning, regulate action, and develop capacities over time. Executive-function constructs therefore serve a pragmatic purpose: they allow learners, educators, and researchers to better recognise strengths, identify emerging capacities, and articulate areas where support or development may be needed. In this sense, EF is not treated as an ontological claim about the mind, but as a heuristic lens that can illuminate patterns within experience without replacing the experience itself. Within the EMBER-S³ framework, this balance is deliberately maintained: EF categories are used cautiously and secondarily, nested within a phenomenological, sensory–modal–spatial orientation that prioritises lived experience before abstraction.

Recognising one’s own capacities, whether through reflection, supported analysis, or embodied craft activity, is itself an act of agency. Understanding strengths and challenges enables individuals to navigate learning environments more intentionally, advocate for their needs, and identify the forms of support or conditions under which they flourish. In this sense, the careful, contextualised use of EF constructs does not constrain agency but can enhance it: by making aspects of experience more visible, nameable, and discussable, learners are better able to participate in shaping their educational trajectories. This recognition becomes part of the broader process of becoming at home in one’s body and in the world, as learners discern the capacities they wish to develop, the support they may

seek, and the ways they can participate meaningfully in their environments and relationships.

2.7.5 Reciprocal (Synergetic) Development of EF and Agency

Agency and EF are deeply intertwined processes that co-develop through dynamic interaction with social and material environments. EF including planning, working memory, inhibitory control, and cognitive flexibility, provides the cognitive scaffolding for agentic behaviour, enabling individuals to set goals, regulate impulses, and adapt strategies in response to changing circumstances (Diamond, 2013; Zelazo, 2015).

Crucially, the relationship is bidirectional: EF supports the enactment of agency, while opportunities to exercise agency, through authentic, choice rich tasks, strengthen EF capacities over time. Research demonstrates that repeated engagement in decision-making and self-directed activity promotes neural and behavioural growth in self-regulation and adaptive control (Diamond & Lee, 2011; Blair & Razza, 2007).

This reciprocal pattern develops across the lifespan and is shaped by social and environmental contexts, highlighting the importance of pedagogical environments that invite initiative and responsibility (Carlson, 2009; Bandura, 2001, 2006).

From a SEND and neurodiversity perspective, this reciprocity has significant implications. EF profiles and agentic expression vary widely across individuals, reflecting natural human variation rather than deficit (Armstrong, 2010; Singer, 2017; Silberman, 2015). A neurodiversity framework challenges normative assumptions about developmental trajectories and foregrounds the need for flexible, multimodal approaches that honour diverse ways of exercising control and choice.

Craft-based pedagogy offers such conditions: embodied, sensory-rich tasks that require planning, problem-solving, and adaptive thinking provide fertile ground for the co-development and synergy of EF and agency. These environments can also align with the social model of disability (Oliver, 1990; Shakespeare & Watson, 2001) by focusing on

reducing environmental barriers and amplifying supports rather than locating limitations within individuals.

Methodologically, this study incorporates inside-out accounts (Daniel, 2023) from neurodivergent participants (first-person, phenomenological descriptions of experience) to illuminate how agency and EF emerge through different modalities in practice-based settings. This approach not only meets calls for inclusive research but also contributes to rethinking educational design for learners with diverse profiles.

By situating EF and agency as mutually reinforcing capacities, the study advances a pedagogical vision that moves beyond deficit-based models toward capability-oriented frameworks, resonating with the theoretical lenses of embodiment, sensory integration, and multimodality outlined in the preceding chapter 3.

2.7.6 Implications for This Study

This section has defined EF and explored its relevance for autonomy, agency, and inclusive pedagogy. By recognising both critiques and benefits, the study positions EF as a resource for enabling learners, neurotypical and neurodivergent alike, to develop strategies for meaningful participation.

The following section examines EF research specifically related to craft-based practices, further situating this study's unique contribution to educational theory and practice.

2.8 Research Supporting Craft-based Practices and Approaches

2.8.1 Introduction

This section examines research demonstrating how craft-based practices support executive functioning, agency, and related capacities, building on the conceptual groundwork established in the previous section. It begins with a review of literature on the broader benefits of craft before focusing on its relationship to executive function in closer alignment with its research focus. This approach strengthens the rationale for the study, highlights

aspects relevant to analysis and discussion, and identifies gaps this research aims to address.

2.8.2 The Wider Context and Benefits of Craft

Recent reports reaffirm the economic, social, and cultural significance of craft education in the UK. Craft contributes over £3 billion annually to the economy and supports more than 150,000 jobs across sectors ranging from heritage crafts to contemporary design (Crafts Council, 2020, 2024; House of Lords Library, 2025). Beyond its economic impact, craft education fosters creativity, problem-solving, persistence, and agency, while engaging learners who may feel disconnected from traditional academic pathways. It embeds practical experience with materials, cultivates resilience, and nurtures innovation, skills essential for future industries. Craft also sustains cultural heritage and drives forward-thinking practices in sustainability and wellbeing. However, participation in craft-related GCSE and higher education courses continues to decline, prompting urgent calls for renewed investment and policy support (Crafts Council, 2024; House of Lords Library, 2025).

Research highlights craft's multifaceted contributions to modern society (Sennett, 2008), neurological and human development (Wilson, 1998), and education, health, and wellbeing (Sigman, 2023). Within education, craft supports discovery and experiential learning (Piaget, 1958), the development of hand skills and craftsmanship (Crawford, 2009; Frayling, 2011), and the acquisition of practical and functional skills (Niedderer & Townsend, 2011; Karppinen, 2008). It also serves as a tool for narrative and historical reflection (Mäkelä & Latva-Somppi, 2011). Beyond these educational benefits, craft enables self-expression and identity formation (Pollanen, 2011; Adamson, 2007), fosters reflection and reflexivity (Ofsted, 2012), and integrates emotion with knowledge (Niedderer & Townsend, 2014, 2016). Furthermore, its positive impact on health, wellbeing, and happiness has been widely documented (Niedderer & Townsend, 2020).

Recent scholarship emphasises thinking through making (Mäkelä, 2007), thinking through material (Huotilainen et al., 2018; Nimkulrat, 2010, 2012), and making sense through hands (Groth & Gulliksen, 2024; Schilhab & Groth, 2024). Groth (2017, p. 2) emphasises that “craft

activities are fundamentally multimodal and complex,” highlighting the role of sensory engagement in embodied learning. Collectively, these studies demonstrate that craft-based environments offer benefits across cognitive, emotional, and social dimensions. Further discussion on research and theory pertaining to embodiment is discussed in the following chapter 3.1.

2.8.3 Craft and Executive Function

Research specifically examining the effects of craft on aspects of what is currently framed as executive function remains limited. One notable study by Andersen et al. (2019) explored the impact of art-based practices, including music, dance, drama, poetry, visual arts, and photography, on executive functioning and self-regulation. These practices share creative and embodied qualities with craft, making the findings relevant. Andersen et al. (2019) reported significant improvements in behavioural regulation, with effects four times greater than the control group. This is promising, as self-regulation is widely recognised across mainstream, neurodivergent, and SEND educational contexts as an important contributor to self-awareness, self-control, and agency. However, crafts were not specifically included in the study, and the research focused on children rather than learners in further education or SEND provision, an area this study seeks to address.

2.8.4 Broader Research Linking Arts, Crafts, and Cognitive Outcomes

While direct research on craft and executive function is scarce, numerous studies highlight cognitive and wellbeing benefits of arts and crafts where executive functioning forms one component. Over the past two decades, research on the arts’ impact on health and wellbeing has grown significantly. In a comprehensive scoping review commissioned and published by the World Health Organization, Fancourt and Finn (2019) synthesised over 3,000 studies, demonstrating the arts’ role in preventing illness, promoting health, and supporting treatment across the lifespan. The World Health Organization (2025) defines mental health as “a state of mental-well-being that enables people to cope with the stresses of life, realize their abilities, learn and work well, and contribute to their community,” a definition that aligns closely with themes of agency and executive functioning.

A recent scoping review by Birau (2024) analysed 181 studies on hand-making activities, including crafts, across multiple disciplines. Findings indicate that crafting:

- Reduces stress and anxiety (Corkhill et al., 2014)
- Stimulates mental agility and problem-solving (Turney, 2004)
- Enhances creativity, self-expression and self-determination (Hackney, 2006)
- Supports identity formation and sense of self (Jackson, 2010)
- Promotes mindfulness and emotional regulation through repetitive, immersive processes (Corkhill et al., 2014; Elliot, 2016)

2.8.5 Research from Art Therapy and Occupational Studies

Art therapy research demonstrates cognitive benefits of crafting activities, including attention and planning, and their role in stress reduction and cognitive regulation (Kaimal et al., 2016, 2017). Occupational therapy studies show knitting improves attention and concentration (Riley et al., 2013), while textile craft research highlights benefits for cognitive organisation and planning (Pöllänen, 2015). Collectively, these findings suggest craft-based activities can foster emotional regulation, impulse control, and stress management, key components of executive functioning.

2.8.6 Neurological and Psychological Perspectives

Sigman (2023) provides a comprehensive review of neurological, psychological, and educational research on practical skills. He argues that “start-to-finish learning,” characteristic of craft-based curricula, cultivates self-regulation, delayed gratification, and sustained attention. Sigman also identifies mechanisms by which skilled craft activities reinforce an internal locus of control, contributing to emotional stability, social behaviour, and mental health. These capacities such as, delaying gratification, controlling impulses, sustaining attention, tolerating ambiguity, and resisting coercion, are integral to executive functioning and agency.

Summary

Current literature illuminates the multifaceted benefits of craft in education and development. These benefits extend beyond practical skill acquisition to encompass holistic and therapeutic capacities essential for agency, independence, and wellbeing. Craft empowers individuals to develop self-management abilities, enhance resilience, and navigate future challenges, fostering greater autonomy and agency.

2.8.7 Research Exploring Multimodal Dimensions of Craft Pedagogy

Building on the preceding discussion of craft's educational benefits, this subsection reviews existing research that explicitly addresses the multimodal dimensions of craft pedagogy. While the literature affirms craft as a holistic and embodied practice, only a limited number of studies have examined how multimodal approaches operate within craft-based learning environments. The following review synthesises these contributions to establish the current state of knowledge before clarifying the gaps that remain.

Recent scholarship has begun to explore multimodal strategies for representing and teaching craft knowledge. Zabulis et al. (2024) developed multimodal dictionaries for traditional craft education, integrating video, motion capture, and textual resources to preserve and transmit heritage skills. Although this work demonstrates the potential of multimodal resources for craft learning, its focus lies primarily on digital preservation rather than live pedagogical practice.

Similarly, Anderson (2025) examined multimodal meaning-making in creative education, highlighting how metaphor and embodied engagement shape agency. While not craft-specific, this study underscores the pedagogical significance of multimodal orchestration for fostering creative agency, offering conceptual insights relevant to craft pedagogy.

Research within school-based craft contexts, such as Kangas, Seitamaa-Hakkarainen, and Hakkarainen (2017), investigated pupils' activities in multimaterial learning environments, revealing the complexity of craft processes and the interplay of material, spatial, and

embodied dimensions. However, this work provides limited micro-level analysis of sensory orchestration during craft learning.

Beyond traditional craft education, Tham (2019) explored makerspaces and multimodal composition, emphasising design thinking and embodied interaction in collaborative environments. This research aligns with multimodal principles but focuses on digital fabrication rather than heritage or therapeutic craft practices.

Finally, Jewitt, Bezemer, and O'Halloran (2025) offer a comprehensive theoretical foundation for multimodal analysis, advocating analytic parity across modes such as gesture, gaze, and spatial arrangement. While their work is not craft-specific, it provides essential methodological tools for examining multimodal orchestration in embodied learning contexts, which is further discussed in the methodology and methods sections. The detailed review of multimodal methods and frameworks, including Norris (2004), Bezemer & Jewitt (2010), and Doak (2018), is presented in Section 5.2 because these works primarily inform the methodological design of this study rather than its conceptual framing. They are therefore not discussed in this literature review, which focuses on theoretical perspectives and research related to craft pedagogy and agency.

Collectively, these studies affirm the relevance of multimodal perspectives for understanding craft and creative practices. However, they primarily address representational or design oriented aspects rather than the pedagogical orchestration of sensory–modal–spatial affordances within live craft learning environments. Few studies systematically analyse how these multimodal dimensions contribute to agency and executive functioning, particularly in SEND contexts. This limitation underscores the need for research that integrates multimodal analysis with embodied, sensory, and spatial perspectives to illuminate the pedagogical potential of craft-based education.

The next section synthesises these limitations to articulate the research gap that this study addresses.

2.9 Clarifying and Addressing the Gaps Identified in the Literature Review

As established in section 2.7, agency and executive functioning (EF) are central capacities for autonomy and meaningful participation in education; yet, despite strong theoretical recognition of their importance, there is limited situated research that traces how such capacities emerge through embodied, multimodal craft practices in situ (Bandura, 2001, 2006; Diamond, 2013). At the same time, world-centred conceptions of educational purpose, such as Biesta's (2015, 2021) emphasis on becoming "at home" in the world, underscore the need for pedagogies that cultivate initiative, judgment, and responsibility through meaningful engagement with materials, places, and others, precisely the kinds of engagements craft afford.

Across the craft and design scholarship, authors have highlighted the multimodal and embodied nature of making, thinking through hands and thinking through material, as foundational to learning, meaning-making, and identity formation (Groth, 2017; Mäkelä, 2007; Marchand, 2011). However, these insights have seldom been operationalised into systematic methodologies capable of analysing sensory–modal–spatial dynamics during live craft learning. This gap is particularly consequential for SEND contexts, where sensory-rich, situated practices may offer distinctive affordances for agency development, yet the micro-level processes through which these benefits arise remain under-examined (Ayres, 1979; Schaaf & Davies, 2010).

Taken together, these limitations highlight a broader research gap: while craft education is widely acknowledged for its cultural, cognitive, and social benefits (Adamson, 2007; Crafts Council, 2020, 2024; Niedderer & Townsend, 2016, 2020; Sennett, 2008; Sigman 2023), research that systematically examines multimodal dimensions of craft pedagogy in situ is scarce (Groth, 2017, 2024). Existing studies often cluster into (a) digital preservation/representation of craft knowledge and practice, e.g., multimodal dictionaries and heritage presentations (Zabulis et al., 2024), and (b) school-based multimaterial environments that map activity and tools but do not provide fine-grained analyses of embodied, sensory–modal–spatial orchestration (Kangas, Seitamaa-Hakkarainen, & Hakkarainen, 2017). Both strands illuminate complexity yet typically stop short of analysing

how sensory feedback, gesture, gaze, spatial arrangement, and material affordances are pedagogically orchestrated to scaffold EF and agentic action in real time.

A parallel body of work on makerspaces and multimodal composition emphasises creative agency, design thinking, and collaborative making; however, it similarly under-specifies the pedagogical coordination of sensory and spatial resources during live skill transmission (Tham, 2019; Anderson, 2025). In other words, these studies speak to what learners create and why creativity matters, but not to the fine-grained ‘how’ of embodied orchestration in craft pedagogy. Moreover, while sensory integration frameworks (Ayres, 1979; Schaaf & Davies, 2010) and embodiment theory provide strong conceptual reasons to attend to foundational senses (proprioception, vestibular, haptics) and their role in capacities, there is little methodological guidance on observing, transcribing, and analysing these dimensions in craft workshops.

From a SEND perspective, this methodological gap is pressing. Prior work in the provision examined here (e.g., woodland-based outcomes) reports beneficial physical and emotional effects (Mata et al., 2016) but does not interrogate the micro-level multimodal interactions through which such effects are enacted (e.g., tutor–student–material triangulations, iterative feedback loops, modal density and complexity). My previous research (Briggs, 2014) explored craft within further education and SEND contexts, with attention to executive function; however, methodological constraints limited data collection to practitioner interviews, excluding direct engagement with learners and multimodal analysis of live phenomena. This study responds by focusing explicitly on sensory–modal–spatial engagements during live craft learning, placing learners, practitioners, and situated craftwork at the centre of the analysis.

How This Study Addresses the Gap: Introducing EMBER-S³

To address this gap, the thesis introduces EMBER-S³ (Embodied Multimodal-Based Experiential Research - Sensory, Spatial, Situated), a bespoke hybrid methodology that integrates phenomenology, multimodality (with analytic parity for gesture, gaze, posture, spatial layout, and sensory modalities), and ecological affordances. It operationalises

analysis through a staged toolkit; sensory-first multimodal matrix, annotated video-still storyboards, and sensory-modal density circles, to illuminate otherwise invisible dimensions of embodied learning analytically legible and pedagogically meaningful in craft contexts. EMBER-S³ is applied in a detailed case study of a green woodworking pole-lathe session, enabling fine-grained observation of sensory-modal-spatial orchestrations and their role in cultivating executive functioning and agency. The outcomes of this case study speak directly to the identified gap by substantiating how multimodal craft pedagogy fosters agency and executive capacities through embodied, situated practices. In doing so, EMBER-S³ offers both a methodological innovation and a practical lens for agency-centred pedagogy, particularly within SEND education where inclusive, body-based approaches are essential.

The next chapter 3 builds on this clarified gap by introducing the theoretical frameworks, embodiment, sensory integration, spatiality, and affordance theory, that underpin EMBER-S³ and guide its application in the case study that follows.

2.10 Chapter 2 Summary and Conclusion

This chapter has critically examined the literature underpinning the study's focus on craft-based education, agency, and executive functioning, situating these within broader educational, policy, and theoretical landscapes. Section 2.1 introduced the purpose and approach to the literature review, establishing its relevance-driven orientation. Sections 2.2–2.4 contextualised the study within general and SEND educational frameworks, highlighting systemic challenges and policy tensions that constrain inclusive, agency-centred practices. Section 2.5 framed SEND through social, neurodiversity, and capabilities-based lenses, advocating for pedagogical approaches that resist deficit narratives and foreground empowerment. Section 2.6 explored the purpose of education, drawing on world-centred perspectives (Biesta, 2015, 2021) and philosophical traditions to justify the study's emphasis on fostering freedom, responsibility, and self-generated agency. Section 2.7 examined agency and executive functioning as interdependent capacities essential for autonomy and meaningful participation, while Section 2.8 reviewed research on craft-based practices, demonstrating their broad benefits for cognitive development, wellbeing, and identity formation. Subsection 2.8.7 introduced emerging scholarship on multimodal craft pedagogy,

including studies on digital preservation, multimaterial learning environments, and makerspaces, which affirm the complexity of craft practices but stop short of analysing embodied, sensory–modal–spatial dynamics in situ. Finally, Section 2.9 synthesised these insights to clarify the research gap: the absence of systematic, multimodal methodologies capable of revealing how sensory-rich, embodied craft practices foster agency and executive functioning, particularly within SEND contexts.

In summary, while craft education is widely recognised for its cultural, social, and educational value, there is a pressing need for research that explores the mechanisms through which craft fosters agency and executive functioning. Existing studies emphasise representation and design thinking rather than the pedagogical orchestration of sensory and spatial affordances during live craft learning. This study responds to that need by introducing and applying a bespoke hybrid multimodal methodology EMBER-S³, within a detailed case study. This approach enables fine-grained analysis of sensory–modal–spatial dynamics in craft pedagogy and demonstrates how these embodied practices foster agency and executive functioning.

The next chapter introduces the theoretical frameworks, embodiment, sensory integration, spatiality, and affordance theory, that inform this approach, providing the conceptual foundation for the study’s design, methodology, and analysis.

Chapter 3 Theoretical Framework

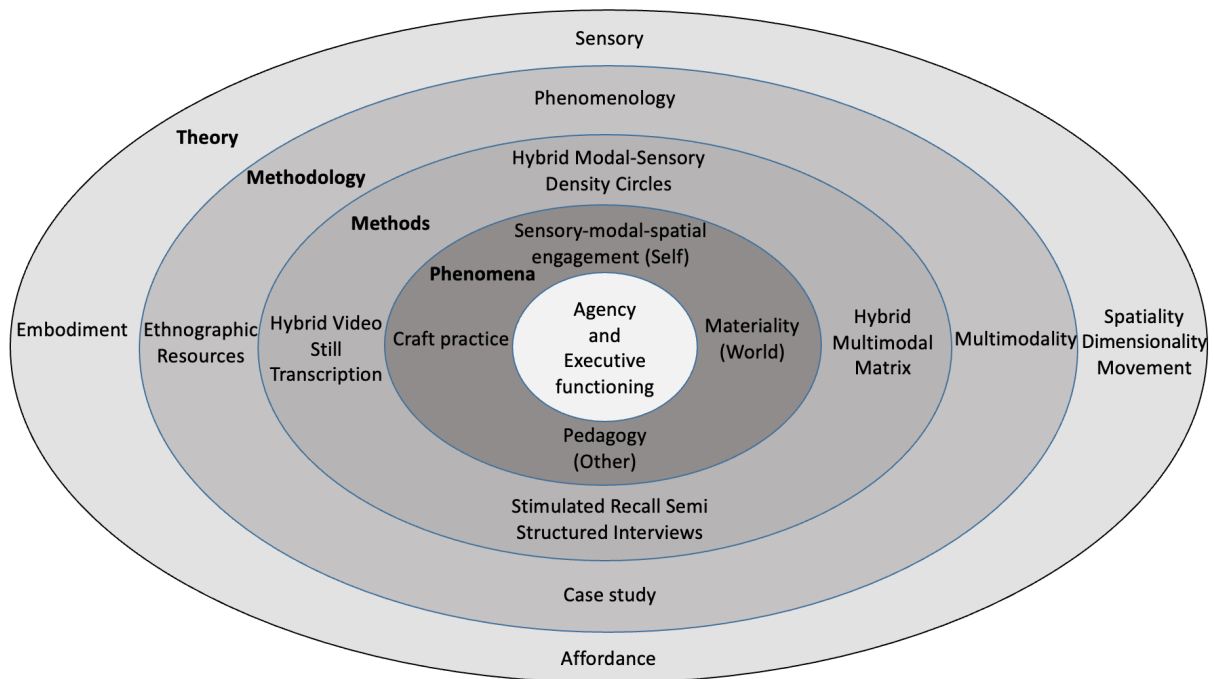
3.0 Introduction to Chapter 3

Building on the literature review, which highlighted the scarcity of applied pedagogical craft research and the lack of methodological frameworks capable of integrating sensory, spatial, and embodied dimensions, particularly within SEND contexts, this chapter develops the theoretical foundations that inform the creation of such a framework. Drawing on embodiment, sensory experience, spatial theory, and affordance theory, it outlines the conceptual underpinnings of the study and explains how these perspectives guide the research design, shape the analytical approach, and support the application of theory within pedagogical craft research. Together, these foundations prepare the ground for the hybrid methodology presented in Chapter 4.

The discussion explores the interrelationships between embodiment, sensory engagement, and spatiality, examining their influence on the emergence of agency and executive functioning through craft-based practices, while drawing on affordance theory to explain how material and environmental properties invite and enable these embodied actions. By situating and justifying these theoretical choices, the chapter provides the foundation for the bespoke hybrid methodological framework (EMBER-S³) and its approach to observing and interpreting embodied, multimodal, and spatial phenomena involved in the enactment and cultivation of executive function and agency.

Within the broader research framework (Figure 5), this chapter therefore addresses the outermost theoretical layer positioning the study within key constructs such as embodiment, sensory, movement, spatiality, dimensionality and affordance theory. Collectively these constructs inform the interpretation of interactions between self, world and others illuminating how these dialogues support the development of agency and executive functioning and the wider pedagogical potential of craft. This is later presented in the case study findings of Chapter 6 and discussions in Chapter 7.

Figure 5 Research framework



3.1 Embodiment

3.1.1 Introduction

This section establishes embodiment as a foundational lens for understanding how agency and learning emerge through dynamic interactions between body, environment, and others. It traces historical and philosophical roots from phenomenology to contemporary enactivism, highlighting the body’s central role in meaning-making. The discussion explores pedagogical traditions, theory and research linking sensory–motor engagement to cognitive, emotional, and moral development, situates craft as a prime context for embodied learning, and synthesises insights from neuroscience and anthropology. Collectively, these perspectives justify the study’s focus on sensory–modal–spatial orchestrations and inform the methodological design of EMBER-S³.

3.1.2 Historical Foundations and Development

Phenomenology, thought to be initiated by Husserl (1859–1938), positioned perception as the starting point for situated knowing (Dourish, 2001). However, Husserl’s ideas were framed within Cartesian dualism, privileging logical thought over sensory experience, where

senses were deemed deceptive (Lakoff & Johnson, 1999). Heidegger (1889–1976) advanced phenomenology beyond this mind–body divide, emphasising being-in-the-world, while Merleau-Ponty (1945/2012) highlighted the body’s role in meaning-making through direct sensory engagement. Mauss’ (1934/1973) “Techniques of the Body” and Bourdieu’s (1972/1977) writings on practice further reinforced the formative power of embodied action.

Steiner extended these insights, asserting that intellect is nurtured through bodily movement and dexterity, whilst also hinting at the deeper significance towards our moral and spiritual development, Steiner (1923/2014) states that:

“...man can think with his entire being...in every movement of the fingers there lie wonderful revelations of man's inner nature... it is man's whole moral nature which moves; his destiny moves with him; everything that he is as a spiritual being.”
(Steiner, 1923/2014, p. 210).

He advocated for practical ingenuity through crafts and agriculture as essential to education (Steiner, 1919/1985, 1919/2004).

Pragmatists such as Dewey (1934), Shusterman (2005), and Schön (1983) later emphasised reflection in and through action. Contemporary neuroscience frames these ideas within enactivism, positing that knowledge emerges through embodied experience and sensorimotor coupling with the environment (Noë, 2004, 2009; Thompson & Varela, 2001; Varela, Thompson, & Rosch, 1991). These perspectives converge in embodied and situated learning (Lave & Wenger, 1991) and enskillment (Ingold, 2000), challenging Cartesian dualism and aligning with socio-cultural and disability-informed notions of the bodymind (Price, 2015; Clare, 2017).

Current scholarship recognises that “knowledge-making is a dynamic process arising directly from the indissoluble relations that exist between minds, bodies and environment” and draws “the sentient, practising, tool-wielding body into the core of their work” (Marchand, 2011, p. 2). Craft thus emerges as a primordial site where agency is forged in the liminal

space between material transformation and self-transformation (Nasseri & Wilson, 2017). This space of “in-between-ness” enables synergistic dialogues that shape our embodied becoming (Nasseri et al., 2017, p. 16).

Consequently, embodiment has become a meaningful pedagogical mode. Holistic craft practices and associated environments offer fertile ground for embodied learning (Groth & Gulliksen, 2024; Nimkulrat & Groth, 2024; Schilhab & Groth, 2024b). Nordic countries, notably Finland, exemplify this approach, where crafts remain integral to curricula and correlate with high wellbeing indicators (Huotilainen et al., 2018).

3.1.3 Early Pedagogical Adoption

Historical pedagogues anticipated these principles. Pestalozzi (1801/1894) emphasised holistic, experiential learning through the integration of “head, heart, and hands,” while Waldorf education embedded crafts within developmentally attuned curricula. Ruskin’s educational philosophy similarly championed learning through doing, asserting that practical engagement fosters “a multitude of matters which no lips of man could ever teach him ... with much furtherance of their general health and peace of mind” (Time and Tide, Ruskin, 1867). His inclusive vision, educating “all people in schools according to their specific needs” (Ruskin, 1867), resonates with contemporary calls for person-centred education and multimodal pedagogy. Ruskin’s advocacy for craft as a vehicle for autonomy and dignity influenced global movements, notably Gandhi’s adoption of Ruskinian principles for social emancipation (Briggs, 2021). These insights, developed in my chapter on craft (Briggs, 2023), provide a historical and philosophical foundation for this study’s focus on embodied, multimodal approaches to agency formation.

3.1.4 Modes of Embodiment: Self, World, and Others

Fuchs (2011, p.2), following Thompson and Varela (2001), identifies three interrelated feedback loops that underpin mind, self-awareness, and agency:

(1) cycles of organismic self-regulation, engendering a basic bodily sense of self;

- (2) cycles of sensorimotor coupling between organism and environment, implying an 'ecological self';*
- (3) cycles of intersubjective interaction, resulting in what may be called a 'social self'.*

These modes underscore the need for education to begin with hands-on, experience-rich engagement, in situated environments with others, before imposing abstract, top-down curricula (Section 2.6). They frame agency as emerging through dynamic bodily–world–social interactions.

Building on these modes of embodiment, Schilhab and Groth (2024) articulate the 4Es of embodiment: embodied, embedded, enactive, and extended, as a contemporary framework for understanding cognition and learning as distributed processes. Embodied emphasises the sensing, moving body as central to meaning-making; embedded situates learning within material, cultural, and ecological contexts; enactive frames knowledge as enacted through purposeful engagement with tools and tasks; and extended recognises how artefacts and technologies become integral to cognitive systems. Within craft pedagogy, these dimensions converge as learners engage in multimodal dialogues with materials, tools, and environments, transforming both the object and themselves. This study draws on the 4E framework to deepen its analysis of sensory–modal–spatial orchestrations, positioning craft as a paradigmatic context for exploring how agency is cultivated through embodied, ecological, and relational processes.

3.1.5 Foundational Research for Embodied Education

Research across neurology and anthropology substantiates the pedagogical value of embodied learning. Bergström warns that neglecting manual engagement risks “finger blindness,” impeding neural development (Mitchell & Livingstone, 1999). Skilled hand use activates somatic sensory systems responsible for proprioception and motor coordination (Marchand, 2008). Wilson (1998) characterises the hand as central to intelligence, while neuroimaging studies (Makin et al., 2012; Stout & Chaminade, 2012; Warren et al., 2007) reveal intricate hand–brain connections. Findings from Rosenkranz et al. (2007–2009) demonstrate that hand stimulation enhances cognitive function, while Shi and Feng (2022)

link motor skill interventions to improved cognition, emphasising open-ended, sequential tasks, attributes inherent in craft.

Evolutionary research further highlights tool use as a driver of brain development and agency (Stackhouse Putt, 2016; Baker et al., 2025). Contemporary practitioner researcher scholarship reinforces craft's multimodal complexity (Groth, 2017), emphasising "thinking through making" (Mäkelä, 2007), "thinking through material" (Huotilainen et al., 2018; Nimkulrat, 2010, 2012), and "making sense through hands" (Groth & Gulliksen, 2024; Schilhab & Groth, 2024). Despite these insights, few studies examine the orchestration of sensory engagement toward agency and executive functioning, a gap this study addresses through its bespoke hybrid multimodal approach.

3.1.6 Implications for EMBER-S³

Section 3.1 reinforces the need for EMBER-S³ to prioritise embodiment as a core analytic lens. The framework must foreground the body's dynamic interactions with materials, environments, and others as central to agency formation, treating sensory and motor engagement as primary meaning-making resources rather than peripheral inputs, ensuring these dimensions are systematically captured in multimodal transcription. This emphasis strengthens EMBER-S³'s capacity to reveal how embodied action and material dialogue underpin agency formation within craft pedagogy. Insights from phenomenology, enactivism, and neuroscience justify incorporating detailed observation of proprioception, coordination, and haptic feedback within multimodal transcription. EMBER-S³ should therefore operationalise haptics and embodied action as key analytic categories, ensuring that sensory-modal orchestrations are systematically captured to reveal how material transformation and self-transformation co-occur in craft pedagogy.

3.1.7 Summary of Embodiment Theory Section

Section 3.1 positions embodiment as a foundational concept for understanding how agency and learning emerge through dynamic interactions between body, environment, and others. Drawing on phenomenology (Merleau-Ponty, 1945/2012), enactivism (Varela, Thompson, & Rosch, 1991), and socio-cultural perspectives, it argues that meaning-making is inseparable

from sensory and motor engagement. Historical pedagogical traditions (Pestalozzi, Steiner, Ruskin) and contemporary research converge on the principle that “thinking through hands” and embodied action are central to cognitive, emotional, and moral development. Craft practices exemplify this, situating the sentient, tool-wielding body (Marchand, 2011) in a liminal space where material transformation and self-transformation co-occur (Nasseri & Wilson, 2017). Neuroscience and anthropology reinforce these insights, showing how skilled hand use activates neural systems for proprioception, coordination, and cognition (Wilson, 1998; Makin et al., 2012).

This section informed and supported the study’s analytical focus on the orchestration of the senses and modalities through which students are educated, self-educate, make meaning and ultimately engender agency. Within this context it is therefore beneficial to delve deeper into the senses and their roles in the development of agency-related capacities. The subsequent section therefore focuses on theory and research that further contributed to the recognition, observation and cultivation of the senses and their utilisation towards these capacities.

3.2 Sensory Theory

3.2.1 Introduction

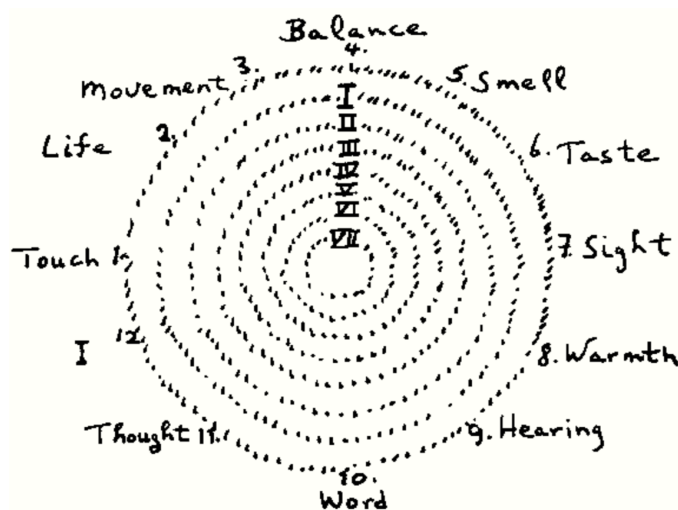
This section positions sensory theory as a critical lens for understanding how multimodal engagements in craft-based education contribute to agency and executive functioning. It defines the senses relevant to this study, explains their pedagogical significance, and outlines how they will be observed and analysed within the hybrid multimodal framework. Drawing on phenomenology, Steiner’s twelve senses, and Ayres’ sensory integration theory, the discussion foregrounds sensory engagement as central to embodied learning and meaning-making. These insights form the sensory-theoretical spine of the EMBER-S³ framework, enabling fine-grained, ethically attuned, and agency-centred analysis of craft pedagogy.

3.2.2 Historical and Conceptual Foundations

The theoretical commitment to the senses in this thesis is grounded in phenomenology and embodied cognition. Building on Merleau-Ponty's (1945/2012) account of embodied perception, particularly the ideas of motor intentionality and body schema, the study treats learning as arising through the whole sensing body in context rather than as a sequence of disembodied inputs (Merleau-Ponty, 1945/2012). Contemporary embodied and enactive perspectives (Fuchs, 2017; Thompson & Varela, 2001) emphasise that perception is a dynamic, relational process in which sensory experience and meaning-making are inseparable. This foregrounds sensory engagement as central to the cultivation of agency.

A complementary lineage comes from Rudolf Steiner's conception of the twelve senses and a "bottom-up" developmental view, where foundational bodily senses scaffold the emergence of environmental, social and cognitive senses. This study draws on Steiner's schema of senses (Steiner, 1916/1990, Lecture VII), presented in its first form in Figure 6 below, to justify a broader sensory palette than the traditional five and to align sensory development with the study's emphasis on embodied becoming.

Figure 6 Steiners' 12 senses (from Steiner, 1916/1990, Lecture VII)



Together, these perspectives support the thesis claim that craft practices create situated, sensory-rich dialogues between people and materials through which agency is formed, refined, and enacted.

3.2.3 Defining the Senses in This Study

Within the domain of physiology, sensory modalities, commonly understood as the five major senses: touch, smell, taste, hearing, and sight, now encompass a diverse range of up to 17 senses, categorised as “a specific system for interpreting and perceiving environmental stimuli by the nervous system” (Betts et al., 2013). There is considerable debate surrounding the identification, classification, and categorisation of the senses (Macpherson, 2011a, 2011b). Macpherson (2011a, 2011b) argues for a pluralistic view, suggesting senses should be defined by functional roles rather than fixed categories, acknowledging senses like pain, balance, and temperature as distinct modalities. However, the primary objective of this study is not to adjudicate these debates but to examine those senses deemed pedagogically significant within craft situations and establish a practical, theoretically informed sensory set that can be consistently observed and analysed in craft contexts.

Consistent with this study’s aims and with the provision’s practice context, the following twelve senses are synthesised from relevant sensory theory (Steiner, 1916/1990; Ayres, 1979, 2005; Betts et al., 2013; Williams & Shellenberger; 1996, Macpherson, 2011a, 2011b) and adopted as the unit of analysis for observation and multimodal transcription:

- 1 Touch (haptics)
- 2 Life (interoception)
- 3 Movement (proprioception)
- 4 Balance (vestibular)
- 5 Smell
- 6 Taste
- 7 Sight
- 8 Warmth

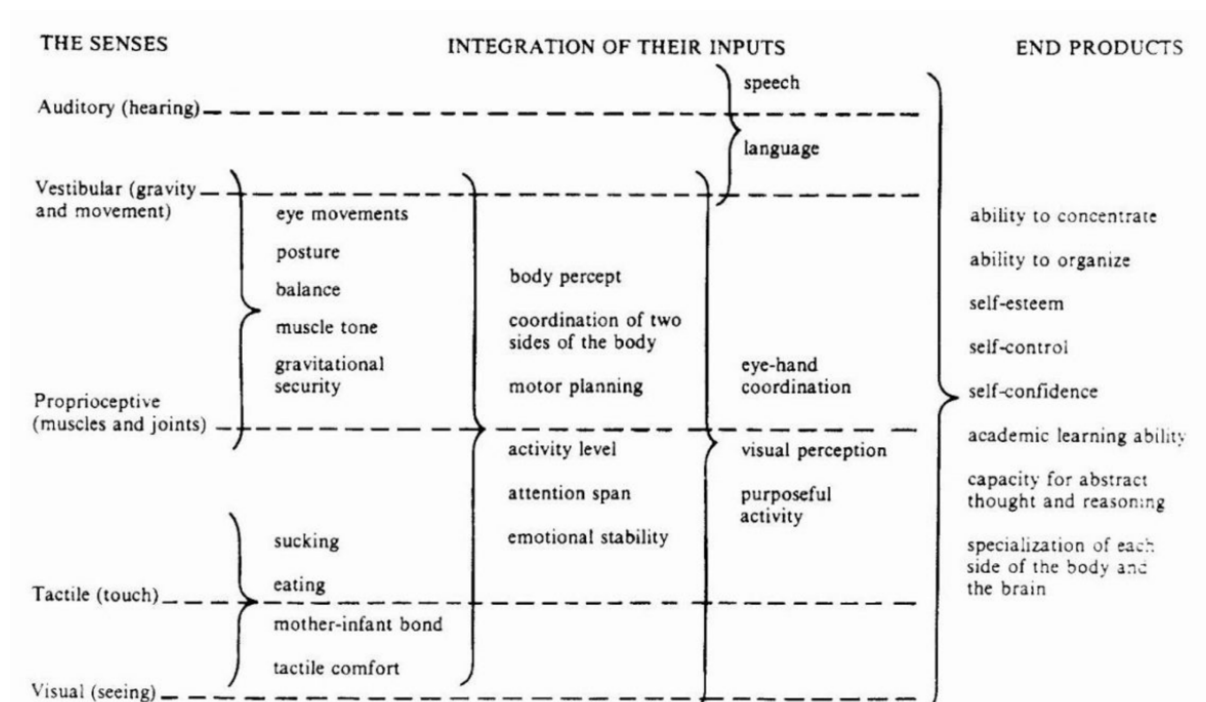
- 9 Hearing
- 10 Speech
- 11 Concept
- 12 Ego (sense of self/other)

This selection balances pedagogical relevance and analytic tractability: the senses are later grouped to reflect their typical roles in craft learning environments and their expected contributions to agency-related capacities (e.g., proprioception and vestibular sense underpin posture, tool control, and spatial orientation; touch, sight, and hearing underpin feedback loops essential for self-monitoring and inhibition).

3.2.4 Sensory Integration Theory and Educational Implications

Ayres' Sensory Integration (SI) theory conceptualises the "organization of the senses for use," highlighting how difficulties in receiving and processing sensory information can affect everyday functioning and learning (Ayres, 1979, 2005). Ayres (1979, 2005) set out a SI model, figure 7 below, hypothesising how the senses integrate, on the left, and contribute to skills, abilities and capacities, towards the right. Bundy and Lane (2020) further elaborate SI principles in contemporary practice. SI continues to evolve, with Schaaf & Davies (2010) highlighting its application in occupational therapy and autism research, while Hannant et al. (2023) provide evidence of sensory processing differences in neurodivergent populations. Trauma-informed approaches also underscore the role of sensorimotor engagement in regulation and agency (Ogden et al., 2006). In this study, SI provides an explanatory scaffold for how foundational senses (e.g., proprioception, vestibular) support capacities (e.g., attention, planning) that are central to executive functioning and the enactment of agency. The study uses the term SI (rather than SPD: Sensory Processing Disorder) to align with a differences-based stance in disability discourse and to foreground interactional contexts rather than deficit framing.

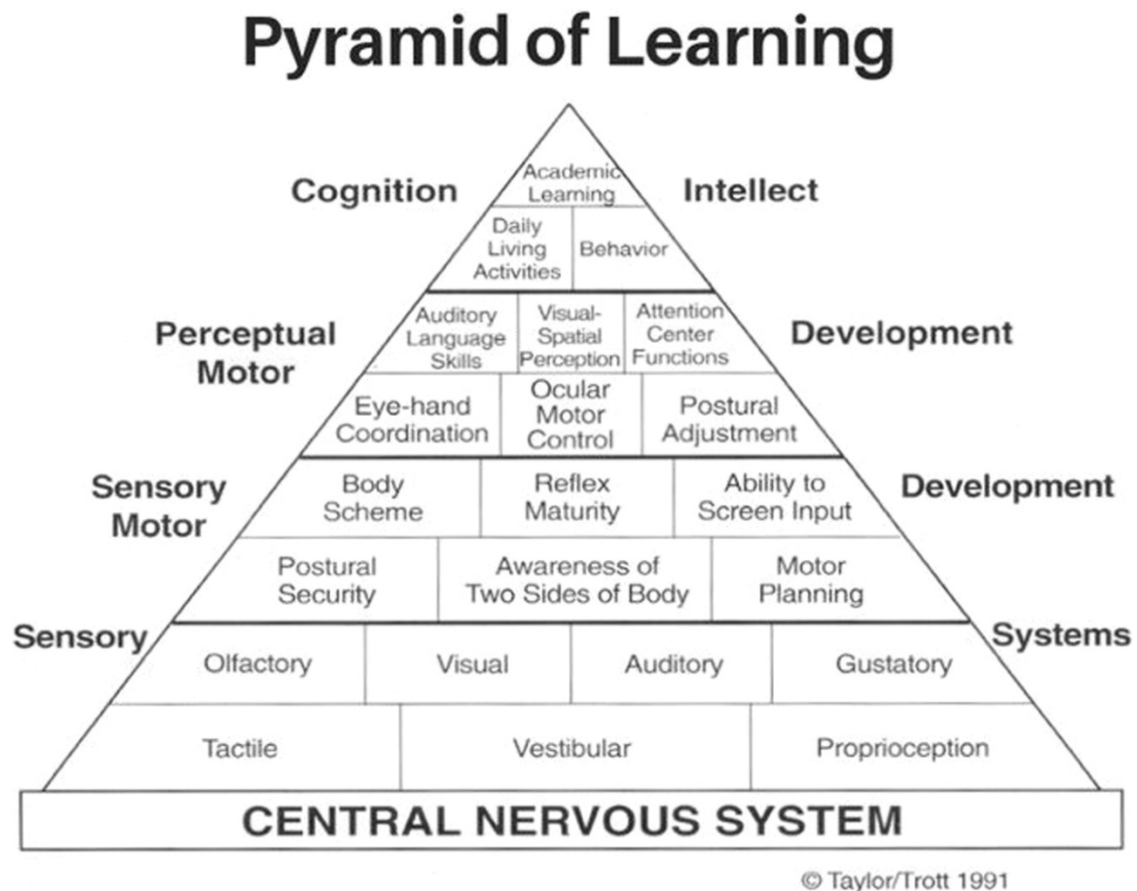
Figure 7 Ayres SI Model (1979)



3.2.5 The Pyramid of Learning

The Pyramid of Learning (Taylor & Trott, 1991, as cited in Williams & Shellenberger, 1996), figure 8 below, extends Sensory Integration theory by illustrating how incremental development of sensorimotor foundations supports functional and cognitive skills such as concentration, organisation, and self-control. It has recently informed the design of assessment tools that map neural, sensory, and motor foundations to identify barriers and support early educational profiles (Hannant et al., 2023), reinforcing its relevance for understanding how craft-based, sensory-rich activities scaffold executive functions and agency. This resonates with this thesis’s analytic focus: repeated, situated craft actions, such as stance, bilateral coordination, and tool angle control, orchestrate sensory systems toward executive capacities including working memory, self-monitoring, inhibition, and planning, all closely tied to the emergence of agency.

Figure 8 Taylor & Trott Pyramid of Learning (1991)



3.2.6 Integrated Sensory-Embodiment Model

To systematise observation and analysis, this study employs a hybrid theoretical model that integrates sensory integration (SI) and embodiment into a coherent visual schema (figure 9) of the sensing human in context (Fuchs, 2011; Thompson & Varela, 2001). The model organises the twelve senses across three orientations, bodily self, ecological self, and social/intellectual self, and relates them to the domains of thinking, feeling, and willing through visual depiction. This heuristic model supports field observation, multimodal transcription, and analysis by making visible the sensory-modal orchestrations implicated in agency formation.

Figure 9 A visual representation of the embodied human and sensory systems

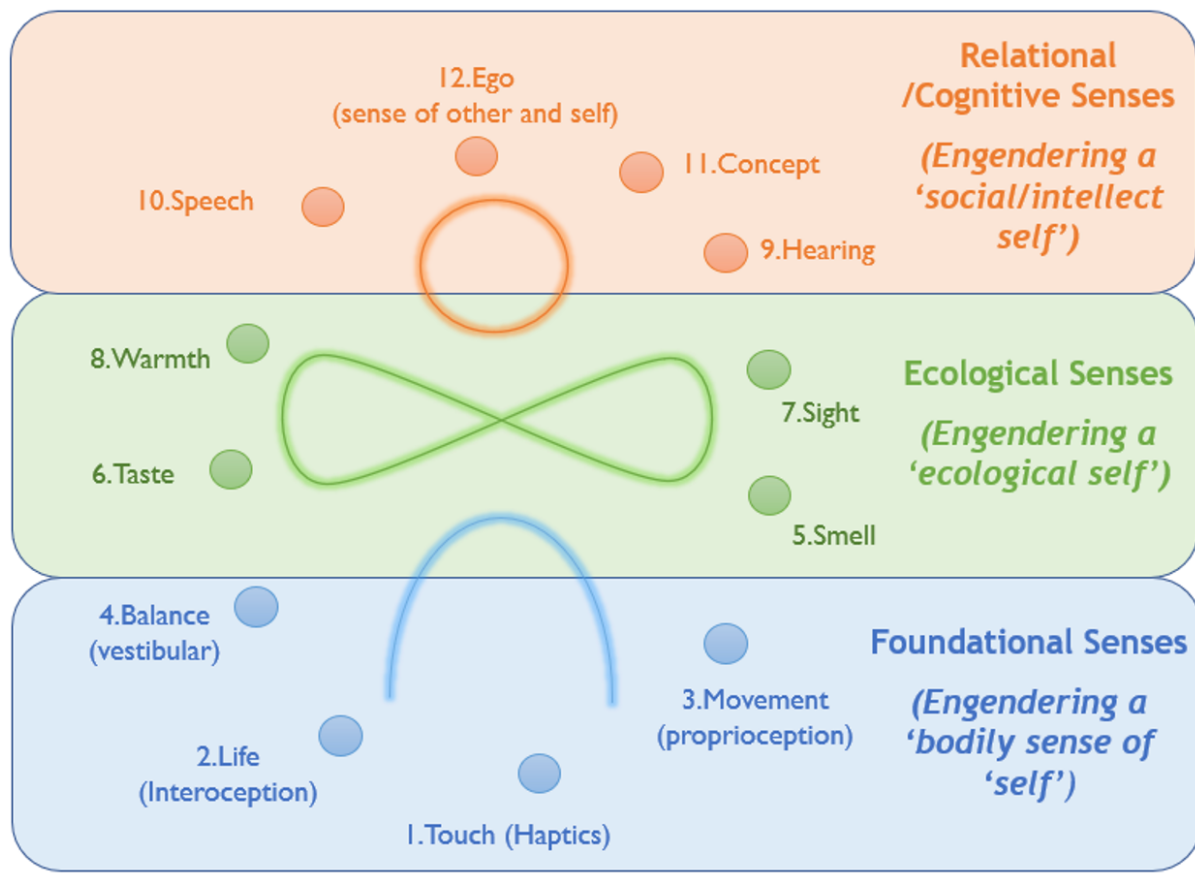


Figure 9 above illustrates the embodied human and sensory systems, foregrounding twelve senses drawn from sensory theory (Ayres, 2005; Steiner, 1916/1990; Williams & Shellenberger, 1996), grouped by orientation: bodily self (blue), environment (green), and social (orange). On the right, corresponding dimensions of embodiment; bodily, ecological, and social sense of self, are depicted, informed by embodiment theory (Fuchs, 2017; Thompson & Varela, 2001). Thinking, feeling, and willing are represented pictorially: a circle for cognition, a lemniscate for rhythmic feeling, and legs for action.

From a Merleau-Pontyan perspective (Merleau-Ponty, 1945/2012), perception is inherently multi- and trans-modal rather than reducible to discrete “sense data.” The categorisation of senses is therefore a theoretical construct (cf. Gibson, 1979), used here to highlight general relationships and feedback loops between body, world, and others, and the gradual formation of self. While the model simplifies complex concepts, its purpose is to focus the

study's analytical lens within a hybrid multimodal framework, not to provide an exhaustive depiction of human sensory experience.

Designed as a heuristic tool, the schema offers a practitioner-friendly visual guide for recognising sensory–embodied dynamics in craft pedagogy. These perspectives support the thesis claim that craft practices create situated, sensory-rich dialogues through which agency is formed and enacted (Fuchs, 2011; Thompson & Varela, 2001). To highlight analytic caution, although senses are displayed in categories for clarity, they operate as interacting systems within lived activity. Following Merleau-Ponty, the starting point remains multi- and trans-modal perception, hence the study's use of the term of sensory-modes.

3.2.7 From Sensory Systems to Executive Functioning and Agency

Within craft sessions, sensory modalities couple with material properties and tool dynamics to form iterative feedback loops (e.g., tactile and auditory feedback confirming cut quality; proprioceptive and vestibular feedback stabilizing posture and tool angle; visual feedback guiding line and form). These loops scaffold higher-level actions (Noris, 2004), planning sequences, monitoring performance, inhibiting impulses, that are constitutive of executive functioning and, in turn, the emergence and consolidation of agency.

This conceptual bridge, from foundational senses to agency-relevant capacities, underpins the study's decision to foreground the senses in the hybrid multimodal transcription and analysis of craft interactions (matrix, annotated video stills, and modal-density circles).

3.2.8 Implications for EMBER-S³

The theoretical commitments outlined here directly inform the design of EMBER-S³, the study's hybrid multimodal framework. They justify a sensory-first analytic lens within multimodal transcription, so that touch, proprioception, vestibular, vision, and hearing are treated as primary meaning-making resources, not merely as background inputs. They also shape the selection and organisation of transcription categories (e.g., gaze/focus/facial expression; gesture/tool manipulation; proxemics/kinesics/haptics; senses; and executive-

function constructs). The SI model, Pyramid of Learning and the integrated sensory-embodiment diagram are used heuristically during analysis and reporting, while retaining the caution that senses operate synergistically in lived practice.

These commitments also resonate strongly with the principles of Practical Skills Therapeutic Education (PSTE), which emphasise embodied, sensory-rich learning environments as vehicles for fostering agency and self-generated conscious action (Gordon, 2023). Taken together, Section 3.2 provides the sensory-theoretical spine for the methodological choices operationalised in Chapters 4 and 5, enabling fine-grained, ethically attuned, and agency-centred analysis of craft pedagogy.

3.2.9 Summary of Sensory Theory Section

This section established sensory theory as a critical foundation for understanding how multimodal engagements in craft-based education contribute to agency and executive functioning. Drawing on phenomenology, Steiner's twelve senses, Ayres' sensory integration theory, and contemporary research, it justified the inclusion of a broad sensory palette and linked these senses to pedagogical processes. The discussion highlighted how sensory systems interact with materiality and spatiality to scaffold higher-level capacities such as planning, inhibition, and self-monitoring. Finally, it demonstrated how these insights inform the EMBER-S³ framework, ensuring that sensory-modal orchestrations are central to the study's analytic lens.

Building on the sensory foundations outlined here, the next section 3.3 Movement, Spatiality, and Dimensionality, explores how bodily movement and spatial engagement further shape embodied learning and agency development. It examines the theoretical and practical significance of spatial dimensions and movement patterns within craft contexts, extending the sensory focus into a dynamic analysis of how learners inhabit and navigate space during craft-based activities.

3.3 Movement, Spatiality and Dimensionality

Introduction

This section examines how bodily movement and spatial engagement shape embodied learning and agency within craft-based education. It synthesises phenomenological, ecological, and sensory integration perspectives to show how learners' movements across sagittal, frontal, and horizontal planes afford opportunities for executive functioning and agency development. By extending the sensory focus into a dynamic analysis of spatiality and dimensionality, this section provides theoretical and practical insights that underpin the bespoke hybrid multimodal framework (EMBER-S³) introduced later. Applied examples from craft practice illustrate how movement and spatial orientation operate in situ, highlighting their pedagogical significance and role in fostering agency-related capacities (further analysed and discussed in chapter 6 and 7).

3.3.1 The Pedagogical Significance of Movement in Craft

Craft requires action; movement serves as the entry point into practical craft-based curricula and forms one of the primary observable analytical foci of this study. The embodied nature of making means that thinking and knowing emerge through the hands, as craft practitioners often think through their hands, with physical action becoming a mode of thought expressed through movement and gesture (Groth, Mäkelä, & Seitamaa-Hakkarainen, 2013). Movement has multiple developmental benefits and is widely used as an indicator of development (Sherborne, 1990). For example, the Ages & Stages Questionnaires (ASQ) monitor developmental milestones such as focusing, grasping, and stepping, which predict future challenges and can trigger early therapeutic support resources and facilitations (Squires & Bricker, 2009; Kerstjens, 2009).

Movement also helps young people feel at home in their bodies, form relationships, and regulate emotion (Sherborne, 1990; Leary & Hill, 1996; Peter & Walter, 2010; Shafir, 2016). Research highlights the benefits of movement-based approaches to support SEND learners and contexts, including yoga (Kenny, 2002), dance (Smith, 2016; Leban, 1948), and

performance (Hickey-Moody, 2009a, 2009b). Craft-related movements, such as carving and tool manipulation, offer cognitive and sensory-motor benefits (Guliksen, 2020), yet no research specifically explores craft-based movements and SEND, a gap this study addresses.

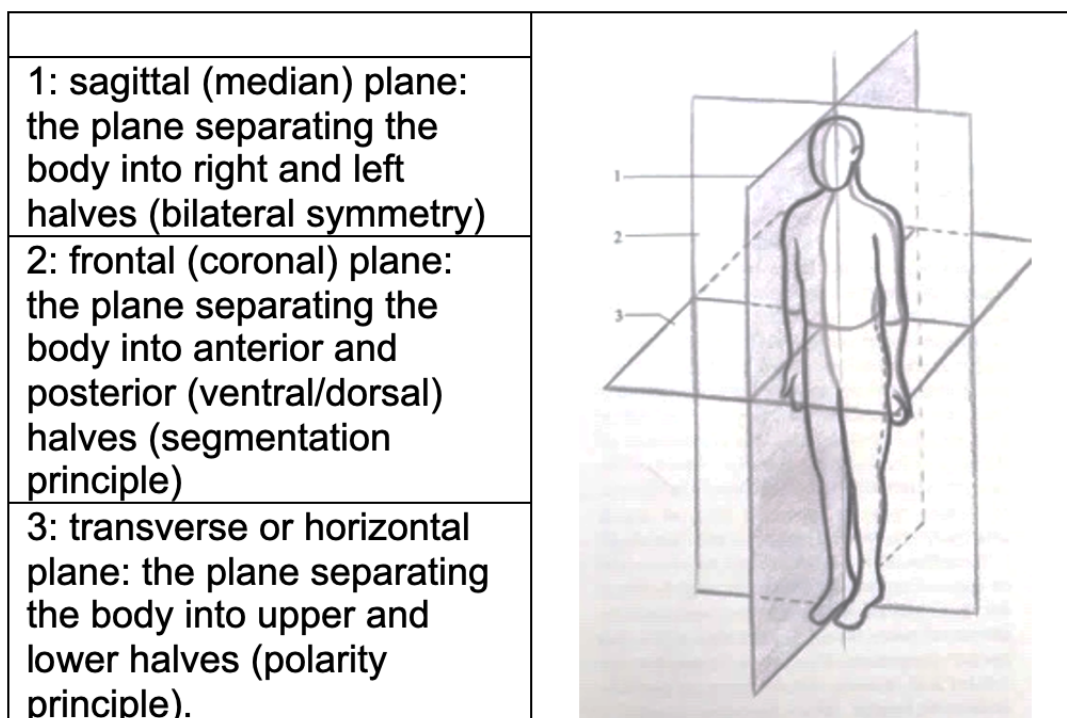
Applied Example

When a person adjusts stance and grip while operating a pole lathe (a body-powered device that spins wood back and forth so it can be shaped with hand tools, see 5.1.3), these micro-movements scaffold proprioceptive awareness and executive functions such as planning and inhibition. Observing these actions provides educators with insight into how learners integrate sensory feedback loops (touch, balance, proprioception) to regulate performance.

3.3.2 Spatiality and Dimensionality in Relation to This Study

“Planes of space” refer to the three primary anatomical and spatial divisions describing how the human body moves and orients itself: sagittal, frontal, and horizontal, see figure 10 below. Movements through these planes create spatial relationships and embodied experiences that shape cognition, emotion, and volition.

Figure 10 Planes of space in relation to the human being (adapted from Rohen, 2007. p. 27).



Phenomenology (Merleau-Ponty, 1945/2012), Gibson's ecological psychology (1979), and extended mind theory (Clark & Chalmers, 1998) frame spatial engagement as a dynamic process influencing agency. Entering dimensionality in space is not merely physical but cognitive, sensory, and social, enabling goal-directed behaviour and intentionality (Pacherie, 2008; Bandura, 2001, 2006). Steiner (1921/1991) and Rohen (2007) illustrate, see table 2 below, how these planes correspond to cognitive (head), emotional (heart), and volitional (will) domains, forming the basis for agency. König (1989, 2023) emphasises that focusing, grasping, and stepping, linked to these planes, are foundational for ego-awareness and agency.

Steiner (Steiner, 1921/1991) and Rohen (2007) emphasise that operation and movement within and through these three primary planes, sagittal, frontal, and horizontal, structure human movement and underpin cognitive, emotional, and volitional domains. For example, Steiner (1921/1991) associates the three spatial dimensions with distinct aspects of human functioning. The depth dimension relates to the inner operations of the mind and the nervous system (head), while movements of the arms and hands across the horizontal plane, right and left, correspond to the rhythmic system (heart), revealing inner processes through bilateral activity. The vertical dimension, expressed in walking, manifests the will and metabolic activity, bringing the third dimension into conscious awareness through embodied action.

Table 2 Dimensions of Space and Corresponding Domains (adapted from Rohen, 2007. p. 27).

Dimension		Plane of separation	Structure principle	Functional domain	Psychological domain*
1.	Right-left	Median sagittal	Bilateral symmetry	Information processes	Cognition
2.	Front-back	Frontal, through the vertebrae	Segmentation	Rhythmical processes	Feeling
3.	Up-down	Horizontal, through the body's centre	Polarity	Material processes	Willing

Following Steiner (1921/1991) and Rohen (2007), who emphasise the cognitive, emotional, and volitional significance of sagittal, frontal, and horizontal planes, contemporary movement science offers complementary insights that reinforce these principles within embodied pedagogy. The National Academy of Sports Medicine (NASM, 2021) and the International Sports Sciences Association (ISSA, 2023) foreground the importance of multi-planar movement in functional training, highlighting how sagittal (forward/backward), frontal (side-to-side), and transverse/horizontal (rotational) planes underpin motor control, stability, and neuromuscular coordination. These frameworks advocate for integrated, dynamic movement patterns that mirror real-world tasks, aligning closely with Gibson's affordance theory (1979) by illustrating how environments and tools invite specific actions through spatial configurations.

In the context of craft pedagogy, these insights resonate strongly with the embodied and multimodal lenses adopted in this study. For example, operating a pole lathe requires coordinated engagement across all three planes: sagittal alignment for depth control, frontal adjustments for bilateral tool manipulation, and rotational dynamics for shaping the wood. NASM and ISSA principles suggest that such multi-planar actions enhance proprioception, balance, and executive functions like planning and inhibition, capacities central to agency formation. This convergence underscores the pedagogical potential of

craft as an affordance-rich environment, where spatiality and movement are not incidental but foundational to cognitive and volitional development. By situating NASM and ISSA within the theoretical triad of embodiment, affordances, and multimodality, we extend their application beyond fitness into educational design, advocating for curricula that integrate spatially complex, embodied practices to foster agency and holistic learning.

Applied Example

Building on these theoretical and contemporary insights, the following example illustrates how multi-planar engagement is operationalised within the craft context studied. Aligning a chisel along sagittal and frontal planes during pole-lathe work requires learners to integrate spatial reasoning with motor control, fostering cognitive flexibility and self-monitoring. When teaching pole-lathe turning, the tutor can intentionally design tasks that engage all three spatial dimensions. For instance, guiding the student to maintain upright posture while stepping through the vertical plane activates volitional control and balance; encouraging bilateral hand coordination to manipulate the chisel across the horizontal plane fosters rhythmic engagement and proprioceptive awareness; and focusing on depth alignment of the tool with the wood billet in the sagittal plane supports cognitive precision and planning. These orchestrated movements do more than develop craft skills, they scaffold executive functions such as inhibition, self-monitoring, working memory, and sequencing, capacities that underpin agency. This synergy between spatial engagement and cognitive development exemplifies how embodied, affordance-rich environments can cultivate actions and capacities, a theme explored further in Chapters 6 and 7.

3.3.3 Foregrounding Spatiality as Foundational for Agency

Spatiality encompasses the lived experience of being in space and relational positioning within the craft environment and others. Merleau-Ponty's phenomenology frames spatial engagement as embodied, while Gibson's affordance theory (1979; Gibson & Pick, 2023) highlights how environments invite action. In craft workshops, spatial arrangements, such as tool placement and ergonomic proximity, shape learners' ability to act intentionally and exercise agency. These spatial configurations are not neutral; they afford or constrain possibilities for movement, perception, and interaction, influencing how learners

orchestrate multimodal resources to achieve higher-level actions. The following section (3.4) further outlines the significance and relevance of affordance theory within this study's context.

Applied Example

Positioning tools within easy reach and maintaining ergonomic proximity reduces cognitive load and supports executive functions like planning and initiation. Proximity of the tutor in relation to the student can aid observation, guided action and learning of skills.

3.3.4 Implications for EMBER-S³ arising from Movement, Spatiality and Dimensionality

Section 3.3 underscores the need for EMBER-S³ to integrate movement and spatiality as core analytic dimensions. Multi-planar actions and spatial orientation, sagittal, frontal, and horizontal, are shown to scaffold executive functions which underpin agency. These insights position spatial engagement and embodied movement as foundational rather than incidental, requiring EMBER-S³ to foreground sensory–modal–spatial orchestrations in its framework. This strengthens its capacity to reveal how craft environments afford rich, embodied interactions and informs its adaptability for inclusive, agency-centred pedagogical design.

3.3.5 Summary of Movement, Spatiality and Dimensionality Section

Section 3.3 explored how bodily movement and spatial engagement underpin embodied learning and agency within craft-based education. Drawing on phenomenology, ecological psychology, and sensory integration theory, it highlights the pedagogical significance of multi-planar movement (sagittal, frontal, horizontal) and spatial orientation in shaping cognitive, emotional, and volitional capacities. Situated examples from pole-lathe turning illustrate how coordinated actions, stance adjustment, bilateral tool manipulation, and spatial reasoning, activate sensory feedback loops that scaffold executive functions such as planning, inhibition, and self-monitoring. These insights position spatiality and movement as foundational for agency formation, reinforcing the need for educational environments that afford rich, embodied interactions.

Building on this understanding, Section 3.4 introduces affordance theory as a lens for conceptualising how materiality and spatial configurations invite and enable these embodied actions. It examines how educational and pedagogical affordances operate within craft contexts, framing their role in fostering agency and executive functioning through intentional design and multimodal engagement.

3.4 Affordance Theory: Framing Pedagogical Potentials within this Study

3.4.1 Introduction to Affordance Theory in Craft Pedagogy

This section situates affordance theory within the study's aim to reveal the educational and pedagogical opportunities arising from the materiality and sensory–modal–spatial interactions inherent in craft practice. In doing so, it seeks to illuminate the pedagogical potential of craft, with findings and future applications discussed in Section 7.1.

3.4.2 Gibson's Concept of Affordances and Agency

Affordance theory, introduced by Gibson (1977), highlights how individuals perceive actionable properties in their environment and act upon them. Affordances are not merely physical attributes but relational possibilities between the actor and the environment. Perception of affordances invites specific courses of action that agency enables, such as intentional selection among multiple affordances and voluntary initiation and control of actions (initiation), as well as modification of actions based on ongoing perceptions (self-monitoring). Thus, perceiving, selecting, enacting, and regulating affordances are intrinsically linked to agency and actively cultivated throughout the process.

3.4.3 Eleanor Gibson and Educational Affordances

Building on J. Gibson's work, Eleanor Gibson extended affordance theory to educational contexts, proposing that development occurs through active exploration of environmental affordances. Her ecological theory of development conceptualises learners as active seekers of information, whose perception enables discovery of new action possibilities rather than

mere accumulation of knowledge (Gibson & Pick, 2023). Development, according to this view, is driven by the interplay between environmental affordances and motivated individuals who perceive and interpret them. Perception enhances the acquisition of actionable possibilities rather than constructing abstract definitions, implying that educational affordances function by facilitating learners' discovery of new ways to act.

3.4.4 Defining Educational and Pedagogical Affordances

Educational affordances refer to the broader learning opportunities that emerge naturally from interactions between learners and their environment, tools, or resources. These encompass potential actions or possibilities accessible when students engage with educational materials, technologies, or contexts, including informal, incidental, or self-directed learning opportunities. In this study, educational affordances include the inherent properties of craft activities that promote physical, cognitive, and emotional development, skill acquisition, and agency formation. For example, working with wood fosters spatial reasoning, while adhering to craft sequences supports working memory.

Pedagogical affordances, by contrast, are intentional and refer to the specific teaching and learning opportunities that educators design to achieve instructional goals. These affordances are consciously embedded within pedagogical strategies and aligned with curriculum objectives and learning outcomes. Within this study, pedagogical affordances are understood as the deliberate structuring of craft activities to foster sensory integration, embodiment, agency development, and executive functioning skills. This involves purposeful choices regarding materials, tools, and environments to create rich educational and therapeutic encounters that support planning, self-regulation, and decision-making.

3.4.5 Situated Example: Craft Context

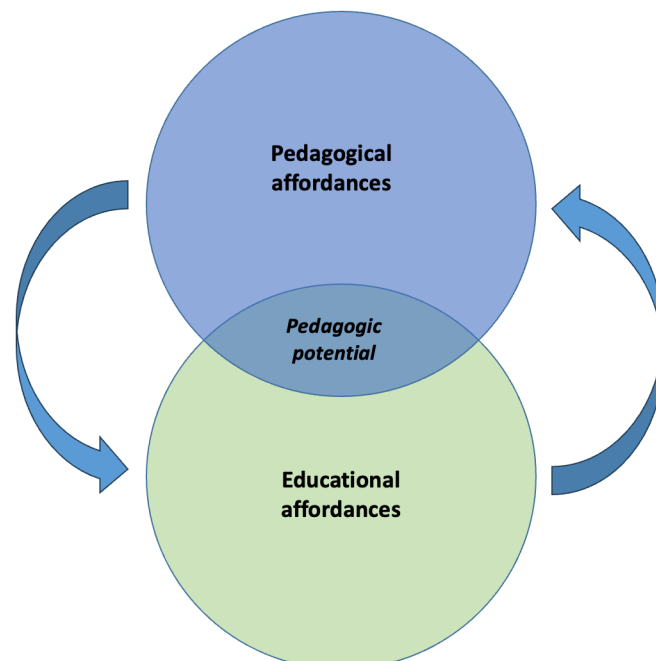
To illustrate the distinction between educational and pedagogical affordances in a situated craft context, consider the pole-lathe turning activity in green woodworking. The educational affordances include the inherent properties of the lathe and wood, which invite actions such as rotating, cutting, and shaping, opportunities that naturally foster

coordination, proprioception, and spatial reasoning. Pedagogical affordances emerge when the tutor intentionally structures the activity to develop executive functions: for instance, by scaffolding the sequence of steps (planning), prompting the learner to pause and check tool alignment (self-monitoring), and encouraging controlled foot pressure to regulate speed (inhibition). This deliberate orchestration transforms a craft task into a multimodal learning experience aligned with curriculum goals.

3.4.6 Synergy Between Educational and Pedagogical Affordances

Educational and pedagogical affordances operate synergistically, each amplifying the other's potential in a dynamic feedback loop that enhances overall pedagogical potential. Figure 11 illustrates this relationship. The distinction lies in their intentionality: educational affordances (Gibson & Pick, 2023) encompass opportunities that arise naturally from the learning environment, whereas pedagogical affordances are deliberately designed by educators to achieve specific outcomes.

Figure 11 Pedagogical potential Venn diagram



3.4.7 Implications for This Study and Methodology

This study employs a fine-grained focus on sensory–modal–spatial affordances, exploring how different types of affordances influence aspects of agency and executive functioning, such as working memory, self-monitoring, and inhibitory control. The framework and concepts of affordances (Gibson, 1977) guided the development of the bespoke hybrid multimodal methodology, enabling the systematic observation and analysis of educational and pedagogical opportunities afforded by materiality and sensory–modal–spatial interactions in craft situations. Alignment with phenomenological and multimodal approaches allowed deeper exploration of these dynamics through detailed analysis, culminating in their application within a real-life case study (outlined in Chapter 6). Section 7.1 revisits this framework to synthesise findings and articulate the pedagogical potential of craft-based practices.

3.5 Conclusion to Chapter 3 Theoretical Framework

3.5.1 Overview and Summary of Theoretical Foundations

This chapter established the conceptual underpinnings of the study, focusing on embodiment, sensory theory, movement, spatiality and dimensionality and affordance theory, that underpin the sensory–modal–spatial dimensions that shape learning within craft-based education. All of which converge to illuminate how embodied engagements foster agency and executive functioning.

Section 3.1 foregrounds embodiment as central to learning and agency, emphasising that meaning making arises through sensory and motor engagement. Drawing on phenomenology, enactivism, and socio-cultural theory, it highlights “thinking through hands” as pivotal for cognitive, emotional, and moral development. Craft exemplifies this, situating the tool-wielding body in a space where material and self-transformation co-occur, supported by neuroscience and anthropology linking skilled hand use to proprioception and cognition.

Building on embodiment, Section 3.2 deepens the focus by examining sensory theory as a critical lens for understanding how multimodal engagements in craft-based education

contribute to agency and executive functioning, forming the sensory spine of the study's hybrid multimodal framework.

Section 3.3 extends this discussion into movement, spatiality, and dimensionality, highlighting how multi-planar bodily actions and spatial orientation shape cognitive and volitional capacities in craft contexts. Situated examples from pole-lathe turning illustrate how coordinated actions, stance adjustment, bilateral tool manipulation, and spatial reasoning, activate sensory feedback loops that underpin executive functions and agency.

Together, embodiment, sensory theory, and spatiality establish the groundwork for Section 3.4, which introduces affordance theory as a conceptual bridge. Affordance theory explains how material and spatial configurations invite and enable these embodied actions, and how educational and pedagogical affordances can be intentionally designed to cultivate agency and executive functioning within craft-based pedagogy.

3.5.2 Previous Frameworks and the Need for Integration

While existing frameworks acknowledge the pedagogical significance of spatial engagement, few integrate spatiality, materiality, and embodiment comprehensively. Low's (2003) analysis of embodied space; "the location where human experience and consciousness takes on material and spatial form" (p. 9), offers valuable insights but primarily addresses urban public spaces and sociocultural power relations, which do not align directly with the practical, pedagogical focus of this research. To address this gap, the study introduces EMBER-S³, a conceptual and methodological framework that synthesises spatial, sensory, and multimodal dimensions to reveal how these orchestrations afford agency within craft-based education.

3.5.3 Integration into Methodology

The theoretical perspectives outlined in this chapter converge within the EMBER-S³ framework, operationalised through Multimodal Interaction Analysis (MIA) (Norris, 2004). This approach captures how learners orchestrate gesture, gaze, movement, and spatial

positioning during craft activities. Modal density and complexity analysis further reveal how sensory–modal–spatial configurations contribute to higher-level actions (Norris, 2004) such as sequencing and executive functions like self-monitoring. Sensory integration theory (Ayres, 1979; Schaaf & Davies, 2010) and embodiment research (Fuchs, 2017; Gallagher, 2005) justify the analytic focus on sensory–spatial orchestration as foundational for agency and executive functioning.

3.5.4 Summary of Key Insights

Movement, spatiality, and dimensionality emerged as central to embodied learning in the literature. Through repeated, situated craft actions, such as stance adjustment, bilateral coordination, and tool angle control, learners engage sensory systems that scaffold executive capacities including working memory, initiation, and inhibition. These capacities are closely tied to the emergence of agency, reinforcing the pedagogical potential of craft-based education.

The chapter synthesised theory and relevant research, highlighting the crucial role of senses, tool use, and spatial engagement in evolutionary and agentic development. It demonstrated that embodied, sensory, and spatial theories hold significant relevance for craft pedagogy and multimodal analysis, revealing the pedagogical and therapeutic potential of craftwork as a vehicle for agency formation.

3.5.5 Addressing Research Gaps

This review underscored the scarcity of applied pedagogical craft research and suitable methodological frameworks that integrate sensory, spatial, and embodied dimensions, particularly within SEND contexts. Previous studies have explored embodied sense-making through craft (Groth, 2017, 2024), focusing on design cognition and “thinking through hands.” However, no research has examined the capacity-forming dimensions of sensory engagement via craft or integrated body movement, spatial, and sensory analysis in SEND settings, or via focused multimodal case studies. This study responds to these gaps by

proposing a hybrid multimodal framework capable of revealing these underexplored phenomena.

3.5.6 This Study's Contribution

By analysing the embodied enactment and cultivation of agency and executive functioning through sensory–modal–spatial interactions with craft materiality, this research contributes a novel methodological approach to the fields of craft pedagogy and practical, body-based education. The next chapters build on this foundation: Chapter 4 clarifies how the multimodal methodology aligns with these theoretical commitments, and Chapter 5 details the specific methods employed to foreground and analyse these dimensions within the case study.

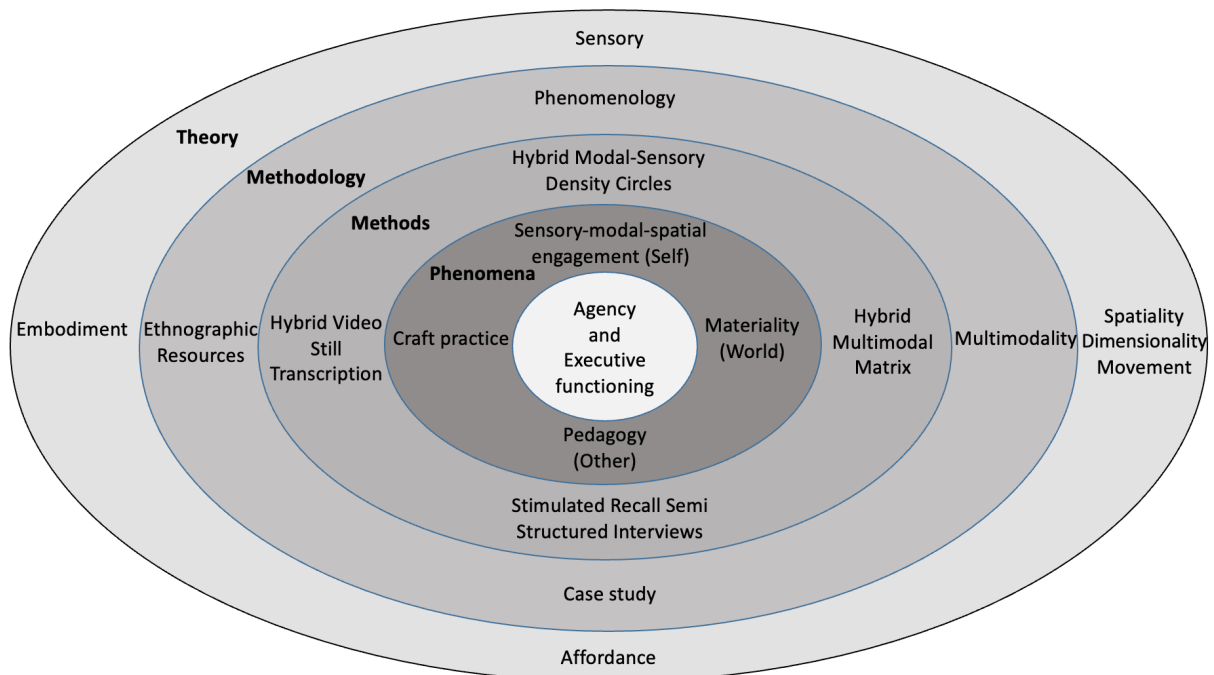
Chapter 4 Methodology

4.0 Introduction

This chapter sets out and explains the methodological framework used to investigate the study's research questions, aims, and objectives. Specifically, it delves into the methodological framework that underpinned the study's distinctive bespoke hybridised framework, EMBER-S³ (Embodied Multimodal-Based Experiential Research - Sensory, Spatial, Situated), and elucidates how phenomenology, multimodality, ethnographic resources, and an ethnographically informed case study were combined to facilitate a rigorous comprehension, observation, foregrounding, analysis, and presentation of the phenomena under study, guided and augmented by the theoretical foundations established in Chapter 3. The case study approach also served to test the bespoke framework and to foreground and contextualise the results.

In relation to the broader research framework (Figure 12), this chapter expands upon the methodological, fourth ring, positioning, justifying, and detailing the approaches taken to make embodied, sensory-modal-spatial processes analytically visible and pedagogically meaningful.

Figure 12 Research framework



4.1 Epistemological and Ontological Positioning

To critically justify the choices of methodology and method, it is important to clarify the epistemological and ontological stance, as these reflect the researcher’s worldview and direct the way research is conducted, how we come to know and make meaning (Grix, 2002). An accessible metaphor (Geisler & Watkins, 1999) likens epistemologies to coloured eyeglasses: they tint what we see; changing lenses changes the world we perceive. Epistemological reflexivity (King & Horrocks, 2010) is therefore essential in examining underlying assumptions, since they influence method, strategy, observation, interpretation, and analysis (Kofer, 2001).

Locating the Study: Epistemological Reflexivity and Ontological Commitments

During my earlier scientific training in Environmental Conservation and Sciences (BSc), my orientation was strongly positivist, seeking to identify reality through hypotheses, observation, and logical methods, a mode of knowledge production grounded in objectivist

epistemology (Mills & Birks, 2014). Positivism assumes an absolute, observable reality that can be measured and understood (Duncan & Nicol, 2004). This approach enabled me to make sense of the world by categorising and labelling its parts to understand how things interact mechanistically, answering questions of what and how. However, it fell short of addressing the why, particularly the dynamic, lived relations between people and their worlds.

As my research focus shifted toward interrelations and interdependence, between people, materials, and environments, objectivism proved insufficient for describing experience in isolation from the person who undergoes it (Crotty, 1998). Social science traditions, therefore, offer a more appropriate lens. These traditions, often interpretivist or constructivist, view meaning as situated, relational, and embodied (Burrell & Morgan, 1979; Denzin & Lincoln, 2017; Kvale, 2007). Within this paradigm, phenomenology provides a rigorous approach for attending to phenomena as they appear in consciousness (Husserl, 1936/1970; Langdridge, 2007), making it highly pertinent to the subject matter and focus here.

On reflection, I am confident in my own epistemological reflexivity (King & Horrocks, 2010), shaped by a varied educational journey, experience as an educator, and lived experience across multiple paradigm shifts. Each worldview brought unique strengths and limitations. While positivism offered clarity and structure, it could not satisfy my growing desire to understand meaning and lived experience. Social science, as a subjective rather than purely objective enterprise (Burrell & Morgan, 1979), better accommodates this inquiry. Interpretive approaches, such as phenomenology, have proven valuable in disciplines like anthropology, pedagogy, and psychology (Gill, 2014). Richardson and Fowers (1998) also highlight the value of interpretive social science in addressing social inquiry. This makes phenomenology highly relevant to the aims of this study.

Consequently, the study adopts an interpretivist epistemology and a relativist ontology. Epistemologically, knowledge is understood as co-constructed through interaction, interpretation, and reflection rather than discovered as an objective truth. Ontologically, reality is viewed as multiple and contingent, shaped by lived experience and context rather

than fixed and universal. This positioning aligns with the study's focus on meaning-making within relational and embodied practices, ensuring that the research approach remains consistent with its subject matter and philosophical foundations. This interpretivist stance aligns with Geertz's (1973) call for 'thick description,' which emphasises capturing the complexity of lived experience within its cultural and contextual setting, a principle that underpins the depth sought in this study's multimodal analysis.

Having established the study's theoretical foundations in Chapter 3, the proceeding section introduces the phenomenological approach that underpins both its philosophical orientation and methodological practice, providing a framework for attending to lived, embodied experience in ways that align with the study's interpretivist epistemology and multimodal design.

4.2 Phenomenological Approach

4.2.1 Introduction to the Phenomenological Approach

Building on the theoretical foundations outlined in Chapter 3, particularly embodiment, affordance theory, and sensory-spatial perspectives, this section situates and operationalises these concepts through a phenomenological lens. Phenomenology provides both a philosophical orientation and a practical strategy for observation and analysis, ensuring that the study's methodological choices remain consistent with its interpretivist epistemology and relativist ontology. By foregrounding lived experience and pre-reflective engagement, the phenomenological approach complements the multimodal framework introduced in Section 4.3, enabling attention to nuanced, embodied interactions without reducing them to abstract categories. This alignment strengthens the coherence of the research design and informs the subsequent analysis of affordances and multimodal orchestration in Chapters 6 and 7, where the pedagogical potential of craft practices is explored in finer-grained detail.

4.2.2 Philosophical Foundations of Phenomenology

Phenomenology, a branch of philosophy concerned with how phenomena appear in consciousness (Langdrige, 2007), was articulated in the early twentieth century by Husserl, Heidegger, Merleau-Ponty, and Sartre. Husserl (1936/1970, as cited in Thawornphun &

Manunpichu, 2010) emphasised the need to return to phenomena themselves, advocating rigorous study of lived experience to reveal essential structures of consciousness (Dowling, 2007). Central to phenomenology is the pursuit of deep understanding of human experience within a world that is subjective and constructed by each individual.

Phenomenology addresses lived experience through two dimensions:

1. Reflective meaning-making: how individuals interpret and articulate experience using language and discursive resources (Smith, Flowers, & Larkin, 2009).
2. Pre-reflective, embodied understanding: the immediate, sensory engagement prior to linguistic framing.

This dual focus is particularly relevant in craft learning, where knowledge emerges through sensory-spatial and multimodal practices rather than abstract verbal reasoning. The study's phenomenological stance aligns with embodiment and sensory integration theories (Chapter 3) and informs the approach to observation outlined below, ensuring attentiveness to situated, embodied dynamics. Such attentiveness is also crucial for recognising the experiences of learners, including many disabled learners, whose meaning-making unfolds through sensory-spatial and embodied modalities rather than primarily linguistic forms.

Practically, this commitment to the phenomenological approach involved me attending a two-year part-time course, *Encountering Nature and the Nature of Things* (Goethean phenomenological science, at the Nature Institute, NY), and a three-month course, *Body-based Practices* (phenomenology and Embodied Cognition, at the University of South-Eastern Norway), which I undertook to strengthen my observational capacities and attune them to phenomena without premature abstraction. Although these trainings were valuable for my own development, they are not a prerequisite for future researchers adopting this approach. Similar reflexive skills can be cultivated through guided practice, structured self-reflection, and attending to the indications set out here.

4.2.3 Phenomenological Approach to Observation in Practice

Observation played a central role in both data collection and analysis within this multimodal framework. Following Bortoft's (1996) assertion that "a change in the way of seeing means a change in what is seen" (p. 143), cultivating attentiveness and resisting premature categorisation was essential. This stance aligns with Goethean phenomenology and scholars such as Bortoft (1996, 2012), Seamon (2018), and Shotter (2014), who advocate for engaging in mutual interaction with phenomena rather than imposing abstract categories.

Goethe's approach to observation emphasises perceiving "variety of relationships livingly interwoven," a phrase used by Bortoft (2012) to characterise Goethe's dynamic, relational way of seeing. Thoreau's invitation to "let the object come to you" and allow "a true sauntering of the eye" (1852, as cited in Specq, 2016, p. 380) guided oscillation between wide and focused attention, helping to avoid habituation and enabling richer perception of nuanced environmental and material affordances. This attuned oscillation resonates with Ingold's (2000) account of perception as a skilled, responsive shifting between open, ambient awareness and moments of concentrated focus, cultivated through an ongoing, participatory engagement with the environment.

In practice, I applied these principles by alternating between a diffuse, wide gaze and a concentrated, focused gaze, attending to entire scenes, both in direct situated observation and in video viewing, while remaining open to subtle pedagogical occurrences and interactions. This approach allowed phenomena to reveal themselves in ways that narrow, habitual observation might obscure. By remaining alert to moments when my attention drifted toward categorisation or habituation, I resisted premature judgment and preconceived assumptions that could have led to perceiving abstractions rather than concrete instances. Instead, I cultivated openness, enabling me to notice how nuanced environmental and material differences shaped participants' responses, interactions, and learning processes. This reflexive attentiveness also heightened my awareness of multiple modes of communication and meaning making, further explored in the multimodality section (Section 4.3). Such sensitivity is essential for capturing the multimodal dynamics that underpin craft pedagogy. Furthermore, this approach supported deeper engagement with what Bortoft (2012) terms "upstream" processes, the formative, pre-reflective dynamics (Shotter, 2014) that precede explicit actions or articulated meanings. These latent potentials, arising in the interplay of materials, environments, and embodied practices, shape what later becomes

observable. Attending to these upstream influences enabled the study to reveal how affordances and sensory-spatial arrangements influence learning before they manifest in overt pedagogical interactions. This orientation facilitated the identification of pedagogical affordances (Gibson, 1979; Gibson & Pick, 2023), enabling a more granular analysis of how these affordances influence learning and agency (see Discussion and Analysis, Chapter 7.1).

4.2.4 Epistemological and Ontological Alignment

By aligning observational practices with the study's epistemological commitments, this phenomenological stance ensures attentiveness to lived experience and embodied, sensory-spatial dynamics. It complements the hybrid multimodal framework by enabling perception of nuanced interactions without reducing them to abstract categories. Through cultivating observational reflexivity, the phenomenological lens strengthens the EMBER-S³ framework's aim to foreground sensory-modal orchestrations and their role in shaping agency. Consequently, the study adopts an interpretivist epistemology and a relativist ontology, viewing knowledge as co-constructed and reality as multiple, situated, and contingent.

The phenomenological approach outlined here establishes the interpretive and reflexive stance that guides observation and analysis, creating a foundation for the multimodal framework introduced in the following Section 4.3, where these principles are operationalised to capture the sensory-spatial and embodied dynamics of craft pedagogy.

4.3 Multimodal Approach

Introduction to Multimodality

The study adopts a multimodal methodological framework (Jewitt et al., 2025), which provides concepts, methods, and tools for analysing visual, aural, embodied, and spatial aspects of interaction, as well as the relations between them (Jewitt et al., 2025; Kress, 2010; Jewitt, 2014). Multimodality is particularly suited to this research because it enables systematic attention to the sensory-spatial and embodied dimensions of craft pedagogy.

Core Commitments of Multimodality

Jewitt et al. (2025) outline three central commitments that underpin multimodal analysis:

1. Materiality of modes, recognising that tools, materials, and spaces afford distinct communicative potentials and constraints.
2. Analytic parity, resisting linguistic primacy by attending equally to gesture, gaze, posture, and spatial layout.
3. Orchestration, examining how modes co-operate to form a multimodal whole.

Relevance to Craft-Based Learning

Craft-based learning is predominantly communicated and understood through embodied modes, observation, mimesis, and gesture, rather than language (Marchand, 2008; Streeck, Goodwin, & LeBaron, 2011). Multimodality is therefore highly relevant, as it enables systematic analysis of organising principles for modes available in specific contexts, including actions, materials, artefacts, gesture, movement, gaze, voice, and spatial arrangements (Jewitt, 2014). It also captures how embodied and situated interactions transmit and tutor skill (Streeck et al., 2011). Rowsell (2013) underscores this synergy, noting:

“Theories of multimodality rest on the assumption that our engagement with the world is through the body: through sight, sound, touch, smell, taste... The body is central to how we make meaning in the world” (p. 111).

This further reinforces the relevance of multimodality to the study’s theoretical foundations of embodiment and sensory experience (see Chapter 3).

Analytic Orientation and Approaches

Multimodal analysis involves examining the diverse modes of interaction and communication through which meaning is made, beyond dominant linguistic forms. Approaches to multimodal analysis vary according to researchers’ epistemological and ontological positions. Jewitt (2014) identifies three broad orientations: systemic functional

linguistics (SFL), social semiotics, and interactional analysis, while acknowledging their complexity and range of applications. This study employs a hybrid approach, drawing on social semiotic principles (Section 4.3.1) and interactional analysis (Section 4.3.2), with specific transcription and analytic procedures detailed in Chapter 5.

Having outlined the multimodal framework and its theoretical commitments, the following sections detail the specific analytic orientations adopted in this study, social semiotic and interactional approaches, along with their methodological implications for transcription and analysis.

4.3.1 Social Semiotic Perspective of Modes and Defining Core Concepts and Terminology

The first analytic orientation adopted in this study is the social semiotic approach to multimodality, which views modes as socially and culturally shaped resources for meaning-making (e.g., gesture, gaze, spatial arrangement, material configuration) (Kress, 2010). This approach emphasises the motivated nature of signs, representational choices reflect the social, cultural, and material contexts in which communication unfolds, rather than being arbitrary (Kress, 2010; Jewitt et al., 2025). It aligns with the study's interpretivist epistemology by foregrounding meaning as situated and co-constructed within specific practices and environments. In craft pedagogy, this lens enables analysis of how materials, gestures, spatial arrangements, and artefacts function as semiotic resources that mediate learning and skill transmission, and how their affordances are assembled in practice to shape what counts as "good" or "safe" work (Kress, 2010; Bezemer & Kress, 2016; Kress & van Leeuwen, 2021).

From a social semiotic perspective, modes are socially and culturally organised resources for meaning-making, not merely channels or media (Kress, 2010). In craft learning contexts, gesture, gaze, proxemics, kinesics, haptics, spatial layout, and tool-material interaction often carry critical information, frequently outweighing speech in moment-to-moment coordination (Rowell, 2013). Within this repertoire, touch/haptics is agentic rather than passive: directed tactile exploration interrogates materials, receives feedback, and enacts skill; recent social-semiotic work has articulated touch as an emergent mode with its own

organising principles (Jewitt, 2017a, 2017b). At the same time, perception is typically multisensory and interdependent, such that seeing, hearing, and feeling operate in mixed degrees during situated activity (Bezemer & Kress, 2016; Macpherson, 2011a, 2011b).

Definitions

- **Mode:** A socially organised set of semiotic resources for constructing meaning (e.g., image, writing, layout, speech, gesture, spatial arrangement). Modes are historically and culturally made, with recognisable organising principles in a community (Kress, 2010; Jewitt et al., 2025). Examples include visual (images/graphics/layout), linguistic (written/spoken language), audio (music/sound effects), gestural (body movement), and spatial (physical arrangement).
- **Modality:** The perceptual channel through which information is processed (e.g., visual, auditory, olfactory, haptic, thermal). A mode can be realised across one or more modalities; e.g., a gestural mode is typically perceived through visual and haptic modalities. In multimodal texts and practices, meaning emerges from the orchestration of modes across modalities (Jewitt et al., 2025; Kress & van Leeuwen, 2021).
- **Sense:** A physiological system (e.g., touch, proprioception, vestibular, interoception, warmth) through which modalities are experienced. Contemporary philosophy and allied sciences recommend treating the senses pluralistically, well beyond the traditional “five” (Macpherson, 2011a, 2011b). Sensory integration literature (Ayres, 1979/2005) and practice frameworks (Williams & Shellenberger, 1996) further highlight vestibular and proprioceptive contributions to functional participation and learning. Holistic perspectives also articulate an expanded taxonomy of twelve senses, useful for broadening sensory–semiotic awareness (Steiner, 1916/1990).

Clarifying distinctions

Modes generate meaning (designable semiotic resources), modalities convey information (perceptual channels), and senses instantiate modality in the body (physiological systems). For example, a demonstrator's gesture (mode) is perceived via visual/haptic modalities through vision/proprioception/touch (senses); its meaning depends on the social rules and affordances of the practice (Kress, 2010; Kress & van Leeuwen, 2021).

Defining Modes, Modalities, Senses, and Sensory-Modal-Spatial in This Study

Section 3 introduced the senses and outlined sensory integration theory. Here, I formalise terminology for the study's multimodal methodology. In this study, I refer to:

- **Mode:** A socially constructed, culturally transmitted semiotic resource with recognisable organising principles (Kress, 2010).
- **Modality:** The perceptual channel through which information is processed (Jewitt et al., 2025).
- **Sensory modalities:** Primary meaning-making resources in craft pedagogy, foregrounded in transcription and analysis because craft learning is embodied, sensory-spatial, and often coordinated through non-verbal cues and material feedback (Bezemer & Kress, 2016; Rowsell, 2013; Jewitt, 2017a, 2017b).
- **Sensory-modal-spatial:** A composite concept used in this study to capture the interdependent orchestration of sensory perception, semiotic modes, and spatial arrangements within craft pedagogy. This term reflects how meaning-making and skill transmission occur through embodied engagement with materials, tools, and environments, where sensory feedback (e.g., haptic resistance, auditory cues), modal resources (gesture, gaze, posture), and spatial configurations (tool placement, body positioning, proximities) operate in synergy.

In practice, this concept guided analysis by:

- Highlighting how sensory feedback informs modal choices (e.g., adjusting grip based on tactile resistance).

- Examining how spatial arrangements scaffold multimodal interaction (e.g., lathe positioning shaping gaze and gesture).
- Mapping modal density and complexity across sensory and spatial dimensions to understand their role in executive functioning and agency development.

This integrated lens was critical for revealing how craft learning is not only multimodal but deeply sensory and spatial, and for ensuring that transcription and interpretation captured the embodied, ecological nature of pedagogical interaction.

This focus connects directly to the study's interest in agency and executive functioning. Recent research demonstrates that sensory processing patterns significantly influence executive functions and action coordination, including in neurodivergent groups such as autistic individuals and those with ADHD (Engel-Yeger & Mevorach Shimoni, 2024; Huang et al., 2024). These findings underscore why modal density and intensity, as well as individual sensory preferences, are critical considerations for pedagogical orchestration in craft learning. Attending to these dynamics ensures that teaching strategies and environments support regulation, planning, and adaptive skill use.

In summary, adopting a social semiotic perspective frames craft pedagogy as a multimodal, multisensory social practice. Here, resources (modes), their perceptual realisation (modalities), and the embodied systems (senses) are analysed together to understand how learning is mediated through materials, gestures, spatial arrangements, and artefacts in situ (Kress, 2010; Jewitt et al., 2025; Kress & van Leeuwen, 2021).

4.3.2 Multimodal Interaction Analysis (MIA)

The second analytic orientation employed in this study is interactional analysis, which focuses on the fine-grained examination of social interaction as it unfolds in real time (Streeck, Goodwin, & LeBaron, 2011). This approach emphasises the sequential organisation of action, attending to how participants coordinate meaning through gesture, gaze, posture, and material engagement within situated contexts. Multimodal Interactional Analysis (Norris, 2004) complements the social semiotic perspective by shifting attention from the

broader cultural and semiotic framing of modes to their moment-by-moment orchestration in practice. In the context of craft pedagogy, this enables the study to capture how learning emerges through embodied interaction, collaborative adjustments, and the dynamic interplay of multimodal resources.

MIA (Norris, 2004) is adopted as the core analytic approach for video data. It:

- Builds multimodal transcripts from video stills with superimposed text to capture gesture, gaze, posture, proxemics, tool manipulation;
- Distinguishes higher-level actions (initiating/performing a skill) from chains of lower-level actions (micro-movements, gaze shifts, tactile adjustments) that scaffold them;
- Examines modal density (intensity of one mode) and modal complexity (co-presence of several modes) to show how orchestrations scale up into higher-level actions.

Overview of MIA

Multimodal Interaction Analysis (MIA) is an analytical approach designed to examine how meaning-making unfolds through the orchestration of multiple modes during interaction (Norris, 2004). It employs video-based transcripts that integrate still images with superimposed text to capture the dynamic interplay of embodied and disembodied modes. Rather than isolating language from its context, MIA conceptualises meaning-making as an emergent process shaped by participants' actions in situ. Drawing on Mediated Discourse Analysis (Scollon, 2001), MIA posits that all mediated actions are accomplished through mediated means and insists on multimodal parity (Hodge & Kress, 1988), ensuring equal analytic weight across modes such as gesture, gaze, posture, and material engagement.

Application to Craft Pedagogy

MIA is particularly suited to craft-based learning environments, where tool use and bodily coordination involve complex, multi-planar movements (sagittal, frontal, horizontal), calibration of tool angles, and real-time sensory feedback through touch, sound, and sight

(Norris, 2004; Marchand, 2011; Gibson, 1979; Gibson & Pick, 2023). These interactions exemplify mediated actions, as learners orchestrate multiple semiotic resources, gesture, haptics, spatial positioning, while negotiating material affordances and responding to environmental cues. This makes MIA an effective lens for analysing how craft knowledge is enacted and transmitted through embodied, sensory-spatial practices.

Foregrounding Actions via MIA

MIA (Norris, 2004) distinguishes between:

- Higher-level actions: Goal-oriented activities such as initiating or enacting a craft skill or sequence, which often exhibit high modal density.
- Lower-level actions: Constituent behaviours including gaze shifts, posture adjustments, and tool grip that support higher-level actions.

In this study, the distinction between higher- and lower-level actions is descriptive rather than hierarchical; these levels do not imply better or worse actions, but different layers of embodied activity that interrelate within the flow of practice.

Modal density (Norris, 2004) can manifest in two ways:

- Modal intensity: One mode dominates (e.g., intense visual focus during a critical cut).
- Modal complexity: Multiple modes of moderate intensity combine toward the same goal.
- Hybrid cases may involve both intensity and complexity, where an intense mode (e.g., haptic feedback) operates alongside several coordinated modes.

This layered perspective enables researchers to trace how multimodal orchestration contributes to the execution of complex craft actions.

Relevance and Methodological Gap

While MIA has been successfully applied in contexts such as autism and minimal speech to explore agency in communication (Doak, 2018), it remains underutilised in craft pedagogy. No existing research has examined the multimodal orchestration of sensory-modal-spatial dimensions in craft learning environments. This study addresses this gap by adapting MIA within a bespoke hybrid multimodal framework to analyse embodied, material, and sensory dimensions of craft learning among adults identified as having SEND. This approach offers novel insights into executive functioning, agency, coordination, and multimodal complexity in skill transmission, contributing to both multimodal theory and inclusive pedagogical practice.

4.3.3 Comparing Social Semiotic and Interactional Approaches

The social semiotic approach to multimodality conceptualises modes, such as gesture, gaze, and material arrangement, as socially and culturally shaped resources for meaning-making (Kress, 2010; Jewitt et al., 2025). It emphasises the motivated nature of signs, focusing on how representational choices reflect broader social, cultural, and material contexts. This perspective is valuable for understanding the semiotic affordances of modes and their role in constructing meaning within craft pedagogy. In contrast, interactional analysis examines the moment-by-moment orchestration of these modes in real-time interaction (Streeck, Goodwin, & LeBaron, 2011). Rather than concentrating on the cultural framing of modes, it attends to the sequential organisation of action, capturing how participants negotiate meaning through embodied practices such as gesture, gaze, and spatial positioning during collaborative work. This approach is particularly suited to analysing dynamic processes of learning and coordination as they occur in situ.

By combining these approaches, the study benefits from a dual lens: social semiotics provides insight into the broader semiotic systems and affordances that shape craft learning, while interactional analysis reveals the micro-level dynamics through which these resources are mobilised in practice. This hybrid orientation ensures a comprehensive understanding of multimodal orchestration in craft pedagogy, aligning with the study's interpretivist epistemology and its focus on embodied, sensory-spatial interaction.

Illustrating This Through Pole-Lathe Woodturning

From a social semiotic perspective, materials, tools, and actions function as semiotic resources. Green wood, for example, is not merely physical; its moisture, colour and grain signal affordances that shape the learner's interpretation of what is possible. The instructor's rhythmic foot pumping and hand positioning operate as semiotic acts, conveying timing and coordination, the "grammar" of the craft. Artefacts such as finished spindles, stool legs and stools, act as representational resources, embodying norms of quality and style, while the spatial arrangement of tools and lathe positions organises workflow and safety. Here, learning is mediated by signs in action, and the craft environment becomes a multimodal text that learners interpret.

Interactional analysis, in turn, foregrounds how these resources are mobilised in real-time. Demonstration and imitation create dialogic processes where tacit knowledge is negotiated. Embodied coordination, synchronising foot and hand movements, is scaffolded through deictic gestures ("like this") and haptic guidance (placing hands on the learner's tool). Repair and feedback occur through corrective gestures or verbal cues ("ease off the pressure"), while shared attention on the spinning wood establishes a joint attentional frame where meaning is co-constructed. In this view, learning is not simply internalising signs but participating in socially organised interaction, where semiotic resources and embodied practices are negotiated moment by moment.

4.3.4 Use of Hybridised MIA in This Study

Extension of MIA in This Study

This study builds on the conceptual foundations of MIA and related frameworks (Doak, 2018; Norris, 2004; Taylor, 2014) by incorporating fine-grained observation and analysis of sensory dimensions. This extension aligns with theories of spatiality and embodiment outlined in Section 3. The study extends MIA conceptually and procedurally:

- 1. Sensory-first multimodal matrix.**

A hybrid multimodal matrix (full 46-second scene) groups modes contextually, gaze/focus/facial expression; gesture/tool manipulation and planes of space; proxemics/kinesics/haptics; senses (touch, hearing, balance, movement); theory/concept (learning/EF); environmental context. This keeps feedback loops in view and captures how modal complexity supports the enactment of EF capacities (working memory, initiation, self-monitoring, inhibition, shift) (Diamond, 2013; Zelazo, 2015; Blair & Razza, 2007; Diamond & Lee, 2011).

2. Annotated video stills + narrative vignettes.

Following Norris (2004) and Doak (2018), storyboarded stills combine narration and pictorial emphasis (arrows for movement and spatial planes; line styles for gaze; text emphasis for language; colour coding for sensory feedback loops). This visually conveys orchestration and key analytic moments.

3. Sensory-modal density circles.

Adapting Norris (2004) and Doak (2018), density circles portray the degree and kind of multimodal orientation toward shared action, extended here to student–materiality (tool–wood) as well as student–tutor interactions. These circles are heuristic, not quantitative; they visualise interpretive emphasis (with reasons grounded in video, ethnographic, and interview data).

The outcome of using this staged process: 1. Matrix, 2. Stills, 3. circles, allowed identification and portrayal of how sensory–modal–spatial orchestrations scaffold lower and higher-level actions, executive functions, such as self-monitoring and inhibition, and how these support agency in craft learning.

The application of MIA within this study offers several advantages. It enables detailed identification of actions, modes, and senses in craft interactions, including tutor–student dynamics and student–material engagement with tools, artefacts, and the environment.

Furthermore, MIA illuminates how shared attention emerges through multimodal orchestration, providing insights for pedagogical strategies. For example, the analysis can

reveal when to employ orchestrations of modes, whether through high modal intensity (dominance of one mode) or modal complexity (coordination of multiple modes), and senses such as touch, haptics, and auditory cues to effectively transmit skills and meaning.

This approach promotes equity by enabling learners who have been identified as having SEND, and their tutors, to engage through their preferred sensory and modal configurations, fostering agency and meaningful participation. By accommodating non-verbal modes such as gaze, gesture, and movement alongside verbal communication, the framework ensures inclusive opportunities for interaction and learning.

A following section (4.4) elaborates on how MIA integrates with ethnographic resources and case study methods within the hybrid EMBER-S framework, complementing the theoretical foundations discussed in Chapter 3.

4.3.5 Phenomenological Approach to Observation and Reflexivity

To enhance methodological rigor and avoid reductionism, this study integrates MIA with phenomenological observational practices. These practices, outlined in Section 4.2, are summarised here in terms of their operationalisation:

- Suspend categorisation: Avoid imposing predefined categories; allow phenomena to reveal themselves (Bortoft, 1996, 2012; Shotter, 2014).
- Alternate attentional modes: shifting between open, ambient awareness and more concentrated, selective attention, supporting perceptual attunement to the environment (Ingold, 2000).
- Monitor habituation: Guard against seeing “types” instead of unique instances; maintain freshness of perception (Bortoft, 1996, 2012; Gibson, 1979)
- Attend to upstream conditions: Observe environmental and material affordances that shape action (Seamon, 2018; Gibson, 1979; Gibson & Pick, 2023).

In practice, this involved oscillating attention between entire scenes (e.g., tutor–student interaction) and micro-moments (e.g., subtle grip adjustments), withholding judgment until

embodied nuances were registered. Observers remained open to emergent pedagogical affordances, such as unexpected material responses or learner adaptations.

This reflexive stance supported a holistic, unbiased account of craft pedagogy in situ, ensuring that observation remained consistent with the study's interpretivist and phenomenological epistemology.

4.4 Ethnographic Resources

Although this study does not claim to be a full ethnography due to its limited duration, it draws on ethnographic approaches commonly used in multimodal research (Taylor, 2014; Doak, 2018; Arnold, 2012). These approaches generate complementary data and provide essential contextualisation, as outlined in the multimodality section and detailed in the methods chapter. Ethnography is typically understood as a systematic approach to studying social and cultural life through prolonged field engagement, capturing emic perspectives and producing rich qualitative accounts (LeCompte, 2010). While this study lacks the extended immersion associated with “doing ethnography” (Green & Bloome, 2004), it adopts ethnographic perspectives and tools to provide a focused yet rich account of craft practices and participant experiences. These tools extend the dataset, enabling contextual depth and “thick description” (Geertz, 1973) of the learning environment, practices, and cultural nuances.

Building on this, the incorporation of ethnographic resources, including curriculum documents, student background information, location details, photographs, and interviews, facilitates the inclusion of the backstory (Flewitt, 2011) and context of the diverse and extensive range of influences that inevitably impact the encounters and interactions that transpire. Furthermore, it provides a social map (Street, Pahl, & Rowsell, 2009) to the multimodal analysis. Additionally, it offers a helpful context for the historical background and cultural meanings, which aid in understanding the positions of the participants and, consequently, how their interactions may be influenced by the broader educational objectives that underpin the nature of the activities and their execution through the local interactions being studied.

In summary this study draws on ethnographic practices commonly used in multimodal studies (Taylor, 2014; Doak, 2018; Arnold, 2012) to generate contextual data and “thick description” (Geertz, 1973):

- Field notes and a reflexive journal captured context and analytic ideas.
- Background documents (student profiles, curriculum materials, practitioner guides) provided institutional and pedagogical context (Street et al., 2009; Flewitt, 2011).
- Photographs supplemented video, providing detail on artifacts and tools.
- Semi-structured stimulated recall interviews elicited emic perspectives from participants by watching selected scenes, validating observations, and co-constructing interpretations (Brinkmann & Kvale, 2015; Mavers, 2012).

These resources extended the dataset, amplified participant voice, and linked micro-analysis to wider practice, strengthening credibility. They are synthesised and contextualised through a case study approach, which the following section defines and explains.

4.5 Ethnographically Informed Case Study

Although one of the primary objectives of this study is the development and validation of a bespoke hybrid framework, its application is presented through an ethnographically informed case study. This approach provides the contextual depth needed to clarify and justify the methodological choices made in investigating the phenomena under review.

Rationale and Alignment

The study adopts a single-case embedded design (Yin, 2018), focusing on a student–tutor–world triad within a specific educational provision and craft workshop. This design is particularly suited to situated craft pedagogy, enabling depth and nuance while integrating ethnographic elements, such as documents, background data, and interviews. It offers

methodological strength by combining the contextual richness of ethnography with the focused, bounded nature of case study inquiry.

Yin (2018) defines case studies as a means to illuminate, describe, or investigate phenomena within their real-life contexts and notes that they can be combined with other methodologies, including ethnography and phenomenology. This study exemplifies these characteristics by examining the development of agency and executive functioning through multimodal, sensory-spatial interactions in craft learning. While ethnographic resources were employed, the study does not qualify as a pure ethnographic case study due to its short duration, fine-grained focus, and hybrid methodology. Pure ethnographies typically aim to construct arguments about cultural or community formation (Schwandt & Gates, 2018), whereas this study concentrates on individual development within a specific pedagogical setting.

Methodological Integration

The combination of case study and ethnographic elements was chosen because it aligns with the research focus: ethnographic practices provide contextual depth, while the case study approach enables detailed exploration of individual development. Together, they complement the study of multimodal learning and agency enactment, offering a robust framework for analysing complex, embodied interactions.

Case Study Characteristics

The following characteristics align with established case-study methodology (Yin, 2018; Schwandt & Gates, 2018):

- Bounded case: One specific student–tutor–world triad in a single provision
- Focused phenomenon: Development of agency and executive functioning
- Multiple data sources: Educational plans, profiles, videos, observations, interviews
- Real-life context: Craft workshop environment

Ethnographic Elements

The ethnographic components draw on multimodal and educational ethnography (Geertz, 1973; Green & Bloome, 2004; Flewitt, 2011):

- Background contextual data: Educational plans, profiles, and curriculum documents providing individual, institutional, and cultural context
- Observational data: Direct observations in the natural learning environment (video recorded)
- Meaning-making focus: How senses, modes, and spatiality within craft situations contribute to agency and executive functioning
- Contextual understanding: Rich description of the learning environment

Design Classification

Following Yin's (2018) framework, this study is best classified as a single-case embedded design, presenting its primary case (the student–tutor–world triad) while analysing several embedded elements within that case, specifically: the enactment and cultivation of executive functioning and agency, and the sensory–modal–spatial orchestrations evident across student–tutor interaction, student–material engagement, and the wider craft environment.

By combining methodological rigour with contextual richness, this approach enables the study to surface pedagogical insights while also validating the hybrid EMBER- S³ framework. In summary, the integration of multimodal analysis, ethnographic resources, and an ethnographically informed case study provided complementary and mutually reinforcing contributions to the bespoke hybrid framework. Extended MIA supported fine-grained observation and analysis of embodied, sensory, and spatial modes, while ethnographic resources contextualised this microanalysis by situating it within the broader practices, histories, and pedagogical intentions of the provision. Stimulated recall interviews further strengthened member checking and foregrounded participant voice, reinforcing the interpretivist and phenomenological commitments underpinning the study. Collectively,

these elements worked in synergy to generate a comprehensive and situated account of how agency and executive functioning were enacted and cultivated within the craft-based pedagogical setting.

4.6 The Hybrid Methodological Framework Developed for This Study (EMBER-S³)

Rationale

Despite widespread recognition that craft is multimodal, embodied, and complex (Groth, 2017), there was no consolidated methodology to foreground sensory–modal–spatial dynamics as they contribute to executive functioning (EF) and agency. EMBER-S³ addresses this gap by integrating phenomenology, multimodality, ethnographic resources, and ecological affordances into a coherent framework.

How EMBER-S³ Integrates Multiple Theories

EMBER-S³ is a layered framework that synthesises distinct theoretical traditions into a single, coherent methodology:

- Phenomenology (Husserl, 1936/1970; Merleau-Ponty, 1945/2012; Van Manen, 1990) gives the epistemic lens: start from lived experience, treat embodied perception and pre-reflective knowing as primary. This ensures observation and analysis remain attuned to phenomena rather than collapsed into abstractions.
- Multimodality (Jewitt et al., 2025; Kress & van Leeuwen, 2021) provides the methodological and analytic toolkit: treat gesture, gaze, posture, spatiality, tool interaction, and sensory modalities with equal analytic weight; analyse how they orchestrate meaning-making in craft settings.
- Ethnographic resources (Geertz, 1973; Green & Bloome, 2004; Flewitt, 2011) furnish context and “thick description,” enabling MIA outputs (matrix/stills/circles) to be

situated within real pedagogical ecologies. Semi-structured stimulated recall interviews also anchor interpretations in participant voice.

- Extended MIA (Norris, 2004; Doak, 2018; Scollon, 2001; Hodge & Kress, 1988) operationalises analysis through three stages: sensory-first matrix, annotated video stills, sensory-modal density circles, revealing how lower-level actions (micro-movements, gaze, haptics) combine into higher-level actions (skill initiation, completion), and how these support EF capacities.
- Ecological affordances (Gibson, 1979; Gibson & Pick, 2023) ground analysis in materiality and space; tools, layouts, proximities, as pedagogical potentials that invite and shape action. This secures a situated, world-centred account of learning and agency.

These strands are not parallel; they interlock and synergise. The phenomenological lens keeps the inquiry rooted in lived perception; multimodality ensures analytic parity across embodied resources; ethnographic context prevents decontextualisation; extended MIA illuminates orchestrations analytically visible; affordance theory explains why certain configurations invite agentic outcomes. Together, they form EMBER-S³, a methodology that is both philosophically consistent and analytically practical, revealing how sensory-modal-spatial engagements in craft pedagogy cultivate executive functioning and agency.

Components and Integration

Below I present the various layers of the EMBER-S³ methodological approach:

- a) Epistemological layer, Phenomenology & Interpretivism
Attends to lived experience and embodied sense-making (Husserl, 1936/1970; Merleau-Ponty, 1945/2012; Van Manen, 1990). This layer justifies treating senses and movement as primary resources of meaning rather than mere inputs.
- b) Methodological layer, Multimodality + Ethnography

Positions gesture, gaze, posture, spatial arrangement, and sensory modalities as analytic peers (Jewitt et al., 2025; Kress & van Leeuwen, 2021), enriched by ethnographic context (field notes, documents, interviews) to provide situational detail (Geertz, 1973; Green & Bloome, 2004; Flewitt, 2011).

c) Analytic layer, Extended MIA (matrix > stills > circles)

Implements a sensory-first multimodal matrix for whole scenes; storyboarded video stills for narrative and emphasis; sensory-modal density circles to visualise orientation, intensity, and complexity. This layer bridges micro transcription with higher-level actions and EF (Norris, 2004; Doak, 2018; Diamond, 2013).

d) Situated affordances, Gibsonian ecology

Frames materiality and space as affordance-rich, inviting action, perception, and regulation (Gibson, 1979; Gibson & Pick, 2023). This guides attention to environmental design, tool placement, ergonomics, and proxemics in analysis and future practice.

Outcomes and Contributions

EMBER-S³ keeps method aligned with epistemology, prevents reduction to abstract categories, and makes sensory–modal–spatial orchestrations analytically legible. It supports pedagogical insight (e.g., scaffolding strategies and environment curation) and is transferable to other body-based educational and therapeutic contexts.

4.7 Ethical Considerations

Introduction

Ethics were not treated as procedural obligations but as integral to the methodological design of this study. Working with participants identified as having SEND, and employing multimodal, video-based approaches, required careful attention to inclusivity, safeguarding,

and participant agency. This section outlines the ethical framework underpinning the research, detailing how principles of informed consent, anonymity, and wellbeing were embedded into the data collection process to ensure rigor and sensitivity. Further operational and practice-based ethical considerations, including how these principles were enacted during data collection, are discussed in greater detail in Section 5.4.

Ethical Framework and Approval

Comprehensive ethical approval was obtained through Sheffield Hallam University's Converis system (Ethic Review ID: ER25832136), ensuring compliance with institutional codes of practice for research involving vulnerable populations (SHU, 2015). This approval shaped key methodological decisions, including the use of video recording and multimodal techniques, drawing on precedents for sensitive deployment in similar SEND contexts (Doak, 2018, 2019). Ethical considerations were therefore embedded from the outset, influencing both design and implementation.

Informed and Ongoing Consent

Consent was approached as a dynamic, dialogic process rather than a one-off event (Miller & Bell, 2002). Participants received clear, accessible information verbally and in written form (see Appendix A for participant information and consent forms), eliminating the need for deception or covert research (Thomas, 2013; Cohen et al., 2011). Signed consent was obtained prior to participation, supplemented by verbal reaffirmation before each observation, recording, and interview. Gatekeepers, Education Learning Coordinators, acted as neutral advocates, ensuring voluntariness and reducing perceived pressure. This iterative approach acknowledged the inherent limits of informed consent, recognising that neither participants nor researchers can fully anticipate all outcomes, while maximising opportunities for withdrawal at any stage.

Anonymity and Data Protection

Anonymity was safeguarded through software masking of faces and voices in all outputs, as specified in consent documentation. Pseudonyms were used throughout; however, for clarity as the case study is a dual-participant case, the term ‘student’ and ‘tutor’, were applied within the presentation of results. Data management protocols (see Appendix B for data management plan) ensured compliance with GDPR and institutional standards, reinforcing transparency and participant protection.

Safeguarding and Wellbeing

Non-maleficence was central to the study’s design (Swain, 2017). Recognising that observation and filming could induce anxiety, sessions were conducted in familiar environments during scheduled activities. Camera placement and researcher positioning were carefully planned to minimise intrusion. Participants were monitored for signs of discomfort, with readiness to withdraw if needed, though this did not occur. These measures ensured that consent rituals were not mere formalities but enacted with genuine care (Juritzen, Grimen & Heggen, 2011).

Methodological Integration of Ethics

Ethical principles were embedded within the research methodology, shaping data collection and analysis. Iterative consent protocols and safeguarding strategies enabled authentic, multimodal data generation, capturing lived experiences without reliance on retrospective accounts. This approach aligns with qualitative principles of fairness and respect while attending to context-specific vulnerabilities experienced by participants identified as having SEND (as operationalised in Chapter 5 and detailed in the ethical considerations in Section 5.4). By foregrounding participant agency and comfort, ethics enhanced methodological rigor, ensuring that data generation was both sensitive and robust.

Complexities of Ethics in Practice

While ethical principles and procedures provide an essential foundation, applying them in situ revealed moments that were more complex, relational, and less tidy than formal

documentation might suggest. For example, the advantages of employing the Education Learning Coordinators as gatekeepers became evident when a student raised questions about the study at home. Their parent contacted the coordinator, who then relayed the questions to me, maintaining an appropriate distance and enabling the family to seek clarification without the student feeling pressured. This process afforded the participant the time and space needed to make an informed decision, which ultimately led to their participation in the pilot study.

A contrasting ethical moment arose when another participant declined consent for information to be sent home, a response that initially caused professional unease. Consultation with their Education Learning Coordinator and the provision's mental-capacity lead confirmed that the participant, being over eighteen and with capacity, had the right to make this decision. This required me to recalibrate my assumptions, reaffirm their autonomy, and recognise the ethical legitimacy of withholding home contact even while the participant enthusiastically engaged in the research itself. His choice to participate, while simultaneously articulating his own terms for doing so, embodied a form of self-authored engagement that reflects the study's broader exploration of agency as a lived, situated, and relational process. These moments highlight how ethical practice is not merely procedural but an ongoing, relational, and context-attuned endeavour that calls for continual reflexive judgment.

Conclusion

These measures ensured that ethics were not confined to compliance but actively informed the study's interpretivist and phenomenological commitments. By embedding ethics within methodological design, the research prioritised participant agency, inclusivity, and sensitivity, reinforcing both rigor and trustworthiness.

Summary

Ethics were integral to the study's interpretivist and phenomenological commitments, functioning as embedded methodological principles rather than mere procedural

obligations. Working with participants with special educational needs and disabilities required inclusive, dialogic consent processes (Miller & Bell, 2002), respect for multimodal participation beyond speech (Jewitt, Bezemer, & O'Halloran, 2016), and sensitivity to positionality within insider research (Wilkinson & Kitzinger, 2013). Ethical reflexivity was operationalised through anonymisation protocols, member checking (Birt et al., 2016), critical-friend scrutiny (Costa & Kallick, 1993), and reflexive journaling (Bortoft, 1996; Shotter, 2014), supporting trustworthiness and authenticity (Lincoln & Guba, 1985).

Procedural ethics, including consent steps, gatekeeping, anonymisation, data protection, and safeguarding, are further detailed in Chapter 5.4.

4.8 Ensuring Quality and Trustworthiness

Introduction

This section evaluates the quality of the study using criteria appropriate to qualitative research. Unlike positivist paradigms that emphasise generalisability, reliability, and replicability, qualitative research prioritises trustworthiness, credibility, and authenticity (Lincoln & Guba, 1985). Janesick (2000, p. 393) notes:

“Validity in qualitative research has to do with description and explanation and whether or not the explanation fits the description. In other words, is the explanation credible? In addition, qualitative researchers do not claim there is only one way of interpreting an event.”

Accordingly, this study employed strategies including member checking, critical-friend scrutiny, and the application of authenticity criteria to enhance rigor, transparency, and trustworthiness.

Member Checking

Member checking, also referred to as respondent or participant validation, is widely recognised as a technique for verifying the trustworthiness of qualitative findings (Birt et al., 2016). In this study, follow-up stimulated recall interviews were conducted with participants, where pre-selected key scenes were reviewed collaboratively (see Methods section 5). These discussions clarified interpretations, validated observations, and often yielded richer descriptions than anticipated.

Challenges emerged when participants faced communication difficulties. For example, during the pilot study, one participant agreed with all my assertions, raising concerns about the credibility of that data and the ethics of the interview technique (King & Horrocks, 2010). To address this, I modified the interview format to semi-structured prompts, which elicited deeper responses. Ultimately, that data from that pilot interview was excluded as it did not meet the selection criteria (see Methods section 5.4).

While member checking is often used to enhance credibility, researchers note that it may not always improve the accuracy of qualitative interpretations, as participants frequently provide minimal or superficial feedback (McKim, 2023). To mitigate these issues, interviews were concise, focused on key scenes, and scheduled alongside existing sessions to respect participants' time commitments. Despite these limitations, member checking provided essential emic perspectives and fostered collaborative meaning-making between researcher and participants (Brinkmann & Kvale, 2015; King & Horrocks, 2010).

Critical Friends

To further strengthen credibility, I engaged critical friends by sharing video clips, field notes, and transcripts for review. These included my supervisor, an expert in multimodal research, and a colleague specialising in craft education and PSTE. Their diverse theoretical and methodological expertise provided outsider perspectives, challenged assumptions, and expanded interpretive lenses. This triangulation enhanced confidence in the observations and analysis, aligning with best practices for qualitative rigor.

Reliability and Generalisability

Qualitative research does not seek replicability in the conventional sense (Janesick, 2000). Instead, it values depth, uniqueness, and contextual insight. While findings may not be universally generalisable, they offer transferable knowledge and illuminate practices that support agency through embodied, sensory, and spatial pedagogies.

Lincoln and Guba (1985) propose authenticity criteria, ontological, educative, catalytic, and tactical authenticity, as benchmarks for quality. In operationalising these criteria, the study aimed to achieve what Geertz (1973) terms 'thick description' and what Ponterotto (2006) extends as 'thick interpretation,' ensuring that findings are richly contextualised and meaningfully connected to participants' lived realities. This study aimed to meet these by raising participant awareness, fostering dialogue, and prompting reflection on pedagogical practices. Although replication may be impractical due to the bespoke nature of multimodal analysis, the study contributes new theoretical and practical insights relevant to SEND and body-based educational approaches. Its hybridised multimodal framework offers a distinctive contribution that could inform similar contexts (see section 4.6 and 7.9).

Conclusion

Ensuring quality in qualitative research requires strategies that go beyond traditional validity measures. Through member checking, critical-friend triangulation, and adherence to authenticity criteria, this study achieved credibility and trustworthiness. These approaches not only validated interpretations but also enriched understanding through collaborative meaning-making. Reflexivity, as a further dimension of rigor, is explored in detail in the proceeding Section 4.9.

Summary

Quality was addressed through strategies aligned with qualitative research principles of credibility, authenticity, and transparency (Lincoln & Guba, 1985). The study employs:

- Member checking via stimulated recall interviews enabled participants to verify and enrich interpretations, with adaptations such as semi-structured prompts and exclusion of non-discriminating pilot data ensuring rigor (Birt et al., 2016; King & Horrocks, 2010).
- Critical-friend review introduced outsider perspectives, challenging assumptions and strengthening analysis (Costa & Kallick, 1993).
- A reflexive audit trail (King & Horrocks, 2010), supported by field notes and documented analytic decisions, maintained transparency throughout the process (Brinkmann & Kvale, 2015).

These measures, complemented by authenticity criteria, ontological, educative, catalytic, and tactical, provided a robust framework for trustworthiness and methodological care, acknowledging limitations of generalisability while emphasising the study's contribution to embodied, multimodal pedagogy.

4.9 Reflexivity and Positionality (Insider Research)

As outlined in Chapter 1 (Section 1.6), my positionality as an employee within the organisation under study shaped both access and interpretation. This insider status necessitated a reflexive stance throughout the research process to critically examine how familiarity, cultural embeddedness, and professional biography influenced design, data collection, and analysis (Alvesson, 2003). Reflexivity, understood as the ongoing interrogation of assumptions and power relations, was essential for maintaining rigor and transparency (Berger, 2015).

Insider research offers distinct advantages, including nuanced understanding, rapport, and ease of access (Costley, Elliott & Gibbs, 2010). These benefits were mobilised to strengthen the study, particularly in formulating relevant prompts and interpreting multimodal pedagogical practices. However, proximity also posed risks of bias, assumed knowledge, and role-related conflicts (Humphrey, 2012; Wilkinson & Kitzinger, 2013). Insider status can lead to assumptions of shared understanding or entitlement to represent participant voices

(Wilkinson & Kitzinger, 2013), while Tamboukou (2013) warns of the author function privileging certain discourses. Long-standing engagement with institutional practices raised concerns about over-sensitisation to familiar modes of pedagogy and potential desensitisation to alternative approaches. To counter this, I adopted strategies to create analytic distance, including extending theoretical lenses (Chapter 3), triangulating perspectives, and foregrounding participant voices through member checks and semi-structured interviews (Brinkmann & Kvale, 2015; King & Horrocks, 2010). Ethnographic background data were also incorporated to contextualise findings, as recommended by Taylor (2014) and Doak (2018, 2019).

Ethical considerations were integral to this reflexive approach. Recruitment was mediated via gatekeepers to emphasise voluntariness, and participants were reassured that there were no expected responses or performance requirements. Camera placement and interview techniques were adapted to minimise observational and agreement bias, while non-discriminating pilot data were excluded to preserve integrity. Reflexive journaling, supervisory dialogue, and critical-friend review further surfaced blind spots and supported methodological care (Cooper & Rogers, 2015; Coy, 2006). These strategies align with literature suggesting insider research can enhance validity through authenticity and richness of responses (Rooney, 2005) and through heightened reflexivity prompted by suspicion of bias (Cooper & Rogers, 2015). Additionally, adopting multiple theoretical lenses and gathering diverse viewpoints facilitated identification of “rich points” and moments of insight (Blommaert & Jie, 2010).

Ultimately, reflexivity enabled me to navigate the dual implications of insider research, leveraging familiarity for depth while mitigating bias and power asymmetries (Ryan, Kofman & Aaron, 2011). This stance not only underpins the methodological choices detailed in this chapter but also directly informed the hybridised multimodal approach adopted in the study. By integrating reflexive practices with multimodal, embodied methods, the research foregrounded participant voice and agency while ensuring rigor, sensitivity, and authenticity throughout.

Summary: Reflexive Mitigations as an Insider

As an insider researcher, I recognised the dual implications of familiarity, access, and nuance on one hand; and potential bias and power relations on the other (Humphrey, 2012; Wilkinson & Kitzinger, 2013). To address these, I implemented a series of mitigations:

- Emphasising voluntariness and neutrality in recruitment and consent via gatekeepers;
- Careful researcher gaze and camera placement to reduce observational bias;
- Adapting interview techniques when agreement bias emerged (shifting to semi-structured prompts);
- Excluding non-discriminating pilot data that did not meet selection criteria;
- Ongoing reflexive journaling and critical-friend triangulation to surface and address blind spots (Brinkmann & Kvale, 2015; King & Horrocks, 2010).

These strategies align with participatory pedagogy, amplify student voice, and sustain methodological care in insider contexts. They also reflect the study's commitment to rigor and inclusivity, ensuring that insider status was mobilised as a strength while its limitations were actively managed.

4.10 Conclusion of Methodology Chapter

This chapter sought to justify and detail the EMBER-S³ methodology as a coherent, rigorous, and inclusive approach for investigating the embodied, sensory–spatial dynamics of craft pedagogy and their relationships to executive functioning and agency. By integrating phenomenology, multimodality, ethnography, and ecological affordances within an extended MIA toolkit (matrix > stills > circles), the study maintains alignment between method and epistemology, prevents reductionism, and illuminates invisible dimensions of embodied learning analytically visible.

The chapter began by establishing the epistemological and ontological positioning (Section 4.1), grounding the study in an interpretivist paradigm that values lived experience and

situated meaning-making. This informed the adoption of a phenomenological approach (Section 4.2), which prioritises embodied perception and the co-construction of meaning in context. Building on this foundation, the multimodal approach (Section 4.3) was elaborated through a social semiotic perspective (4.3.1), the principles of Multimodal Interaction Analysis (MIA) (4.3.2), and a critical comparison of social semiotic and interactional approaches (4.3.3). The study's use of a hybridised MIA (4.3.4) and its integration with phenomenological observation and reflexivity (4.3.5) ensured that analytic tools were tailored to capture the complexity of embodied, sensory-modal-spatial practices.

Ethnographic resources and an ethnographically informed case study design (Section 4.4) provided contextual depth, enabling the interpretation of multimodal data within the lived realities of the participants. These elements converged in the development of the hybrid methodological framework EMBER-S³ (Section 4.6), which operationalises the study's theoretical commitments through a structured yet flexible analytic process.

Beyond design, the chapter critically addressed the principles underpinning implementation. Strategies for ensuring quality and trustworthiness (Section 4.8) were embedded throughout, including member checking, critical-friend triangulation, and a reflexive audit trail, which collectively anchored interpretation in participant perspectives and enhanced transparency. Reflexivity and positionality (Section 4.9) were treated as central methodological concerns rather than peripheral reflections. Insider status offered unique depth of access but demanded continuous self-examination to mitigate bias and power asymmetries; this was achieved through reflexive journaling, theoretical triangulation, and dialogic engagement with participants and peers.

Finally, ethical considerations (Section 4.7) were integral to the research design, shaping decisions around consent, anonymity, and safeguarding. Working with SEND participants required inclusive, iterative consent processes, respect for multimodal participation beyond speech, and sensitivity to participant wellbeing. These measures ensured that ethics functioned as a structuring principle rather than a procedural formality, reinforcing the interpretivist and phenomenological commitments of the study.

Taken together, the methodology chapter demonstrates a coherent and critically reflexive approach that integrates design, ethics, and quality assurance within a qualitative paradigm. By combining multimodal methods with rigorous ethical and reflexive practices, the study offers a robust framework for exploring embodied pedagogies and agency. This methodological stance not only supports the validity and authenticity of the findings but also contributes to advancing research practices in SEND and craft education contexts, where inclusivity, participant voice, and methodological care are paramount.

The next chapter details the specific methods, transcription conventions, ethical procedures, and analytic steps used to operationalise this framework in practice.

Chapter 5 Methods

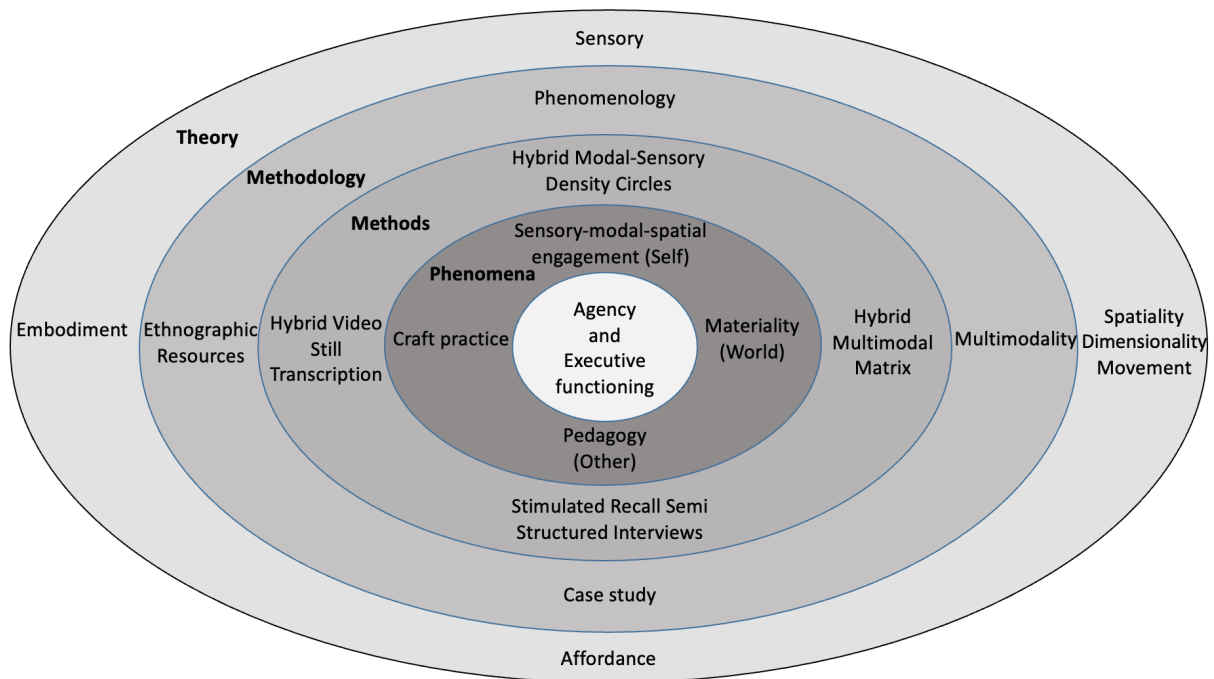
Introduction to Chapter 5 Methods

Building on the methodological foundations established in Chapter 4, this chapter moves from conceptual justification to practical implementation. It explains how the study operationalised its interpretivist and phenomenological stance through the bespoke hybrid framework EMBER-S³, detailing the procedures used to generate, transcribe, and analyse multimodal data within an ethnographically informed case study.

The chapter begins by situating the research within its context and setting (Section 5.1), outlining the institutional environment, curriculum, and workshop materiality that shaped the pedagogical interactions under study. It then introduces the approach to multimodal transcription and analysis (Section 5.2), critically reviewing existing frameworks and explaining the rationale for the sensory-first hybrid design. Section 5.3 describes the operationalisation of EMBER-S³, presenting step-by-step procedures for data collection, viewing, sampling, and transcription, alongside the analytic tools: multimodal matrix, annotated video stills, and sensory–modal density circles, that illuminated embodied processes analytically visible. Section 5.4 addresses ethical practice and methodological integration, demonstrating how principles of consent, safeguarding, and reflexivity were embedded throughout the research process. Finally, Section 5.5 outlines strategies for ensuring quality and trustworthiness, including member checking, critical-friend review, and reflexive audit trails.

In relation to the broader research framework (Figure 13), this chapter corresponds to the Methods ring (third layer), bridging the theoretical and methodological commitments established earlier with the analytic procedures that underpin the findings presented in Chapters 6 and 7.

Figure 13 Research framework



5.1 Context and Setting of the study

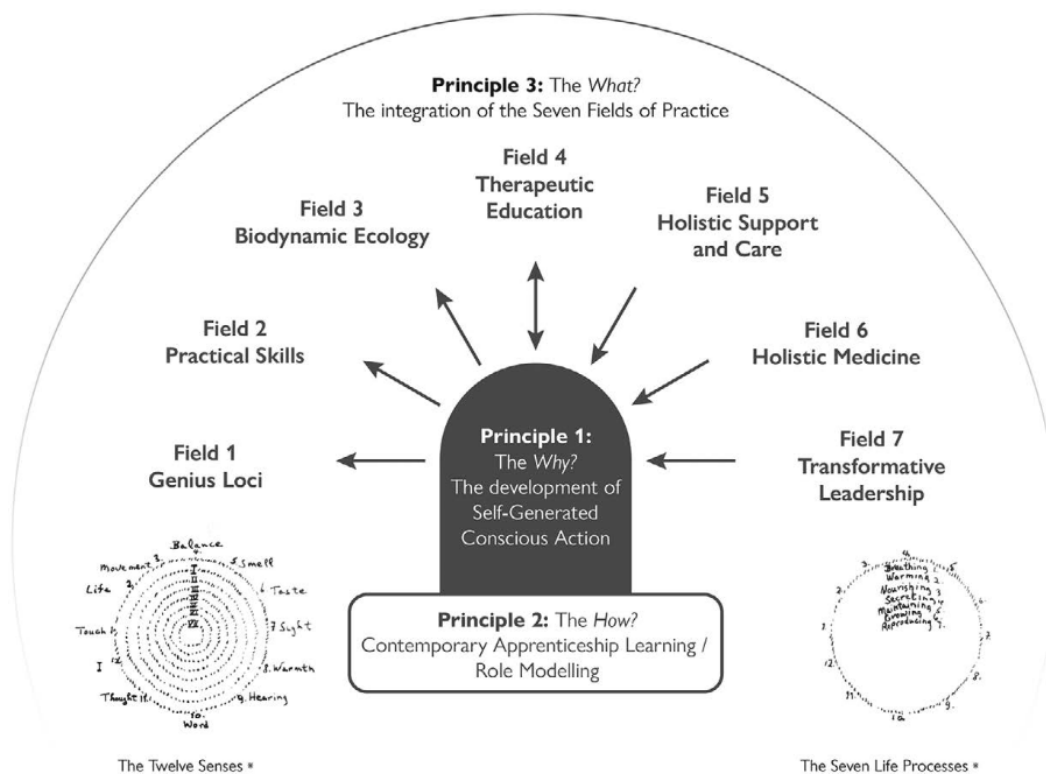
Introduction to Setting

This section establishes the physical and pedagogical context in which the research was conducted, providing essential background for interpreting the multimodal analysis that follows. It explains when, where, and how the selected green woodwork pole-lathe scene was enacted and why this context is significant for exploring sensory–modal–spatial interactions. Drawing on ethnographic resources, the section describes the institutional setting, the Practical Skills Therapeutic Education (PSTE) curriculum, and the workshop environment, highlighting the material affordances; tools, apparatus, and crafted objects, that shaped the interactions under study. This contextualisation ensures that the reader understands how the setting aligns with the research objectives of investigating agency and executive functioning through embodied craft practice.

5.1.1 Institutional and Pedagogical Context

The study took place within a specialist college for young people with special educational needs and disabilities in the United Kingdom, offering part-time and full-time provision for learners aged 16–25. The curriculum is grounded in Practical Skills Therapeutic Education (PSTE), which draws on the philosophies of John Ruskin, Rudolf Steiner, and William Morris. PSTE emphasises holistic development through engagement of “hand, head, and heart” (Gordon & Cox, 2023), creating opportunities for learners to meet real-world challenges in authentic settings. Its overarching aim is to help each student develop their capacity for self-generated conscious action, fostering self-awareness, social responsibility, and purposeful contribution (Gordon & Cox, 2023). Figure 14 illustrates the three core principles of PSTE; Why (development of self-generated conscious action), How (applied contemporary apprenticeship learning), and What (integration of seven fields of practice), which underpin the pedagogical approach adopted in this study.

Figure 14 The what, the how the why in PSTE (Gordon & Cox, 2023, p. 191).



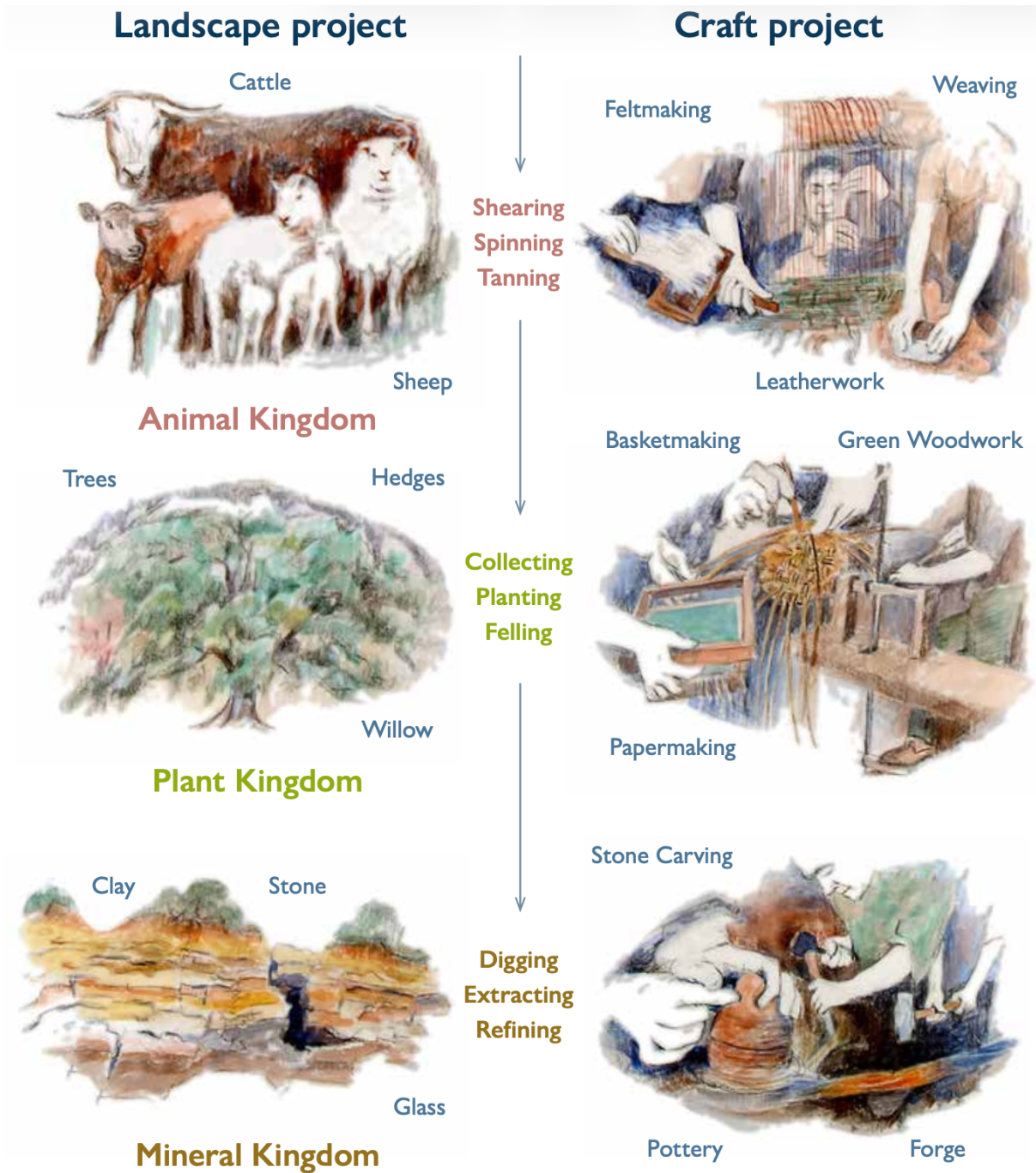
* Rudolf Steiner, *The Riddle of Humanity*, Dornach 12 August 1916

5.1.2 Green Woodwork Curriculum

The Green Woodwork curriculum is designed to create meaningful, embodied learning experiences that connect students with natural materials and processes. Learners progress through a sequence of craft activities, sawing, splitting, side-axing, draw-horse shaping, and pole-lathe turning, transforming raw timber into functional objects such as stools (see figure 15 for a pictorial curriculum image of source material to crafts and figure 21 for photograph of finished 3-legged stool). This progression from gross to fine motor skills is thought to foster cognitive, emotional and physical capacities while embedding therapeutic and educational opportunities. The curriculum emphasises purposeful making, crafting items for personal use or community benefit, rather than vocational training, positioning craft as a vehicle for holistic development and agency (Gordon & Cox, 2023).

The pictorial curriculum image (figure 15) foregrounds this flow from landscape to crafted artifact, portraying the movement from tree to finished stool. It emphasises the role of the hands in all craft images, highlighting the significance of haptic engagement. While the intention is not to train professional green woodworkers, the curriculum serves as a mode for creating meaningful, situated activities where education and therapy converge toward the overarching aim of students self-developing “Self-Generated Conscious Action” (Gordon & Cox, 2023).

Figure 15 Pictorial curriculum image of source material to crafts (The descent into matter curriculum, the nine ancient crafts, illustration by Kay Wedgbury)



5.1.3 Workshop Environment, Materiality, and Pole Lathe Operation

The Green Woodwork shelter is located centrally on the site, facing the woodland (see figures 16-18 for photographs of the shelter and its surroundings). Approximately 80% open to its environment, the workshop includes a tool and materials shed at the rear, a log-burning stove in the centre, and workbenches along the sides. The pole lathe is positioned

at the periphery, facing outward toward the woodland (figure 18). This spatial arrangement affords multimodal engagement by integrating tactile, visual, and proprioceptive feedback loops during craft activities, further outlined and discussed in chapter 6.

Tools such as chisels, gauges, and drawknives are organised to support ergonomic access and safe practice. The materiality of the space, natural light, wood textures, and rhythmic tool sounds, functions as an active pedagogical resource, shaping interactions and enabling embodied learning (Marchand, 2011; Gibson & Pick, 2023), further outlined and discussed chapter 6 and 7. Figures 16-21 illustrate the workshop layout, the pole lathe, and the finished stool, providing visual context for the multimodal analysis that follows.

Figure 16 Photograph of Green Woodwork shelter and surroundings



Figure 17 Photograph inside Green Woodwork shelter



Pole Lathe Operation: Technical Overview

A pole lathe operates by drawing a cord attached to a sapling or bungee cord with a stepping motion, generating the rotation of the cylindrical wood billet (see figure 20 Illustration of a traditional pole lathe in use, diagram by Dilly Williams). Gauges (tools resembling chisels) are secured around the handle to stabilise and adjust the tool's angle, enabling the cutting edge to move in and out of the material. One hand employs precise motor movements to further angle and support the cutting edge as it encounters the wood, while the other hand tracks the gauge across left and right to create an even surface. Various gauges and flat chisels are used to create different cuts, shapes, and designs.

These actions require coordinated engagement across multiple planes (analysed and foregrounded in fine grained detail in section 6.3), activating sensory feedback loops that underpin executive functions central to agency development and the spatial and rhythmic nature of the pole-lathe process exemplifies how multimodal, embodied interactions afford opportunities for cultivating agency, the analytic focus of chapter 6 in this study.

Figure 18 Photograph of pole lathe



Figure 19 Photograph of pole lathe and billet of wood/stool leg



Figure 20 Illustration of a traditional pole lathe in use (Illustration by Dilly Williams).

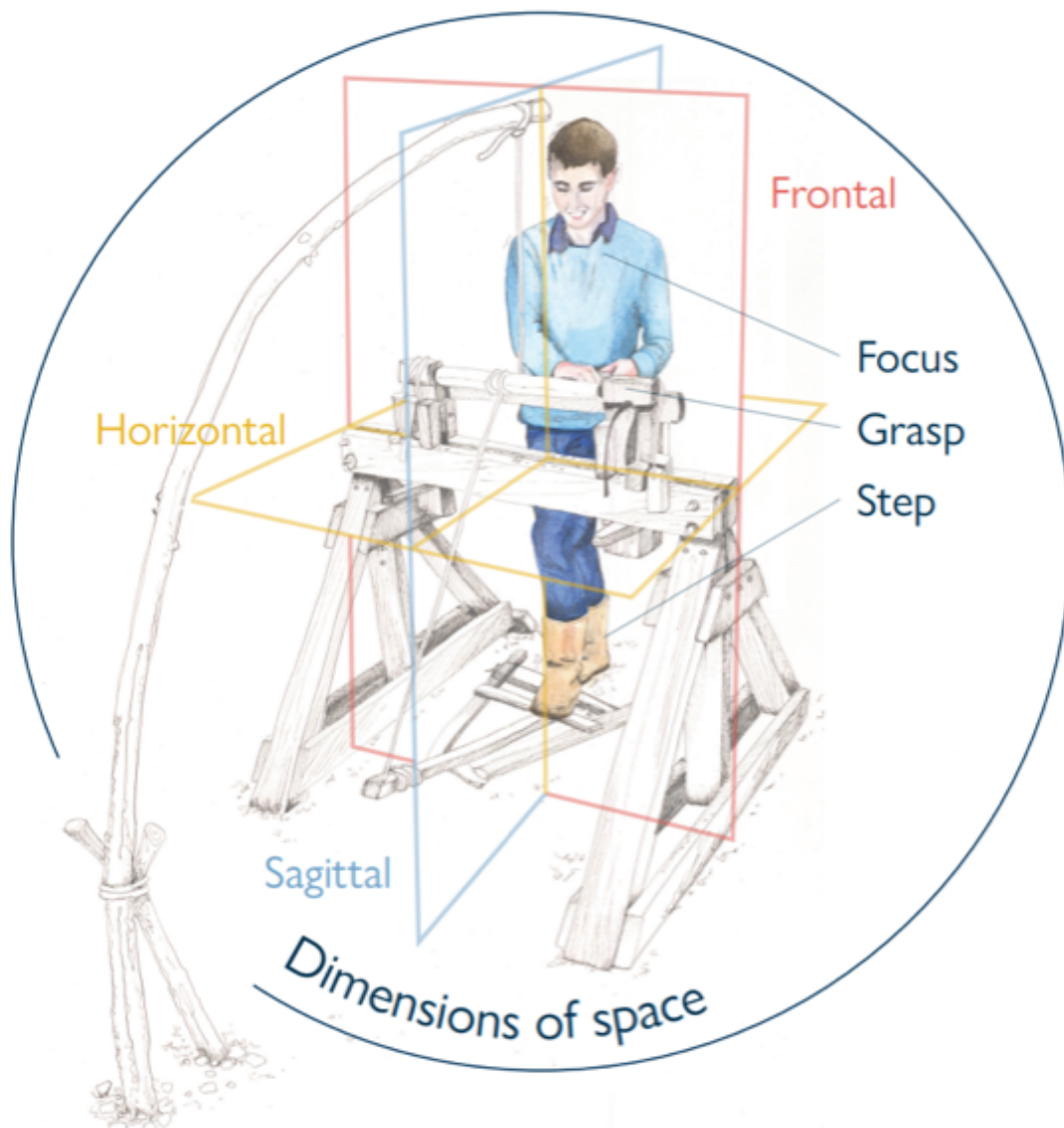


Figure 21 Photograph of finished 3-legged stool



5.1.4 Participants and Roles

The case study focuses on a tutor and one student (Student D) within a Practical Skills Therapeutic Education (PSTE) context. The tutor, an experienced craft practitioner, had worked with Student D for two terms prior to the study, providing continuity and rapport. Student D, aged 19, attended the provision for over two years and had an EHCP outlining aspirations for independence, self management and regulation, and confidence. These goals informed the pedagogical orientation of the craft sessions and shaped the analytic focus of this study.

Contextual Synthesised Profile of Student D's Aspirations and Learning Needs

To protect confidentiality and comply with GDPR, original documents have been excluded; however, a synthesised summary of Student D's profile is presented in table 3 below (for

further detail see Appendix C Student D profile information). This table provides a concise overview of Student D’s aspirations and identified needs, which later inform the analysis in Section 6.4. By linking these contextual details to the findings, the case study demonstrates how the pedagogically oriented craft activity appeared to support the development of capacities aligned with these goals, such as independence, self-regulation, and agency.

The information is provided solely to contextualise the analytic focus of this study and to foreground the potential benefits of craft-based learning for fostering agency and executive functioning. It is acknowledged that these descriptions offer only a partial view and are not intended to define the individual or represent all learners with similar labels. Characteristics may vary across contexts and time, and any diagnostic categories referenced should not be interpreted as fixed or deficit-based, consistent with the stance outlined in Chapter 2.5.

Table 3 Synthesised student background information

	Synthesised student information from EHCP and background information
Aspirations	1. Independence 2. Self-management and regulation
Medical background and diagnosis	3. Sensory processing difficulties 4. ADHD 5. ASD 6. Anxiety 7. Depression 8. Moderating between lethargy and restless/active
Identified barriers to learning	9. General passivity leading to needs not being met 10. Struggles with following instructions 11. difficulties with his working memory particularly short-term acquisition and retrieval 12. needs to move to a calm area to deescalate himself
Strategies to Help Learning	13. Overcome his self-critical tendency or self over-estimation of his abilities by providing positive messages about learning outcomes 14. Provide reminders of practical, key points and help him to keep his work space organised so that he can find what he needs to use easily
Communication	15. Experiences difficulty in following instruction in the classroom

5.1.5 Context of the Selected Scene

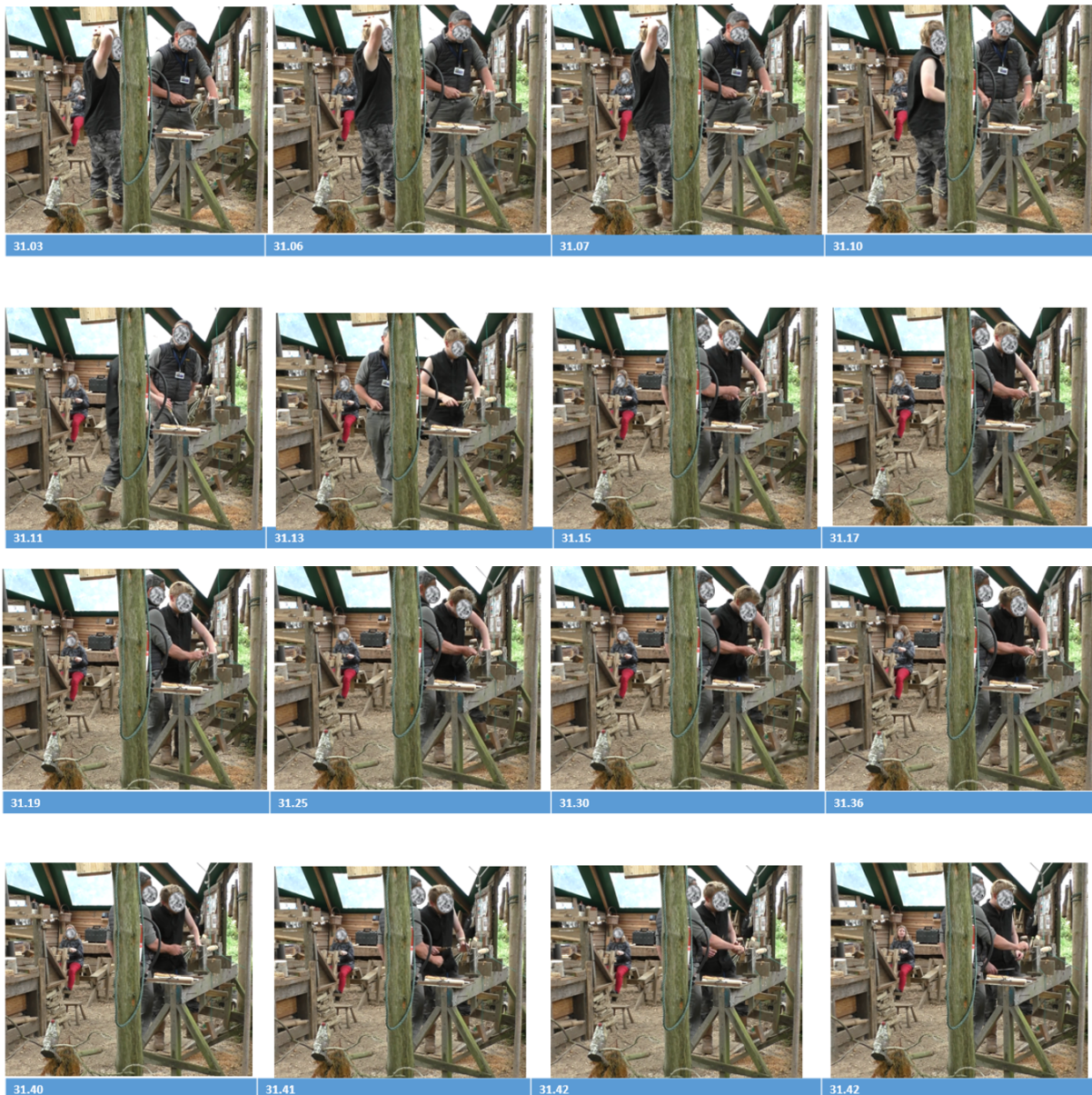
To situate the subsequent multimodal analysis, this section introduces the selected pole-lathe scene (sampling and selection outlined in 5.3.4) within its pedagogical and material context. The scene represents a critically rich moment in which the student transitions from observing to enacting a new craft skill, offering dense sensory–modal–spatial interactions

aligned with the study's research objectives. Presenting this scene here provides the reader with a visual and descriptive anchor before exploring the analytic strategies in section 5.2. The accompanying storyboard offers an overview of the sequence without detailed annotation, ensuring clarity while maintaining focus on context rather than interpretation.

The selected Greenwood work pole-lathe scene was conducted during a 2.5-hour morning session, part of a weekly rhythm of three sessions over seven weeks. It represents a pivotal moment during the second recorded session, chosen using the criteria outlined in section 5.3 (critical richness, multimodal density, and relevance to executive functioning and agency). In this scene, the student moves from observation to active participation, learning a new technique for using a gauge (chisel-like tool) to round off a billet of wood on the pole lathe. This transition foregrounds the orchestration of sensory feedback, embodied movement, and spatial engagement central to the study's analytic focus.

The extract presented here (figure 22) in storyboard format depicts the student (left) observing the tutor (right) demonstrating the technique, followed by the student successfully enacting the skill (for larger versions see Appendix D). The storyboard provides a straightforward, image-based representation to contextualise and familiarise the reader with the scene before the narrated and more detailed transcription and analysis, outlined in section 5.3 and the results that follow in Chapter 6.

Figure 22 Pre-analysis selected pole-lathe scene storyboard video still depiction



Conclusion to Setting and Context Section

This section has outlined the institutional, curricular, and physical context that shaped the pedagogically oriented craft interactions examined in this study. It introduced the materiality of the workshop, tools, and artifacts, as well as the participants and their roles, establishing a foundation for the detailed methods (Section 5.3) and multimodal analysis and findings, presented in Chapter 6.

5.2 Approaches to Multimodal Transcription and Analysis: Critical Review of Existing Frameworks and Rationale for the Study's Bespoke Approach

5.2.1 Purpose and Scope

This section establishes the methodological foundation for the study by critically reviewing existing multimodal transcription and analysis frameworks and evaluating their suitability for examining the embodied, sensory–modal–spatial complexity of craft pedagogy. These multimodal artefacts were designed to produce what Ponterotto (2006) calls ‘thick depiction,’ enabling readers to apprehend embodied complexity and the sensory–modal–spatial orchestration of craft learning beyond linguistic transcripts. It explains why these frameworks, while valuable, require adaptation and integration to meet the study’s interpretivist-phenomenological stance outlined in Chapter 4. The discussion clarifies the rationale for selecting and combining three core instruments, sensory-first multimodal matrix, annotated video stills, and sensory–modal density circles and demonstrates how these tools operationalise the study’s aims to illuminate agency and executive functioning in authentic, tool-mediated learning environments.

5.2.2 Multimodal Orientations and Why They Matter

Multimodality provides a conceptual and methodological lens for analysing visual, aural, embodied, and spatial aspects of interaction, treating gesture, gaze, posture, spatial layout, materials, and artefacts with analytic parity rather than privileging language alone (Jewitt, 2014; Kress, 2010; Jewitt et al., 2025). Three dominant orientations underpin multimodal research: systemic functional linguistics (SFL), social semiotics, and interactional (video-based) analysis. This study adopts a hybrid of social-semiotic and interactional approaches to capture the orchestration of modes in practice, as defined in Section 4.3.

As a practical scaffold, Bezemer and Jewitt (2010) and Bezemer, Diamantopoulou, Jewitt, Kress, and Mavers (2012) propose an iterative pathway for moving from corpus breadth to micro-level depth through four steps: collecting/logging, viewing, sampling, and transcribing/analysing. This structure ensures feasibility without sacrificing analytic depth and informs the design choices made here. Complementing this, Norris (2004) demonstrates

staged multimodal interactional analysis (MIA), which transcribes language, proxemics/posture, gesture, and gaze separately before synthesising them into integrated visuals, a strategy that mitigates “screen-to-print” losses. Goodwin (2001) further cautions that transcription systems must balance accuracy with legibility, a principle that underpins this study’s dual-format outputs: tabular matrixes for precision and pictorial storyboards for accessibility.

5.2.3 A Refined Four-Step Scaffold for Craft Context

To ensure rigor and reproducibility, Bezemer and Jewitt’s (2010) four-step scaffold is retained and expanded for the craft context. A brief comment is made for each step in relation to the craft pedagogy context of this study here and in further detail in the following section 5.3. Each step is adapted to foreground sensory–modal–spatial dynamics and is operationalised in Section 5.3.

Step 1: Collecting and Logging

Aim: Build a rich corpus that captures interaction and context.

What to capture: Video recordings (30–60 mins) showing the workshop, lathe, tools, and tutor proximity zones; field notes; photographs of tools, artefacts, and spatial layout; context documents (curriculum, practitioner guides, student profile/EHCP summaries); and an analytic memo log noting emerging ideas, time codes, participants, activities, tool use, environmental conditions, and candidate “critical moments” flagged for later viewing loops.

Craft-specific setup: Camera positioned outside the shelter on a fixed tripod to reduce intrusion; researcher placed laterally to preserve natural interaction.

Step 2: Viewing

Aim: Surface non-verbal modes, sensory couplings, and spatial orchestration.

Techniques: Whole-scene viewings with sound for rhythm and speech; sound-off viewings to foreground gesture, gaze, posture, and spatial layout; variable speed (0.25–0.5×) for cut initiation/withdrawal; tight loops (1–5 s) to examine micro-adjustments of stance and grip; collaborative viewings with supervisors/critical friends to challenge assumptions and refine sampling criteria.

Output: A list of moments where sensory feedback (haptic/auditory) and EF indicators (e.g., self-monitoring, inhibition) are evident.

Step 3: Sampling

Aim: Select clips with critical richness aligned to research aims and thesis scope.

Criteria: Modal density/complexity (multiple modes coordinated toward a higher-level action; Norris, 2004), pedagogical salience (demonstration-to-enactment transitions), and EF affordances (working memory, initiation, self-monitoring, inhibition).

Decision: One 46-second pole-lathe clip was selected for micro-analysis and stimulated-recall interviews (see section 5.3.4 for full selection and sample rationale).

Step 4: Transcribing and Analysing

Aim: Preserve sequence detail and embodied salience while illuminating sensory and spatial dynamics analytically legible.

Three-stage pipeline:

1. Sensory-first multimodal matrix grouping modes contextually, gaze/focus/facial expression; gesture/tool manipulation (including planes of space); proxemics/kinesics/haptics; senses (touch, hearing, balance/vestibular, movement/proprioception); theory/construct (learning/EF); and environment/context, so feedback loops remain visible across the scene.

2. Annotated video stills with narrative vignettes (Norris, 2004; Mavers, 2012) using arrows for movement/planes, line styles for gaze, typographic emphasis for speech, and colour-coding for sensory feedback loops, with two-tier text (description + analysis) per panel.
3. Hybrid sensory–modal density circles (after Norris, 2004; Doak, 2018) for interpersonal (student–tutor) and material (student–tool–wood) interactions, including senses less visible in stills (proprioception/vestibular/interoception), with rationale captions grounded in video, interview, and matrix data.

5.2.5 Strengths and Limitations of Exemplar Frameworks

To justify the design of the bespoke hybrid approach, EMBER-S³, it is essential to critically appraise the multimodal frameworks that informed its development. While these exemplars offer valuable insights, each presents limitations when applied to the embodied, sensory–modal–spatial complexity of craft pedagogy. This section synthesises their contributions, constraints, and influence on the methodological innovations adopted in this study.

Bezemer and Jewitt (2010) provide a clear, iterative pathway for moving from corpus breadth to micro-level depth, emphasising systematic steps of collecting, viewing, sampling, and transcribing. Bezemer et al. (2012) suggested approaches, illustrated in Appendices E and F (science and surgical training transcripts), demonstrate how multimodal orchestration can be represented through matrix tables/diagrams and annotated stills. This procedural rigor was instrumental in shaping EMBER-S³. However, their method relies heavily on screen-to-print translation, which risks losing embodied salience, particularly tactile and spatial nuances central to craft. To address this, EMBER-S³ combines matrix transcription, storyboarded stills, and sensory–modal density circles, ensuring that sensory feedback loops such as touch, proprioception, and vestibular cues remain visible (Bezemer & Jewitt, 2010).

Building on this, Norris (2004) advocates a staged transcription process that begins with language (Appendix G), then proxemics and posture (Appendix H), gesture (Appendix I), and gaze (Appendix J), culminating in an integrated visual representation (Appendix K). Norris’s

principle that “each step in the transcription process is also a step in the analysis” (p. 78) underpins EMBER-S³'s design. While Norris's framework excels in preserving sequential logic and capturing tacit, embodied interactions, it does not explicitly prioritise sensory modalities or affordances. EMBER-S³ extends this schema by introducing sensory-first grouping and adding environment/context columns to foreground materiality and spatial affordances (Norris, 2004).

Goodwin (2001) highlights a critical tension between recovering the endogenous structure of events and maintaining reader legibility (i.e., balancing the need to capture the full complexity of real interactions with making the transcript clear and readable for the audience). His emphasis on clarity without sacrificing analytic depth informed EMBER-S³'s dual-format outputs: tabular matrixes for precision and pictorial storyboards for accessibility. This pairing ensures that complex embodied interactions are communicated effectively to diverse audiences (Goodwin, 2001).

The importance of materiality is foregrounded in Arnold (2012), whose ethnographic analysis of a bilingual bike-repair shop (Appendix L) demonstrates how hands-on pedagogy can be surfaced through concise interactional analysis. While Arnold's approach highlights the pedagogical role of material engagement, it lacks the granularity needed to capture multimodal orchestration in complex craft environments. This limitation reinforced the need for a hybrid approach that integrates material affordances with sensory and spatial dimensions (Arnold, 2012).

Finally, Doak (2018, 2019) and Taylor (2014) provided critical insights for adapting multimodal analysis to SEND-sensitive and educational contexts. Doak's multimodal matrix (Appendix M) influenced EMBER-S³'s sensory-first matrix design, grouping modes contextually and tagging executive functions (EFs). Taylor's (2014) grid (Appendix N) informed the integration of spatial layout and proxemics as analytic categories. Furthermore, Doak's (2018) use of storyboarded stills and modal density circles (Appendices O and P) inspired EMBER-S³'s visualization strategies, which were extended to include student-material interactions, a dimension absent in classroom-based studies. These frameworks demonstrate how multimodal analysis can accommodate diverse

communicative repertoires and highlight agency, validating EMBER-S³'s commitment to inclusive, embodied pedagogy and analytic parity across modes and senses (Doak, 2018, 2019; Taylor, 2014).

In summary, these exemplars collectively shaped EMBER-S³ by highlighting:

- The need for procedural rigor (Bezemer & Jewitt, 2010).
- The value of staged transcription as analysis (Norris, 2004).
- The importance of reader legibility (Goodwin, 2001).
- The pedagogical centrality of materiality (Arnold, 2012).
- The relevance of SEND-sensitive multimodal tools (Doak, 2018, 2019; Taylor, 2014).

By synthesising these insights, EMBER-S³ offers a context-sensitive, transferable methodology for revealing the sensory–modal–spatial orchestrations that scaffold agency and executive functioning in craft-based education.

5.2.6 Rationale for a Sensory-First Bespoke Hybrid Approach

The limitations identified in the preceding section underscore the need for a methodological framework capable of capturing the fine-grained, embodied, sensory–modal–spatial orchestration that characterises live craft pedagogy. Existing approaches from craft more specifically (discussed in section 2.8-2.9) either prioritise representational aims (e.g., multimodal dictionaries for heritage preservation) or focus on general multimaterial classrooms without attending to the iterative feedback loops between gesture, gaze, haptics, spatial layout, and material affordances that underpin skill acquisition, EF and agency. The toolkit addresses the needs of researchers and practitioners working with multimodal data in educational, social and situated contexts.

To address this, the study developed EMBER-S³ (Embodied Multimodal-Based Experiential Research: Sensory, Spatial, Situated), a hybrid framework that synthesises phenomenology, multimodality, ethnographic resources, and affordance theory. EMBER-S³ operationalises analysis through a staged toolkit designed to:

1. Foreground sensory modalities (touch, proprioception, vestibular, auditory) as primary meaning-making resources rather than peripheral inputs.
2. Integrate spatial and material affordances into the analytic frame, recognising their pedagogical role.
3. Illuminate iterative, embodied processes analytically visible through systematic transcription and visualisation.

The toolkit comprises:

1. A sensory-first multimodal matrix for panoramic mapping of modes and senses across time.
2. Annotated video stills with narrative vignettes to preserve embodied salience and sequential logic.
3. Hybrid sensory–modal density circles to visualise intensity and complexity of multimodal engagement, including student–material interactions often overlooked in conventional approaches.

This design ensures that, as Norris (2004, p.78) asserts, “each step in the transcription process is also a step in the analysis,” enabling the framework to illuminate how sensory–modal–spatial orchestrations scaffold higher-level actions and executive functions. By applying EMBER-S³ in an ethnographically informed case study of green woodworking, the study offers a methodological contribution that is both context-sensitive and transferable to other embodied learning environments. For example, the toolkit is intended for researchers in multimodal interaction analysis, educators exploring embodied learning, and practitioners seeking analytic rigor in complex multimaterial practices, body-based activities, and situated multimodal environments (further discussed in 7.9).

5.2.7 Decision Principles

The decisions outlined here ensure methodological rigor and transparency in operationalising the bespoke approach introduced in Section 5.2.6 and operationalised in

section 5.3. These principles guided the design of the analytic workflow and the selection of visual and documentary resources.

Decision Principles

- Depth over breadth: Focus on one 46-second pole-lathe clip (selection and sampling further outlined in 5.3.4) to enable fine-grained analysis of executive functions (EFs) and multimodal orchestration rather than a superficial survey of multiple scenes.
- Sensory-first orientation: Incorporate senses and environment columns in the multimodal matrix to preserve affordances and feedback loops central to embodied craft learning.
- Extended visualisation: Adapt modal density circles to include student–material interactions, acknowledging the pedagogical role of materiality alongside interpersonal dynamics.
- Integration of theory and method: Ensure each transcription stage functions as an analytic step, consistent with Norris’s (2004) principle that “each step in the transcription process is also a step in the analysis” (p. 78).

5.2.8 Section Summary

The critical review and comparative analysis of exemplar frameworks (Section 5.2.5) and the rationale for a bespoke approach (Section 5.2.6) establish the need for EMBER-S³, a sensory-first hybrid methodology tailored to craft pedagogy. This approach integrates multimodal transcription, visualisation, and ethnographic resources to illuminate how sensory–modal–spatial orchestrations scaffold executive functioning and agency in authentic, tool-mediated learning environments.

Section 5.3 now operationalises this design, detailing:

- Step-by-step procedures for data generation, viewing, sampling, and transcription and analysis

- Instrument specifications (matrix, storyboard, density circles)
- Quality safeguards and ethical considerations aligned with Chapter 4
- Outputs that feed directly into the analysis, findings and discussions presented in Chapter 6 and 7.

By bridging theory and method, Section 5.3 demonstrates how EMBER-S³ transforms abstract principles into practical tools for rigorous, context-sensitive analysis.

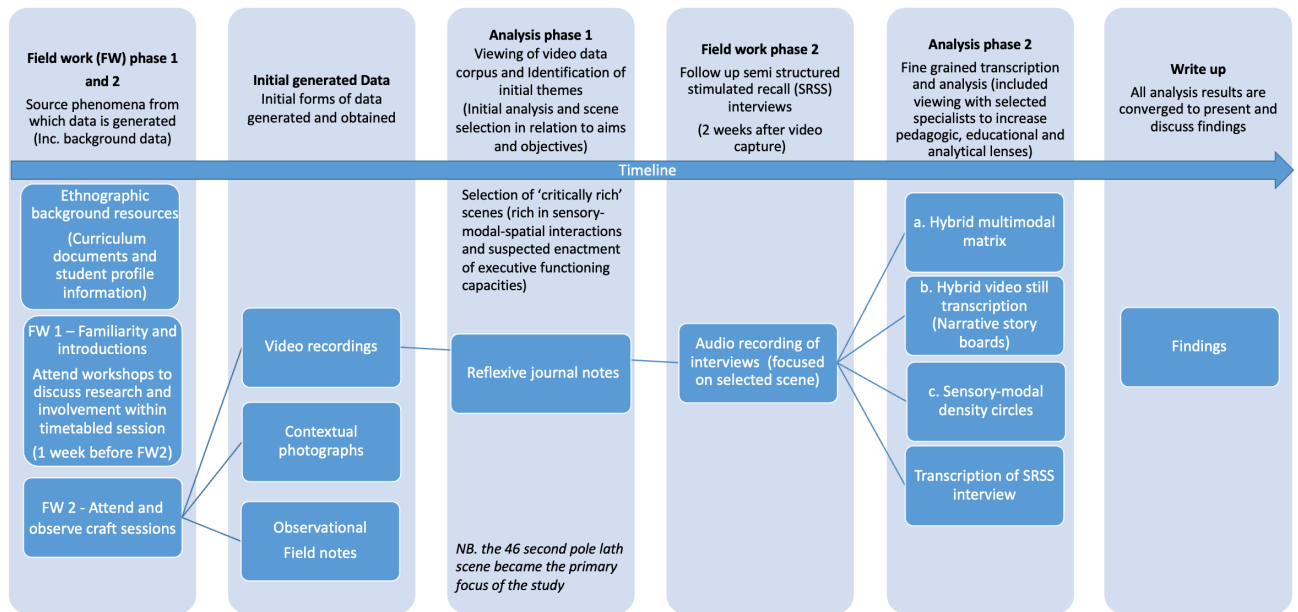
5.3 Operationalising EMBER-S³: Methods, Alignment, and Outputs

Introduction

This section moves from the design principles outlined in Section 5.2 to their practical implementation. It details how the bespoke hybrid framework, EMBER-S³, was operationalised through a structured, multi-stage process encompassing data generation, viewing, sampling, transcription, and analysis, see figure 23 below for a diagram overview of timeline and process of data collection and analysis (see appendix G for larger version). Each stage was both procedural and interpretive, consistent with Norris’s principle that “each step in the transcription process is also a step in the analysis” (2004, p.78). The aim was to illuminate sensory–modal–spatial dynamics analytically visible and pedagogically meaningful, enabling fine-grained insight into how craft-based interactions foster executive functioning (EF) and agency.

While ethical principles underpin every stage of operationalising EMBER-S³, and briefly attended to in this section, their practical enactment is addressed in Section 5.4 as a distinct component to foreground their significance and provide detailed procedural clarity (including references to appendices of related resources). This separation avoids mixing methodological tools with ethical safeguards, while ensuring coherence with the more conceptual discussion in Chapter 4.

Figure 23 Diagram depicting the timeline and process of data collection and analysis



5.3.1 Selection Procedures

Selection Rationale

The original intention was to analyse three crafts, Greenwood work, spoon forging, and blacksmithing, to compare pedagogical affordances across contexts. However, the sheer volume of multimodal data generated during initial sessions made this scope impractical. To achieve depth over breadth, the focus was narrowed to Greenwood work, specifically a pole-lathe turning activity. This decision allowed for granular analysis of sensory–modal–spatial orchestrations within a single craft, aligning with the study’s primary objectives: to test and refine EMBER-S³ and to explore how embodied craft practices cultivate EF and agency.

Beyond issues of scope, Greenwood work was selected because it offers one of the richest sensory–modal–spatial contexts within the craft curriculum. Unlike many crafts that primarily foreground fine-motor precision, Greenwood work spans a full macro-to-micro progression of embodied processes, beginning with felling, axing, sawing, and splitting, moving through rough shaping with the side axe, and culminating in controlled tool use on the shavehorse and pole lathe. Pole-lathe turning in particular engages all three spatial planes simultaneously and generates dense multimodal feedback through posture, rhythm,

balance, bilateral coordination, tool–material contact, and auditory–tactile cues. This makes it uniquely suited for testing and refining EMBER-S³, as it affords analytically visible sensory-modal-spatial dynamics that are present in all craft learning but often less traceable.

Greenwood work also plays a foundational role within wider craft ecologies. Many craft processes rely on wooden components, for example, drop spindles and spinning wheels for turning fleece into yarn, loom parts for weaving, handles for blacksmithing tools, and wooden fixtures used across textile and metal crafts. Conversely, green woodworkers often rely on blacksmiths, or become blacksmiths themselves, to forge the specialist tools required for shaping wood. These interdependencies illustrate how crafts flow into and support one another, reinforcing the transferability of insights gained from studying Greenwood work. Because it sits at the intersection of so many embodied, tool-based practices, Greenwood work provides an exemplary and generative context through which the EMBER-S³ framework can be tested, refined, and meaningfully applied.

5.3.2 Collecting, Logging, and Contextualising Data

Purpose

The initial stage of operationalising EMBER-S³ involved systematically collecting, logging, and contextualising multimodal data to ensure traceability, analytic rigor, and alignment with the sensory-first orientation of the framework. This process established the foundation for subsequent viewing, sampling, and transcription by capturing authentic, embodied interactions within their ecological context.

Corpus Overview

The dataset comprised video recordings, ethnographic field notes, photographs of tools and artefacts, curriculum and background student information documents, and a field notes and reflexive journal. A 46-second pole-lathe clip was selected for micro-analysis due to its critical richness (see 5.3.4 for selection criteria and Figure 25 for sampling funnel diagram). See figure 24 for a table summarising data corpus overview and how it was used in the study (see Appendix R for larger version).

Figure 24 Overview summarising data corpus and how it was used in the study

Type of data	Quantity	How it was used in study
Video recordings of workshop craft activity/interaction	3 sessions of Green woodwork 45mins-1hr each (GWW) 46 second scene selected and transcribed as described to the right	Provide multimodal data for observation, selection, transcription and analysis, video transcriptions generated from video data; - Multimodal Matrix (General overview of the video scene transcribed into modal/sensory categories) - Annotated Video stills (provide narrative vignette of selected critically rich 26 second scene) - Sensory-Modal Density circles (foreground orchestration of modes/senses in relation to RQ's; enactment of EF capacities and agency)
Field notes	1 handwritten journal	Initial notes and time stamps of pedagogically rich moments and observations
Photographs	5 (Presented in setting/context)	Provide context of workshop/setting/tools/crafted artifacts
Reflexive journal	1 handwritten journal	Notes of critically significant observations while viewing the video clip in relation to the research objectives
Documents	-PSTE Practitioners guide and GWW curriculum docs -Student profile information for student D (EHCP and ILP individual learning plan)	-Provide context and background of organisation, college, curriculum and participants - Exploration of how craft may meet identified needs and aspiration of learners (addressed according to themes arising from video and interview data of student D)
Interview with participants: Student D, Tutor and researcher (audio recording)	One 12 min Audio recording Later transcribed	The semi structured recall interview focused on the pole lathe scene - stimulated by playing the 46 second clip and asking semi structured questions with Student D and practitioner in order to member check with participants and gain additional lived experience/outcomes of the craft encounter -Transcript excerpts used in analysis and discussion section to converge with observations

Procedures and Environment

Data generation occurred across three Greenwood work sessions (30–60 minutes each) within an open-sided shelter facing woodland, affording natural light and accessible sensory engagement (see Section 5.1). Tools and apparatus were arranged for ergonomic access, and the pole lathe was positioned to enable embodied interaction. Spatial decisions, such as placing the camera outside the shelter on a fixed tripod and maintaining lateral researcher positioning, were crucial for preserving natural dynamics and reducing observational bias.

Video Recording

A fixed tripod camera provided panoramic coverage of the pole-lathe activity, including tutor–student interactions, spatial layout, and material engagement. High-resolution video was essential for micro-analysis of sensory–modal–spatial dynamics (e.g., gaze shifts, grip adjustments, proprioceptive cues).

Audio Capture

Integrated audio recorded verbal exchanges and environmental sounds (e.g., rhythmic tool impacts, fire crackle), functioning as sensory feedback loops relevant to executive functioning and agency.

Photographs and Artefacts

Still images documented tool arrangements, workshop layout, and crafted artefacts, supplementing video data and supporting contextual interpretation.

Field Notes and Reflexive Journal

Observational notes captured environmental affordances, participant behaviours, and emergent analytic ideas. Reflexive journaling (See Appendix S for examples of field notes and reflexive journal entries) supported interpretive transparency and mitigated habituation bias (Bortoft, 1996; Shotter, 2014).

Documentary Resources

Curriculum guides, student profiles, and EHCP summaries were logged to contextualise pedagogical intentions and personalise analytic focus.

Stimulated-recall interviews

Interviews were conducted one week post-recording to triangulate interpretations and amplify participant voice, using an audio recording device and later transcribed (see Appendix T Interview transcript). Details of the stimulated-recall interviews are further outlined in section 5.3.7.

Data Management and Logging Protocols

Each file was assigned a unique identifier and logged in a secure data management system. Metadata included session date, duration, participant codes, and environmental conditions. Files were stored on the institutional Q-drive in compliance with GDPR and SHU Research Ethics Policy (2015), with unused video deleted post-analysis (see Appendix B Data management plan).

Link to EMBER-S³

This stage operationalised the sensory-first principle of EMBER-S³ by prioritising high-fidelity capture of sensory cues (touch, proprioception, vestibular, auditory) and spatial configurations. These affordances were critical for illuminating embodied processes analytically visible in later stages (matrix, storyboard, density circles).

5.3.3 Viewing

Purpose

The second stage of operationalising EMBER-S³ involved iterative viewing of the recorded sessions to surface multimodal and sensory–spatial dynamics. This process was essential for identifying critical richness and informing subsequent sampling decisions, consistent with the interpretivist and phenomenological stance adopted in this study (Bortoft, 1996, 2012; Shotter, 2014).

Viewing Techniques

Data viewing followed a multi-layered strategy adapted from Bezemer & Jewitt (2010) and Norris (2004), designed to reveal subtle sensory couplings and embodied orchestration:

- Sound-on viewings: Captured rhythm, speech, and auditory feedback loops, highlighting how sound functioned as a sensory cue for executive functioning (e.g., self-monitoring and inhibition).
- Sound-off viewings: Focused attention on gesture, gaze, posture, and spatial layout, enabling observation of embodied coordination beyond verbal interaction.
- Variable speed loops: Slowed playback to 0.25–0.5× for micro-movements such as grip adjustments, stance shifts, and tool angle changes, which often signal proprioceptive engagement and EF processes.
- Collaborative viewings: Conducted with supervisors and critical friends to challenge assumptions, surface blind spots, and refine sampling criteria (Lincoln & Guba, 1985).

Link to EMBER-S³

Viewing operationalised the sensory-first principle by prioritising embodied, multimodal cues over linguistic primacy (Jewitt, Bezemer, & O'Halloran, 2016). These iterative loops supported the identification of modal density and complexity (Norris, 2004), ensuring that subsequent sampling captured moments of pedagogical salience and EF affordances.

5.3.4 Sampling

Purpose

The third stage focused on selecting clips for micro-analysis that exemplified multimodal complexity and pedagogical significance. Sampling was guided by the study's aim to explore how sensory-modal-spatial orchestrations scaffold executive functioning and agency.

Criteria for Selection

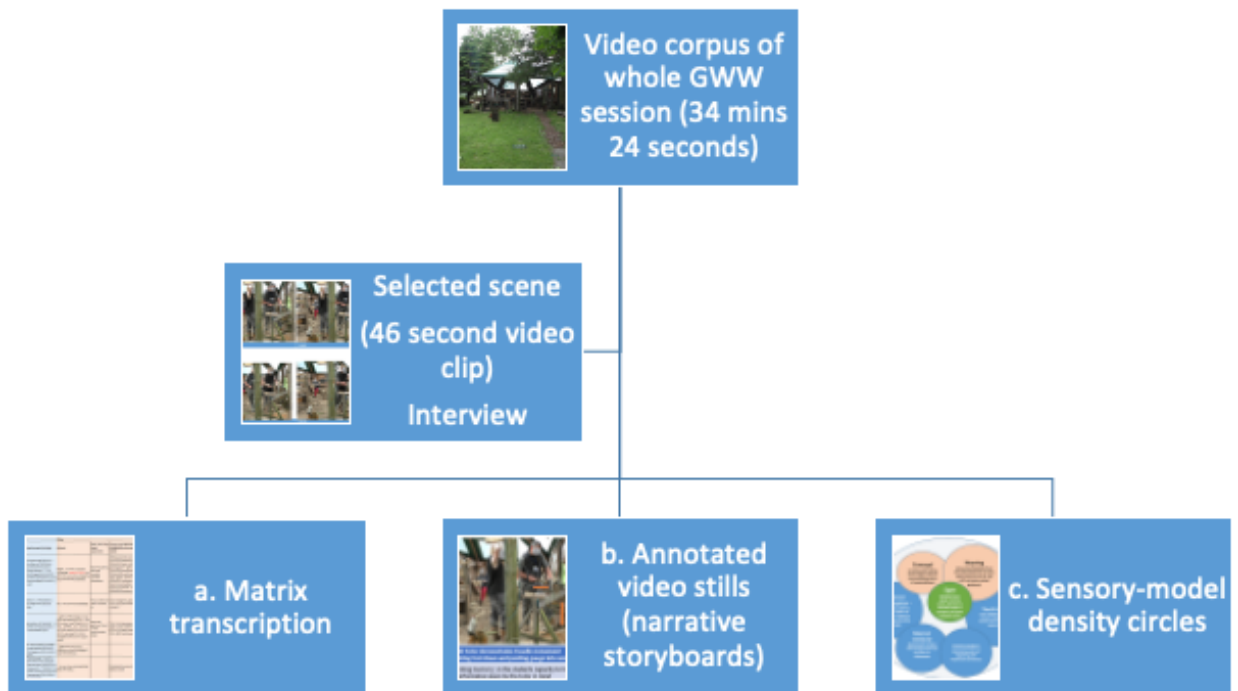
The chosen clip met three core criteria:

- Modal density and complexity: Multiple modes co-present toward a higher-level action, consistent with Norris's (2004) framework.
- Pedagogical salience: Transition from tutor demonstration to student enactment, representing a critical learning moment.
- EF affordances: Observable indicators of working memory, initiation, self-monitoring, and inhibition (Diamond, 2013; Blair & Razza, 2007).

Decision and Validation

After iterative viewing and collaborative discussion, one 46-second pole-lathe clip was selected for micro-analysis. While other recordings were rich and offer potential for future analysis, this clip was chosen due to its alignment with the study's specific selection criteria and focus on depth over breadth. Stimulated-recall interviews validated its relevance, confirming alignment with the study's objectives and amplifying participant voice (Brinkmann & Kvale, 2015; Doak, 2018). See Figure 25 below for sampling funnel diagram.

Figure 25 Sampling funnel diagram



Link to EMBER-S³

Sampling operationalised EMBER-S³'s commitment to depth over breadth by focusing on a single, richly multimodal scene. This decision enabled fine-grained analysis of sensory–modal–spatial orchestrations and their role in fostering EF capacities and agency.

5.3.4 Transcription and Analysis Tools

Operationalisation followed a three-stage pipeline designed to capture and interpret multimodal complexity:

- A. Sensory-First Multimodal Matrix
- B. Annotated Video Stills with Narrative Vignettes
- C. Sensory–Modal Density Circles.

Each tool served a distinct analytical function and collectively enabled triangulation of embodied, sensory, spatial and intellectual dimensions.

A. Sensory-First Multimodal Matrix

Purpose

To construct a panoramic representation of the 46-second sequence, preserving sensory feedback loops and identifying critical junctures for deeper analysis.

Procedure

- Timeline segmented into 1–10 second slices (finer increments for rapid actions).
- Columns grouped modes contextually:
 - Gaze/focus/facial expression
 - Gesture and tool manipulation (including planes of space: sagittal, frontal, horizontal)
 - Proxemics/kinesics/haptics
 - Senses (referring to the 12 identified in section 3.2, e.g. touch, hearing, balance/vestibular, movement/proprioception)
 - Theory/construct (learning action; EF tags)
 - Environment/context (tool layout, light, noise)
- Colour coding: student (blue), tutor (orange), environment (green).
- Glossary and coding rules embedded for consistency (see Appendix U for full matrix and glossary)

Contribution to Analysis

The matrix (see Appendix U for full matrix) exposed iterative feedback loops e.g., tactile and auditory cues confirming cut quality, and flagged EF indicators such as self-monitoring during tool use (see table 4 for extract from sensory-first multimodal matrix). These insights informed sensory salience weighting in density circles and guided storyboard panel selection. By mapping sensory–modal–spatial orchestration across time, the matrix provided a foundation for interpreting how embodied actions scaled into higher-level capacities.

Table 4 Extract from sensory-first multimodal matrix

Time (total scene 31.03-31.45)	Speech	Gaze, focus and facial expression	Gesture and object/tool manipulation (inc planes of space)	Proxemics, Kinesics and haptics	senses: inc touch, hearing, balance, movement (proprioception)	Theory/concept (learning)
Student						
31.11-31.33		Gaze focused on fingers/tool and tool rest and head moves towards work area as movement begins	Moves little finger onto tool rest and then fingers on top of tool		Sound (hearing) of wood carving gives feedback that the technique is correct, feedback is also received via Touch - Resistance in correct contact between tool and material also gives consistent feedback of correct movement, balance, flow and technique	'Organisation of materials' and in his ability to impose order on his work/crafted object
31.33-31.39	That's what I did last time... on the other one.	Tilts head as his focus moves sideways tracking tool movement	Twists grasp to the left to allow tool to track/cut along the wood edge			'Shift' shows ability to recall and enact previously learnt skill and apply within another situation
31.39-31.45	oh... done, done... (tutor comment) ...wow	Smiles and relaxes face as head draws back with body	Pulls back tool and hands from work	Steps back from work piece to view completed task	Shows awareness of own competence/learning and pleasure and sense of achievement/well-being through successful completion task	'Self-monitoring' in that the student shows the ability to monitor his own performance and measure it, "inhibition" in his ability to stop his actions at the appropriate time without being prompted

B. Annotated Video Stills + Narrative Vignettes

Purpose

To preserve embodied salience and sequential logic in a visually accessible format, enabling readers to apprehend multimodal complexity at a glance.

Procedure

- Frames exported at 5 to 0.5–1 second intervals during dense moments.
- Annotations included (referring to examples given below) figure 26 for example a. story board of video stills and figure 27 for example b. annotated video Still:
 - Movement arrows (indicating movements of individuals and later planes of space: sagittal, frontal, horizontal)
 - Gaze lines (dotted = glance; solid = sustained focus; double = joint attention)
 - Sensory loop colours (Blue = touch/haptic, proprioception; green = visual/sight; orange = hearing)

- Each panel of the narrative story boards featured dual-text captions: description (top) and analysis (bottom), cross-linked to matrix timecodes and EF tags.

Contribution to Analysis

Storyboards (see Appendix V for full set) illuminated micro-adjustments, stance shifts, grip changes, and tutor scaffolding strategies not evident in verbal transcripts. Visual encoding of gaze and gesture revealed how joint attention frames supported initiation and confidence, while colour-coded sensory loops highlighted proprioceptive and haptic feedback underpinning self-monitoring and inhibition.

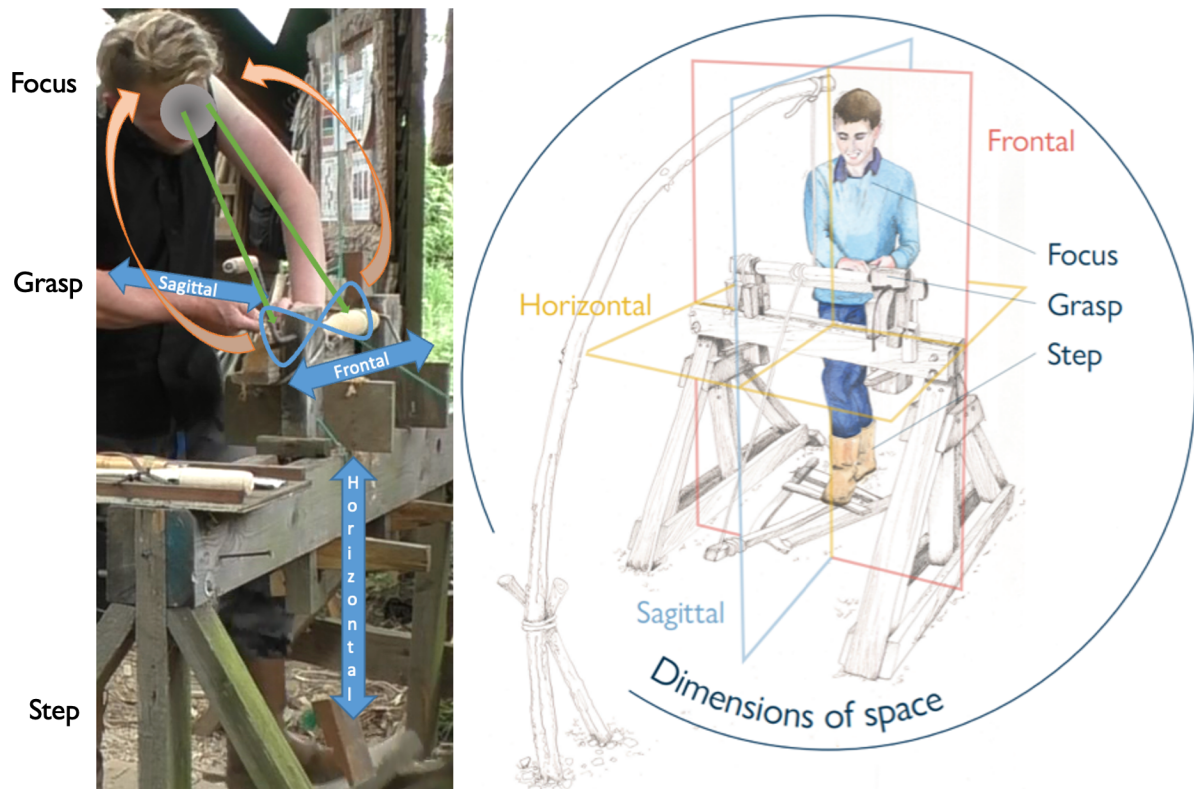
The full set of narrated annotated video stills (see Appendix W) provided a granular visual record and analysis of the embodied interactions over the full scene. This enabled cross-referencing with the multimodal matrix and density circles to triangulate sensory–modal feedback loops and executive function indicators such as initiation, self-monitoring and inhibition.

These insights enriched narrative analysis in Chapter 6, evidencing how multimodal cues scaffolded executive functioning and agency enactment.

Figure 26 Example a. story board of video stills

<p>31.03 – Tutor explains and demonstrates new tool skill/ Student observes (wide gaze)</p>	<p>31.06 Tutor demonstrates treadle movement (pushing foot down and pushing gauge into wood)</p>	<p>31.07 cont.. Releasing foot and retracting gauge at the same time</p>
<p>Tutor begins by explaining and breaks down aspects of new skills before full demonstration</p>	<p>'Working memory', in the student's capacity to hold the information given by the tutor in mind</p>	<p>Tutor uses complex multimodal orchestration to role model/demonstrate skill/technique</p>
<p>31.11 Student grasps tool and enters performance space of lathe of own volition</p>	<p>31.13 Student adopts position (mimesis), engaging tool using new technique/tutor moves to side</p>	<p>31.15 Tutor gently guides students finger position using gestures, touch and description</p>
<p>'Initiation', in the student's ability begin the task and activity</p>	<p>Tutor response is sensitive and supportive, adopting a position to allow agency while supporting him</p>	<p>Attention goes from gaze of wider body orchestration to focus to finer use of proxemics, kinesics, haptics</p>

Figure 27 Example b. annotated video still (including illustration introduced earlier for context)



C. Sensory–Modal Density Circles

Purpose

To visualise intensity and complexity of multimodal engagement for (a) student–tutor and (b) student–material interactions, critical in craft contexts where material feedback co-teaches the learner.

Procedure

- Circles comprised concentric rings (inner = dominant sensory-mode; mid = supporting; outer = contextual).
- Sectors represented senses (touch, hearing, vestibular, proprioception) linked to modes (gesture, gaze, posture) and affordances (tool/wood).
- Sector size reflected judged salience, documented in rationale captions grounded in video, interview, and matrix data.
- Colour coding followed sensory schema introduced in Section 3.2.5.

(further contextual guidance provided within the presentation of analysis findings)

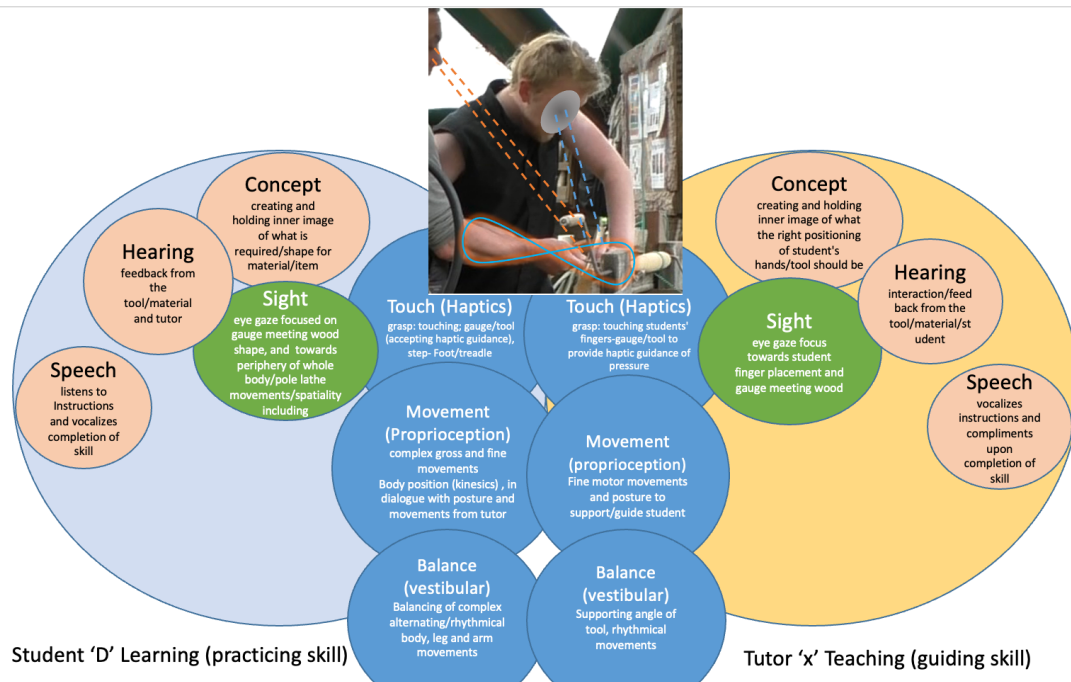
Contribution to Analysis

Density circles revealed dominance of proprioception and haptics during tool withdrawal, correlating with EF capacities of self-monitoring and inhibition. By visualising modal intensity and complexity, these diagrams provided a heuristic for interpreting how sensory-modal-spatial orchestrations scaffolded lower and higher-level actions (Norris, 2004). This visualisation complemented matrix and storyboard outputs, enabling triangulation and reinforcing claims about the pedagogical potential of embodied craft practices. Below are two examples of how the sensory-modal density circles were used, a. student–tutor interaction; b: student–material interaction; (see Appendix X for full set of sensory-modal density circles in larger format).

Example (a) Student–Tutor Sensory–Modal Density Circles

Building on Norris’s (2004) and Doak’s (2018) use of modal density circles, this study adapted and extended the approach to create hybrid sensory–modal density circles. These visualisations were employed to examine and portray the orientation, intensity, and complexity of sensory–modal engagement within the student–tutor interaction during the shared activity of teaching (tutor) and learning/practising (student) the pole-lathe skill. Figure 28 below illustrates this representation, highlighting how multimodal orchestration supported executive functioning and agency within the craft context.

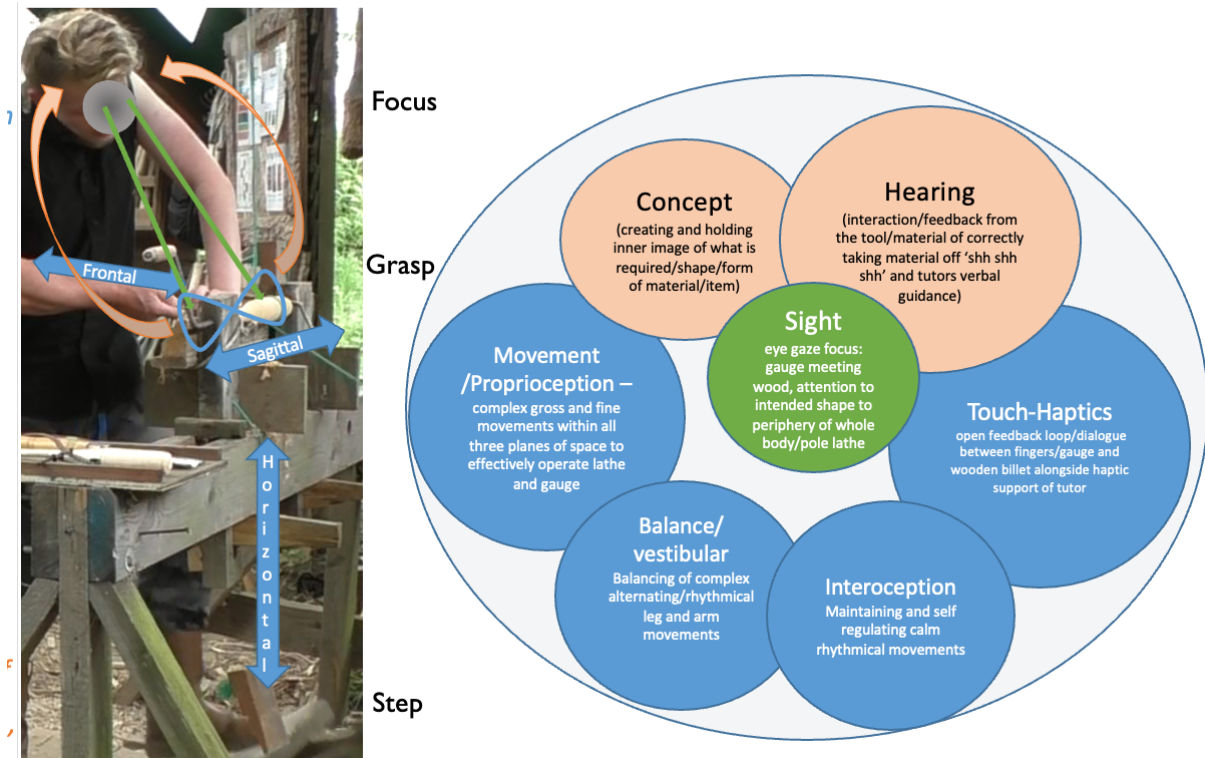
Figure 28 Sensory-modal density circles presenting student-tutor interaction analysis



Example (b) Student–Material Sensory–Modal Density Circles

This study also applied hybrid sensory–modal density circles to analyse the student’s interaction with materiality during the pole-lathe activity, see figure 29 below. These visualisations foreground the intensity and complexity of sensory–modal engagement within student–material dialogues, illustrating how tactile, proprioceptive, and auditory feedback loops co-orchestrate embodied learning. The accompanying annotated video still contextualises these dynamics by depicting the sensory feedback loops (colour-coded arrows) linked to the corresponding sectors of the density circle. Together, these representations reveal how material affordances and sensory cues scaffold executive functions such as self-monitoring and inhibition, contributing to the enactment of agency within craft practice.

Figure 29 Sensory-modal density circles presenting student-material interaction analysis (with annotated video still for context)



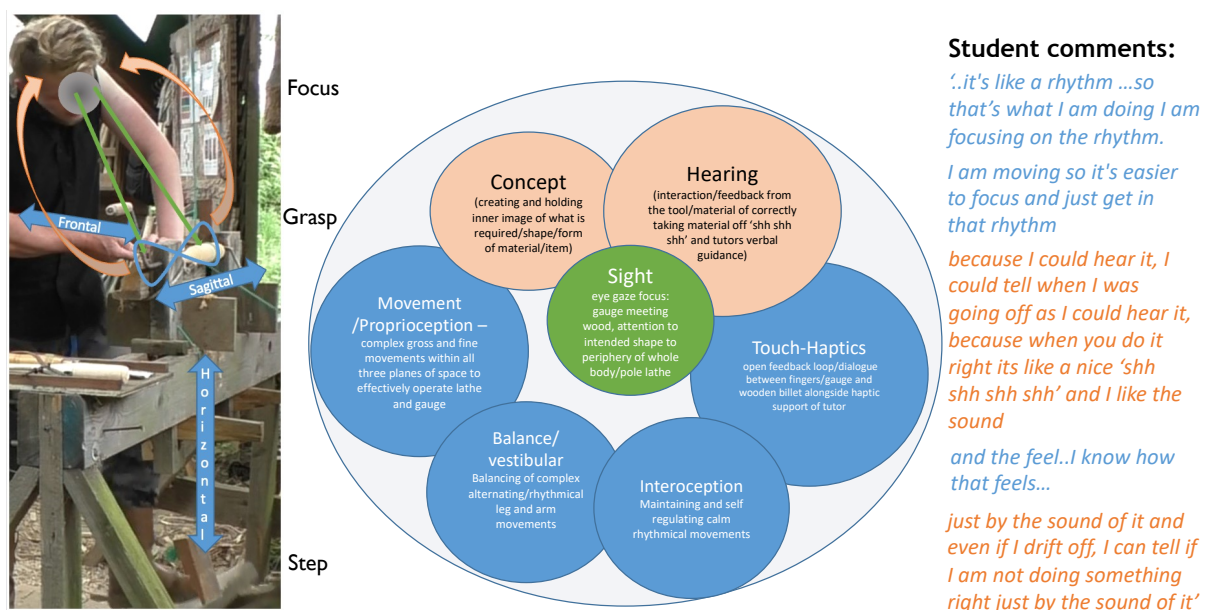
5.3.6 Integration and Triangulation

The outputs from all three transcription tools, the sensory-first multimodal matrix, annotated video stills, and sensory-modal density circles, were triangulated with stimulated-recall interview excerpts and ethnographic resources (curriculum documents, field notes, photographs). This integration ensured that interpretations were not only grounded in observable multimodal data but also validated through participant perspectives and contextual detail.

For example, the matrix identified a critical moment of self-monitoring and inhibition during tool use and skill enactment (time code 31:11–31:45). This observation was corroborated by the student's interview response: "...I could tell when I was going off...as I could hear it, because when you do it right its like a nice shh shh shh shh...and the feel you know...because I know how that feels' (Appendix T Interview transcript). The storyboard

panel for this moment visually encoded the visual, auditory and haptic focus and proprioceptive adjustments, while the density circle highlighted the dominance of body based, haptic and auditory senses. Together, these artefacts provided a layered account of how sensory feedback loops scaffolded EF capacities and agency enactment, see figure 30 below for composite image combining transcription methods, focusing on sensory-modal orchestrations involved in self-monitoring. This triangulation process aligns with Lincoln and Guba’s (1985) criteria for trustworthiness by combining methodological triangulation (multiple analytic tools) and data triangulation (video, interviews, ethnographic context). It also operationalises the interpretivist commitment to co-constructed meaning by amplifying participant voice within the analytic narrative.

Figure 30 Composite image combining transcription methods, focusing on sensory-modal orchestrations involved in self-monitoring



5.3.7 Stimulated-Recall Semi-Structured Interview (Using Video and the Crafted Artefact as Prompts)

Purpose and Rationale

To amplify participant voice and validate interpretations arising from the multimodal analyses, the study employed stimulated-recall, semi-structured interviews. Participants revisited selected moments from their own craft sessions via short video clips and, where

helpful, handled the crafted artefact produced, enabling embodied, situated recall rather than abstract retrospection. Within the study's quality strategy, these interviews functioned as member checking to enhance credibility and authenticity and to refine emergent interpretations of agency and executive functioning (EF) developed from the matrix, storyboard, and density-circle artefacts.

The approach aligns with prior work in comparable SEND contexts, where video-based recall is reported as less distressing than direct questioning and supports first-person accounts of situated learning (e.g., Doak, 2018).

Alignment with EMBER-S³

Within EMBER-S³, the interviews extend the sensory–modal–spatial lens by inviting participants to articulate how sensory feedback (e.g., haptic “feel” or sound of the cut), spatial positioning, and tool–material dialogue informed their decisions in the moment. They therefore sit after multimodal artefact creation and within triangulation, feeding back into the interpretive cycle that integrates corpus analysis, participant voice, and ethnographic context.

Materials and Prompts

Video prompt: The video clip was the same 46 second excerpt selected for multimodal density and pedagogical salience (demonstration, enactment transitions and completion of the pole lath sequence, EF affordances such as working memory, initiation, self-monitoring, inhibition).

Tactile prompts: the crafted artefact was available for handling to stimulate embodied recall when appropriate (used explicitly after an instance of agreement bias was observed during pilot work, further explained in the following section 5.4).

Interview Schedule and Conduct

Timing and setting: Interviews were conducted 1 week after filming, on-site in a quiet, familiar space, using a laptop to display clips, balancing immediacy of recall with reflection time and maintaining contextual familiarity.

Duration: 10–60 minutes per interview (12 minutes in this case study)

Format: Semi-structured questioning and prompts, supported open, participant-led commentary. Typical prompts included:

‘So we are looking at...’

‘What is it about the...’

‘...so how does the ... help you with that?’

‘...and what would you say...’ (to invite a participant to respond)

Recording: Audio recordings were made and supported by brief researcher notes for reflexive tracking (see Appendix S).

Documentation: The full interview transcript (Appendix T) is provided, to ensure transparency, support trustworthiness, and provide readers with access to the complete dialogic context underpinning the interpretations offered in Chapters 6 and 7. The full transcript is presented in a tabular format with a time log column and separate columns for each participant (Student, Tutor, Researcher) to preserve the sequential integrity of the dialogue and foreground multimodal dynamics. This structure enhances clarity by enabling readers to track turn-taking, temporal progression, and the interplay of perspectives in real time. It also supports transparency and analytic rigor by aligning with multimodal principles of orchestration (Jewitt et al., 2025; Norris, 2004), ensuring that embodied and dialogic nuances remain visible. By providing a time-coded layout, the table facilitates cross-referencing with video stills, multimodal matrices, and sensory–modal density circles, enabling triangulation and strengthening trustworthiness (Lincoln & Guba, 1985).

Analytic Integration

As described and illustrated previously, interview data was triangulated with the multimodal matrix, storyboard panels, and sensory–modal density circles. For instance, the participant

statement “...I could tell when I was going off...as I could hear it, because when you do it right its like a nice shh shh shh shh...and the feel you know...because I know how that feels’, corroborated analytic inferences that haptic and auditory feedback loops supported self-monitoring and inhibition within tool use.

Quality and Trustworthiness

The interviews operationalised the study’s member checking strategy (with adaptations where necessary), complementing critical-friend review and the broader authenticity criteria. Together, these measures supported credibility, dependability, and transparency for interpretive claims about agency and EF in craft learning.

5.3.8 Reflexive Approach to Transcription and Analysis

Operationalising EMBER-S³ required a high degree of reflexivity to ensure rigor and interpretive integrity. Multimodal transcription is not a neutral act; as Bezemer and Jewitt (2010) notes, “the meanings realised by any mode are always interwoven with the meanings made with those other modes co-present and co-operating in the communicative event” (p. 5). Decisions about framing, salience, and representation inevitably shape what is foregrounded or muted (Kress & van Leeuwen, 2021). To address this, I oscillated between concept-free observation (Bortoft, 2012) and theory-informed viewing, resisting habituation and remaining alert to emergent phenomena. Iterative viewing loops, whole-scene scans followed by 1–5 second bursts, enabled micro-analysis of sensory–modal–spatial relationships while maintaining macro-context.

Acknowledging the “impossibility of including everything” (Taylor, 2014, p. 232) and the risk of meaning loss in screen-to-print translation (Bezemer & Jewitt, 2010), I adopted strategies to balance analytic depth with readability: triangulating matrix detail with annotated stills and narrative captions and using modal density circles to visualise complexity. This reflexive stance strengthened the robustness and trustworthiness of the analysis by aligning transcription decisions with the study’s interpretivist and phenomenological commitments.

5.3.9 Summary of Pedagogical Significance and Conceptual Integration

While the preceding subsections have detailed the operational steps of EMBER-S³, it is important to foreground the pedagogical and theoretical significance underpinning this hybrid approach. Craft, as enacted in this study, operates as a multimodal, embodied pedagogy, where sensory–modal–spatial orchestrations, touch, proprioception, vestibular/balance, vision, and auditory feedback, form iterative loops of action, reflection, and adaptation. These loops scaffold executive functions such as initiation, working memory, self-monitoring, and inhibition, capacities that are foundational for agency and align with the educational purpose of fostering self-generated conscious action (Gordon & Cox, 2023) and world-centred subjectification (Biesta, 2021). The orchestration of modes and senses within affordance-rich craft environments exemplifies the synergy and complexity of embodied learning, where material transformation and self-transformation co-occur in a liminal space of becoming (Nasseri & Wilson, 2017).

This interpretive lens also situates the findings within personalised education, as the multimodal strategies observed were closely aligned with Student D’s EHCP aspirations for confidence, sensory integration, self-regulation, independence, and agency. By making these dynamics analytically visible, EMBER-S³ not only addresses a methodological gap but also illuminates the pedagogical potential of craft-based education for inclusive, agency-centred practice. These insights extend beyond the immediate case study, offering transferable principles for designing learning environments that prioritise embodied, sensory-rich engagement and challenge reductive, outcome-driven models of education. The following section now turns to the outputs generated through this process and their role in shaping the analysis and discussion presented in Chapter 6 and 7.

5.3.10 Outputs and Link to Analysis

The operationalisation of EMBER-S³ produced a suite of artefacts that functioned as both analytic tools and communicative resources:

- Sensory first multimodal matrix (Appendix U)
- Annotated storyboard panels with dual-text captions (Appendix V)

- Detailed video still transcription, analysis, and narration of the pole lathe scene (Appendix W)
- Sensory–modal density circles for interpersonal and material interactions (Appendix X)
- Stimulated-recall semi-structured Interview transcript (Appendix T)
- Composite figures visually foregrounding the sensory, modal, and spatial aspects, integrating data from matrix, sensory-modal density circles, interview quotes, and storyboard panels for key EF moments (Appendix Y)

These artefacts were not static representations but interpretive instruments that shaped the findings presented in Chapter 6. For instance, the matrix enabled identification of EF indicators across the timeline, the storyboard panels revealed embodied nuances of tutor scaffolding and learner adaptation, and the density circles visualised modal intensity and complexity, making otherwise invisible sensory–modal–spatial dynamics analytically legible.

By linking these outputs to the research questions, the study demonstrated how multimodal orchestration within craft pedagogy fosters EF capacities such as, working memory, initiation, self-monitoring, and inhibition, and supports the emergence of agency. This evidence informed the pedagogical implications discussed in Chapter 7 and the methodological transferability explored in Chapter 8.

5.3.11 Section Summary

Section 5.3 has detailed the operationalisation of EMBER-S³ through a structured, multi-stage process:

- Selection and briefing procedures ensured ethical rigor and participant agency.
- Data generation and contextualisation captured authentic craft interactions within an affordance-rich environment.
- Viewing and sampling strategies surfaced critical moments of multimodal complexity aligned with EF and agency.

- Transcription and analysis tools, sensory-first matrix, annotated video stills, and sensory-modal density circles, illuminated sensory–modal–spatial orchestrations analytically visible.
- Integration and triangulation validated interpretations through participant voice and ethnographic context.
- Outputs and link to analysis demonstrated how these artefacts informed findings and pedagogical insights.

Together, these steps operationalised the interpretivist and phenomenological commitments of the study, ensuring that analysis remained attuned to lived, embodied experience while achieving methodological rigor. By making invisible dimensions of craft pedagogy visible, EMBER-S³ offers a transferable framework for investigating embodied learning and agency in diverse educational contexts.

The following section (5.4) builds on these operational steps by detailing how ethical principles were embedded throughout the research process. While ethics informed every stage of EMBER-S³, presenting them separately ensures clarity and highlights their role as a foundational dimension of methodological integrity.

5.4 Ethical Practice and Methodological Integration

Introduction

This section details how ethical principles were operationalised throughout the research process, complementing the conceptual considerations outlined in Section 4.7. While Chapter 4 established the theoretical and procedural foundations for ethics, this section demonstrates how those principles, such as consent as a dialogic process (Miller & Bell, 2002), attentiveness to lived experience (Shotter, 2014), and respect for multimodal participation (Jewitt, Bezemer, & O'Halloran, 2016), were enacted during data generation, transcription, and analysis. Ethics were embedded within the operationalisation of the EMBER-S³ framework, ensuring that methodological decisions aligned with the study's

interpretivist and phenomenological commitments. It is presented as a separate section for two reasons:

1. **Clarity and Emphasis:** Ethical practice was not a peripheral consideration but a dynamic, integral component of the study's design. Treating ethics as a distinct section foregrounds its significance and ensures transparency in how ethical decisions shaped methodological implementation.
2. **Operational Detail:** Chapter 4 outlined the ethical framework conceptually; this section focuses on its practical application during fieldwork and analysis, including specific examples and links to methodological tools described in Section 5.3.

Although some content overlaps with Chapter 4 and the previous section 5.2 and 5.3, this repetition is justified to maintain coherence and provide a complete account of ethical enactment within the operational context of EMBER-S³.

5.4.1 Ethical Approval and Governance

Comprehensive ethical approval was obtained through Sheffield Hallam University's Converis system (Ethic Review ID: ER25832136), ensuring compliance with institutional guidelines for research involving vulnerable populations (SHU Research Ethics Policy, 2015). All safeguarding and whistleblowing procedures were implemented in accordance with these standards. This approval shaped key methodological decisions, including the use of video recording and multimodal techniques, drawing on precedents for sensitive deployment in similar SEND contexts (Doak, 2018).

5.4.2 Participant Recruitment and Ethical Safeguards

Participants were recruited through organisational networks, with Education Learning Coordinators acting as gatekeepers to maintain neutrality and reduce perceived pressure. Information sheets and consent forms were distributed via email and hard copy, ensuring participants had time and space to opt out without obligation. Tutors were briefed explicitly

that participation was voluntary, mitigating risks associated with insider research (see Appendix A Participant information sheet).

5.4.3 Consent as an Ongoing Process

Consent was approached as a continuous, renegotiated process rather than a one-off event (Miller & Bell, 2002). Participants were provided with clear, accessible information sheets and consent forms outlining the study's aims, methods, and their rights, including withdrawal at any stage (see Appendix A for participant information and consent forms).

Stages of Consent:

- Before data generation: Written consent was obtained following detailed briefings
- During sessions: Verbal re-consent was sought before each observation and recording, reinforcing autonomy.
- After sessions: Participants were reminded of their right to withdraw data post-session.

The use of Education Learning Coordinators as gatekeepers added a layer of neutrality, reducing perceived pressure and enabling participants and parents to seek clarification without direct contact. For example, one participant raised questions via a parent, who communicated through a coordinator, ensuring informed consent without compromising autonomy.

Briefing Process

Briefings occurred at three stages:

1. Pre-session: Face-to-face meetings supplemented by written information sheets summarising the study's aims, methods, and participant rights and provided Familiarity and introductions.
2. During sessions: Verbal reminders before recording commenced, reinforcing the right to withdraw at any point.
3. Post-session: Debriefs and provision of contact details for follow-up queries.

This iterative briefing and consent process upheld the interpretivist and phenomenological commitments of the study by prioritising participant agency and comfort.

5.4.4 Anonymity, Privacy, and Data Management

To protect participant identity, digital masking software was used to obscure faces and voices in video and image data. Transcripts employed pseudonyms, and a separate coding system was securely stored apart from raw data (see Appendix B for data management plan). Participants were informed of the limits of anonymisation, acknowledging that recognition within the local community might still occur due to contextual familiarity (see Appendix A).

Data were stored on the institutional Q drive during the EdD programme and retained for 10 years post-completion, in line with GDPR and SHU policy (Appendix B). Unused video files were deleted at the end of the project. These procedures were clearly communicated in participant information sheets and consent forms (see Appendix A).

5.4.5 Safeguarding and Wellbeing

Filming took place in familiar environments during regular sessions to minimise anxiety. Camera placement was carefully considered, positioned outside the Greenwood shelter with the researcher beside the camera, to reduce disruption and maintain a natural learning atmosphere. The researcher remained alert to signs of discomfort and was prepared to halt data collection if distress was observed (Swain, 2017). This proactive stance ensured that consent rituals were meaningful rather than perfunctory, fostering trust and psychological safety.

5.4.6 Addressing Positionality and Power Dynamics

As an insider researcher, I recognised the potential for perceived pressure and bias.

To mitigate this:

- Recruitment communications emphasised voluntariness and were channelled through gatekeepers (Education Learning Coordinators).

- Reflexive strategies included journaling, iterative debriefs, and critical-friend review (Brinkmann & Kvale, 2015).
- Member checking and collaborative analysis with supervisors and colleagues helped maintain analytic sharpness and reduce blind spots (Birt et al., 2016; Costa & Kallick, 1993).

An illustrative example arose during a pilot interview where a participant agreed with all questions, likely due to communication difficulties or relational dynamics. In response, I adapted the interview format to semi-structured questions with video and tactile prompts (the crafted artefact) to stimulate recall, which provided a more participant-centred interview. Consequently, that earlier pilot dataset was excluded from the study to prioritise rigour and authenticity.

5.4.7 Alignment with Methodology

These ethical procedures were not isolated from the study's methodological design. They complemented the hybrid multimodal framework by:

- Amplifying participant voice through stimulated recall interviews (Jewitt, Bezemer, & O'Halloran, 2016; Norris, 2004; Doak, 2018).
- Reinforcing trustworthiness and authenticity (Lincoln & Guba, 1985).
- Sustaining the study's commitment to agency-centred pedagogy within Practical Skills Therapeutic Education (Gordon & Cox, 2023).

For example, iterative consent protocols supported the interpretivist stance by enabling participants to renegotiate involvement at multiple points, while anonymisation measures ensured that multimodal artefacts (matrix, storyboard, density circles) could be shared without compromising privacy. Camera positioning decisions and the use of gatekeepers were directly informed by safeguarding principles, illustrating the synergy between ethics and operationalisation.

5.4.8 Section Summary

In summary, ethical practice in this study was not treated as a procedural formality but as a dynamic, integral component of its interpretivist and phenomenological stance, guiding design decisions for research with SEND participants and multimodal, video-based data. By embedding ethics within the operationalisation of the EMBER-S³ framework, the research prioritised participant agency, inclusivity, and sensitivity, ensuring that data generation and multimodal analysis were both rigorous and respectful. These measures, iterative and ongoing consent protocols, anonymisation and data protection, safeguarding in familiar environments, and reflexive mitigations such as member checking and critical-friend review, were enacted throughout fieldwork and analysis to uphold trustworthiness and authenticity. Operationalising ethics in this way directly enacts the dialogic, lived-experience commitments articulated in Section 4.7, including consent as a renegotiated process (Miller & Bell, 2002), attentiveness to lived experience and co-constructed meaning (Bortoft, 1996, 2012; Brinkmann & Kvale, 2015; Shotter, 2014), respect for multimodal participation beyond speech (Jewitt, Bezemer, & O'Halloran, 2016), and sensitivity to positionality in insider research (Wilkinson & Kitzinger, 2013). Taken together, this synergy between ethical principles and the EMBER-S³ methodology reinforces qualitative criteria for trustworthiness and authenticity (Lincoln & Guba, 1985) and provides a robust foundation for the findings, discussions, and recommendations that follow.

Building on these embedded ethical principles, the following section outlines the complementary strategies employed to ensure quality and trustworthiness throughout the operationalisation of EMBER-S³.

5.5 Ensuring Quality and Trustworthiness

Purpose and alignment

While Section 5.4 addressed ethical principles and their integration into the research process, this section focuses on strategies for ensuring quality and trustworthiness during

the operationalisation of EMBER-S³. It fulfils the commitment made in the Chapter 5 overview and complements ethics by detailing how member checking, critical-friend review, and reflexive audit trails were embedded to uphold rigor and authenticity. These strategies build on qualitative criteria that privilege trustworthiness, credibility, and authenticity over positivist notions of reliability and replicability (Lincoln & Guba, 1985; Janesick, 2000) and specify how those criteria were enacted during data generation and analysis.

5.5.1 Member Checking (Stimulated-Recall Interviews)

Member checking was operationalised through stimulated-recall, semi-structured interviews in which participants reviewed pre-selected video scenes to verify and enrich interpretations arising from multimodal analyses. This approach supported validation of observations, clarification of interpretations, and often yielded richer descriptions than anticipated. Challenges encountered (e.g., agreement bias/communication difficulties) during pilot work led to adaptations of interview technique (shorter prompts, embodied prompts via artefacts), illustrating responsive quality practice. The same interviews also served as the member-checking mechanism within Section 5.3's pipeline, linking quality assurance directly to the operational tools (matrix, storyboard, density circles).

5.5.2 Critical-Friend Review

To broaden perspective and temper potential insider bias, critical-friend triangulation was employed: supervisors and a colleague with relevant expertise reviewed selected video clips, field notes, and transcripts. Their feedback provided "outsider" scrutiny and theoretical/methodological challenge, strengthening credibility and deepening the analysis produced by EMBER-S³.

5.5.3 Reflexive Audit Trail

Quality was further supported through a reflexive audit trail maintained across the lifecycle of the study (field notes, analytic memos, documented decisions about salience and representation). This running documentation complemented the ethical reflexivity

described in Section 5.4 and provided transparency for how interpretations emerged from, and iteratively shaped, the multimodal transcription stages.

5.5.4 Section Summary

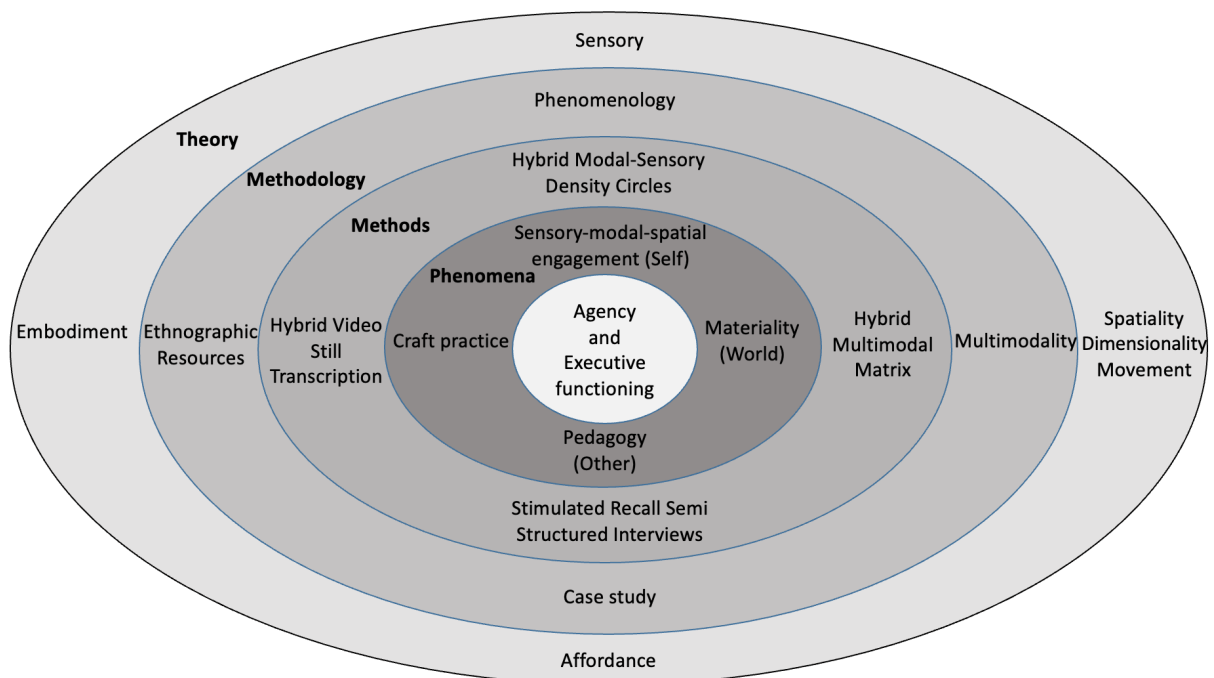
Together, these strategies enact the study's commitment to qualitative rigor and authenticity (Lincoln & Guba, 1985), integrating participant validation, theoretically diverse critique, and reflexive transparency into the EMBER-S³ workflow. In practical terms, member checking, critical-friend review, and the reflexive audit trail are interwoven with the sensory-first matrix, annotated video-still vignettes, and sensory-modal density circles, ensuring that claims about embodied learning, executive functioning, and agency are grounded, transparent, and trustworthy as the thesis moves into analysis and discussion.

Chapter 6 Analysis, Findings, and Multimodal Interpretation of Embodied Craft Practice

6.0 Introduction to Chapter 6

In alignment with the research framework illustrated in figure 31, this chapter operationalises the second ring of the framework, phenomena, by examining the workshop environment, student–tutor interactions, and student–material dialogues. These dimensions are analysed through the methodological and theoretical lenses established in Chapters 3–5, ensuring coherence between epistemology, methodology, and interpretation. By integrating results and discussion within a single chapter, the analysis remains attuned to the interpretive nature of multimodal research, enabling immediate linkage between situated observations and theoretical constructs such as embodiment, sensory integration, and affordance theory.

Figure 31 Research framework



Purpose and Analytic Focus

This chapter applies the EMBER-S³ framework to the case study, focusing on the selected pole-lathe craft scene, to explore how sensory–modal–spatial orchestrations within craft

pedagogy foster executive functioning and agency. It addresses the refined research question: “How does craft shape agentic becoming?”, and its expanded form, focusing on how materiality and multimodal engagements shape the cultivation of executive functions and agency.

Structure of the Chapter

The analysis proceeds across four interrelated dimensions:

- Section 6.1: The Workshop Environment examines macro-level affordances of the Greenwood shelter, showing how spatial and sensory qualities scaffold autonomy, self-regulation, and executive functions such as initiation, working memory, self-monitoring, and inhibition.
- Section 6.2: Student–Tutor Interactions moves to finer-grained analysis of multimodal scaffolding: gesture, gaze, rhythm, and haptic guidance, revealing how joint attention frames and intersubjective coordination support confidence and agency.
- Section 6.3: Student–Material Engagements foregrounds tactile, proprioceptive, and auditory feedback loops in the learner’s dialogue with tools and wood, illustrating how material affordances function as real-time feedback systems for embodied learning. These interactions involve coordinated movements across sagittal, frontal, and horizontal planes, requiring spatial reasoning and fine motor adjustments that support executive functions such as planning, inhibition, and self-monitoring.
- Section 6.4: Alignment with Learner Aspirations and Needs synthesises insights from the preceding analyses and contextualises them in relation to Student D’s aspirations, needs and EHCP. This section demonstrates how the affordances and multimodal orchestrations examined in 6.1–6.3 align with person-centred goals for

independence, self-regulation, and agency, bridging micro-level findings with the broader educational purpose of the study.

- Section 6.5: Emerging Themes and Interpretive Synthesis introduces thematic patterns arising from the multimodal analysis, preparing the ground for the broader pedagogical implications discussed in Chapter 7. These themes consolidate findings across environmental, interpersonal, and material dimensions, highlighting their collective significance for agency-centred education.

Analytic Approach and Tools

To illuminate these dynamics for analysis and presentation of its findings, the study draws upon multimodal artefacts (outlined in the previous chapter) generated through EMBER-S³:

- Sensory-first multimodal matrix for panoramic mapping of modes and senses across time;
- Annotated video-still storyboards with narrative captions to preserve embodied salience;
- Sensory–modal density circles to visualise intensity and complexity of multimodal engagement;
- Stimulated-recall interviews and ethnographic resources to amplify participant voice and contextual depth.

Together, these artefacts provide a layered approach for capturing sensory–modal–spatial orchestrations and interpreting their role in fostering executive functioning and agency within craft-based pedagogy.

Bridge from Macro to Micro Analysis

Section 6.1 establishes the environment as an active pedagogical space rich in affordances; Sections 6.2 and 6.3 then build on this foundation through finer-grained analysis of

interpersonal and material interactions, making visible the mechanisms through which agency is enacted and refined within the affordance-rich setting. Section 6.4 closes the analytic loop by aligning these findings with learner aspirations, and Section 6.5 synthesises emerging themes to prepare for the implications explored in Chapter 7.

How Chapter 6 Addressed the Research Aims, Objectives and Questions

This chapter operationalises the refined research questions and objectives outlined in Section 1.2 by applying the EMBER-S³ framework to analyse and interpret multimodal data from the selected pole-lathe craft scene. It examines how sensory–modal–spatial orchestrations within craft pedagogy foster executive functioning and agency, addressing the overarching question: How does craft shape agentic becoming?

The analysis responds to four sub-questions:

- 6.1 What affordances does the workshop environment offer for executive functioning and agency?
- 6.2 How do student–tutor interactions and pedagogical scaffolding support these capacities?
- 6.3 How do student–material engagements and sensory feedback loops contribute to embodied learning and agency formation?
- 6.4 How do these dimensions align with Student D’s aspirations and needs?

Through detailed multimodal analysis, this chapter explores Student D’s progressive development of key executive functions; working memory, initiation, self-monitoring, and inhibition (Diamond, 2013), as he learns and successfully enacts a new skill on the pole lathe. These capacities underpin self-regulation and agency (Bandura, 2001, 2006; Emirbayer & Mische, 1998) and are evidenced through chains of lower- and higher-level actions (Norris, 2004) captured in the 46-second scene (see Appendix W for detailed video still transcription and analysis of the full scene).

Sections 6.1–6.3 present the multimodal analysis in three layers:

- Workshop environment: examining spatial and material affordances (Gibson, 1979; Gibson & Pick, 2023).
- Student–tutor and student–tutor–material interactions: highlighting pedagogical scaffolding during skill transmission (Vygotsky, 1930–1934/1978; Doak, 2018).
- Student–material interactions: foregrounding sensory–modal–spatial engagement during active practice (Marchand, 2011; Groth, 2017, 2024).

Although these dimensions are deeply entangled, they are addressed individually for clarity before being synthesised in Section 6.4, which contextualises findings in relation to Student D’s aspirations and needs.

Having outlined how this chapter addresses the research aims, objectives, and questions, the next section explains the rationale for integrating results and discussion, a structural choice that reflects the interpretive and multimodal nature of the analysis.

Integrating Results and Discussion: A Methodological Necessity for Multimodal Analysis

To stay aligned with the refined aim; investigating how holistic craft-based education, through its materiality, pedagogy, and sensory–modal–spatial engagements, contributes to the cultivation of executive functioning and agency, and with Objectives 2–3 (apply EMBER-S³ in a case study; interpret and synthesise findings to articulate pedagogical affordances), Chapter 6 presents results and discussion together so that situated observation and interpretive synthesis proceed hand-in-hand. This integrated structure directly operationalises the phenomena and objectives set out in Section 1.2, ensuring that analysis of the workshop environment, student–tutor interactions, and student–materiality interactions is immediately connected to the research questions about agency formation and executive functioning.

In multimodal research, results, findings, and discussion are deeply interdependent and are best presented within a single integrated chapter. This reflects the iterative and interpretive

nature of multimodal analysis, where meaning emerges through the dynamic interplay of sensory, spatial, and embodied data rather than through isolated variables (Jewitt, Bezemer, & O'Halloran, 2016; Norris, 2004). The hybrid multimodal framework employed in this study (EMBER-S³) synthesises phenomenology, multimodal interaction analysis, and ethnographic resources, generating rich, layered datasets; video stills, sensory–modal density circles, and transcription matrices, that require immediate contextual interpretation to avoid loss of embodied salience.

Separating findings from discussion risks fragmenting the holistic understanding of embodied learning and agency formation central to craft practice (Groth, 2017; Mäkelä, 2007). By contrast, integrating these sections keeps the analysis attuned to lived practice and allows direct linkage between situated observations and the study's theoretical scaffolds; embodiment, sensory integration, and affordance theory, supporting reflexivity and methodological transparency (Marchand, 2011). This approach also aligns with qualitative principles of authenticity and trustworthiness (Lincoln & Guba, 1985) and is particularly suited to SEND and neurodiversity contexts, where participant voice and lived experience are inseparable from interpretation.

Finally, an integrated chapter reduces redundancy and enhances accessibility for diverse audiences by sustaining a coherent narrative that foregrounds the pedagogical potential of craft and the multimodal orchestration of agency (Taylor, 2014; Doak, 2018). Broader implications and synthesis of these insights, including the sub-question, “What do the findings suggest about the pedagogical potential of craft?”, are then taken up in Chapter 7, where the objectives and aims are extended to theory, research, and practice.

In sum, presenting results and discussion together is not just a stylistic choice; it is a methodological necessity that directly serves the thesis's refined aim and Objectives 2–3 by weaving situated detail and interpretive explanation into a single, coherent account of how craft shapes agentic becoming.

6.1 The Workshop Environment

6.1.1 Purpose and Research Question

This chapter begins by examining the macro-level affordances of the Greenwood workshop environment (Section 6.1), establishing how its spatial and sensory qualities created conditions for autonomy, regulation, and agency. These environmental affordances form the foundation for the finer-grained analyses that follow: Section 6.2 explores how student–tutor interactions mobilised multimodal scaffolding: gesture, gaze, and haptic guidance, to support initiation and confidence, while Section 6.3 focuses on student–material engagements, revealing how tactile and proprioceptive feedback loops shaped embodied learning and executive functioning. Together, these sections illuminate the dynamic interplay between environment, pedagogy, and materiality, showing how agency emerges through iterative, multimodal processes at multiple scales. It therefore addresses objective 2.A: What affordances does the workshop environment offer for executive functioning and agency?

6.1.2 The Workshop as an Active Pedagogical Space

The workshop functioned as an active pedagogical space, rich in sensory–modal and spatial affordances that enabled embodied dialogues between learner, tools, and materials. Within this affordance-rich setting, iterative feedback loops between body, material, and space scaffolded higher-level actions such as planning, sequencing, and self-regulation, and supported the development of executive functions, including initiation, working memory, self-monitoring, and inhibition (Diamond, 2013; Zelazo, 2015). These conditions resonate with Gibson’s (1979) ecological theory of affordances, in which material and spatial properties invite action possibilities that nurture agency, and they align with multimodal interaction analysis in attending to the orchestration of gesture, gaze, posture, and spatial layout in situ. Together, these insights position the workshop environment as foundational for embodied learning and agency.

Key Findings: Workshop Environment and Agency

- **Active pedagogical space:** The environment afforded embodied dialogues between learner, tools, and materials, supporting higher-level actions (planning, sequencing, self-regulation).
- **Executive function development:** Iterative body–material–space feedback loops scaffolded initiation, working memory, self-monitoring, and inhibition, capacities central to agentic action.
- **Freedom of movement:** Open design and immediate access to outdoor space enhanced autonomy and locus of control, enabling voluntary withdrawal and re-engagement (consistent with an agentic perspective).
- **Sensory affordances:** Natural sounds, tactile materiality, and woodland smells reduced cognitive load and emotional stress, supporting regulation and concentration.
- **Theoretical alignment:** Findings cohere with Gibson’s (1979) affordances and with multimodal interaction analysis (Norris, 2004), illustrating how spatial/material properties invite and organize action possibilities.
- **Educational purpose:** The environment supports Biesta’s (2015, 2021) view that education enables learners to be ‘at home in the world’ through freedom, responsibility, and self-directed purpose.
- **Link to chapter 7:** These affordances form a conceptual bridge to the broader pedagogical rationale for craft discussed in Section 7.1.

6.1.3 Illustrative Participant Perspective

When considering student–tutor and student–material interactions, it is essential to recognise the broader environmental context as a significant factor enabling multimodal and spatial possibilities within craft pedagogy. The following excerpt from the follow-up interview (Appendix T) illustrates these dynamics:

1.25 - Student D: “...personally I love being outside, I hate being stuck in a classroom I can’t handle it...I guess it’s in an open space...you know I just like being outside, it really helps me...Because everything is not chaotic and overwhelming and not a trapped-in feeling...I guess just more relaxing, easier to process and less chaotic.”

Practitioner: “I think Student D...yeah, he benefits massively from being up here...he doesn’t like being down at college particularly...I think there is a lot of hustle and bustle down there, whereas here all we have got is the sound of the birds, the fire and the smell and if you (directing towards Student D) do want to take yourself off, you know that you can just walk outside and you’re into a woodland aren’t you and you have private space.”

Student D: “...and when I get my name called I just come back.”

Practitioner: “And at college you can’t really do that can you...”

Student D: “No there is nowhere to really get away and it’s crowded and chaotic...I can’t recognise it at the time but I am just so overwhelmed it’s just like wow...don’t get me wrong I still have bad days here but it’s always less bad days here than college. I have more bad days at college than I do here, and it’s easier to sort out here as well I would say.”

Practitioner: “...yeah I know where you’re coming from...yep.”

These reflections underscore how the Greenwood shelter’s open design and outward-facing lathe positions afford proxemic and visual space, enabling physical and psychological freedom of movement. This freedom, evidenced by Student D’s ability to leave and return without encountering barriers, appears to culminate in a heightened sense of locus of control (Sigman, 2023), contributing to agency by supporting initiation, self-monitoring, self-regulation, and inhibition during craft activities.

6.1.4 Embodied Learning in an Affordance-Rich Environment

The craft workshop’s open and natural design played a pivotal role in fostering autonomy, self-regulation, and meaningful engagement. Freedom of movement and access to outdoor space enhanced Student D’s locus of control, enabling voluntary withdrawal and re-engagement, which aligns with Bandura’s (2001) agentic perspective. Calming sensory qualities: natural sounds, tactile materiality, and woodland smells, reduced cognitive load and emotional stress, thereby supporting inhibitory control and self-monitoring (Diamond, 2013; Blair & Razza, 2007; Zelazo, 2015). These affordances illustrate how spatial and

material properties scaffold agency through embodied interaction in an affordance-rich environment.

Collectively, these findings substantiate Biesta's (2015, 2021) argument that education should enable individuals to 'be at home in the world' by curating environments that afford freedom, responsibility, and self-directed purpose. Furthermore, the multimodal orchestration of sensory–spatial interactions within the craft environment reflects Marchand's (2011) notion of the sentient, tool-wielding body, foregrounding the embodied nature of learning and agency formation through craft.

These insights underscore the foundational role of the workshop environment in shaping embodied learning and agency, and they provide a conceptual bridge to the broader pedagogical implications discussed in Section 7.1, where these affordances are examined in relation to inclusive, agency-centred educational practice and their potential for informing future curriculum design.

6.1.5 Building on Environmental Affordances: Toward Micro-Level Analysis

The preceding discussion established the workshop environment as an active pedagogical space, rich in sensory–modal and spatial affordances that scaffolded executive functioning and agency. While these macro-level conditions provide the foundation for embodied learning, the mechanisms through which agency is enacted and refined become visible only through closer examination of the interactions within this affordance-rich setting.

Sections 6.2 and 6.3 therefore move from the environmental context to a finer-grained analysis of multimodal orchestration during craft practice. Section 6.2 focuses on student–tutor interactions, revealing how pedagogical scaffolding and joint attention frames mobilise gesture, gaze, and haptic guidance to support initiation, self-monitoring, and confidence. Section 6.3 then examines student–material engagements, foregrounding how tactile and proprioceptive feedback loops, tool manipulation, and spatial positioning co-construct learning and agency. Together, these analyses illuminate the dynamic interplay

between environmental affordances and embodied action, showing how agency emerges through iterative, multimodal processes at both interpersonal and material levels.

6.2 Student–Tutor Interactions: Pedagogical Scaffolding and Multimodal Orchestration

6.2.1 Purpose and Research Question

Building on the environmental affordances outlined in Section 6.1, this section examines how student–tutor interactions within the Greenwood workshop mobilised multimodal resources to scaffold executive functioning and agency. While the open, sensory-rich environment provided the conditions for autonomy and self-regulation, the enactment of agency depended on dialogic coordination between tutor and student. Through gesture, gaze, rhythm, and haptic guidance, the tutor orchestrated multimodal cues that supported initiation, self-monitoring, and confidence during skill acquisition.

The analysis foregrounds joint attention frames and intersubjective scaffolding, revealing how pedagogical strategies extended beyond verbal instruction to include embodied modes of communication. These findings illuminate the dynamic interplay between proxemics, gesture, and material affordances, showing how multimodal orchestration enabled Student D to progress from observation to independent enactment of the pole-lathe technique. This section draws on annotated video stills, sensory-first multimodal matrices, and density circles to illustrate how these interactions scaffolded higher-level actions and executive functions in situ. It therefore addresses Objective 2.B: How do student–tutor interactions and pedagogical scaffolding support these capacities?

6.2.2 Overview of the Student-Tutor Interaction and Summary of Key Findings

The video stills below (figure 32) from left to right illustrate: the initial demonstration by the tutor on the right and observation of the skills by the student (stood to the left), followed by the self-initiation of the skills by the student, and finally the student practising the skill with close proxemic guidance by the tutor. These foreground the three main interactions that are discussed within this section. The following section 6.3 focuses on the student-material

interaction more discreetly. Further context and detail of the analysed full 46-second scene is provided in Appendix W.

Figure 32 Video stills illustrating the three main interactions discussed within section 6.2



This section focuses on the intersubjective interaction and pedagogical scaffolding between the student and tutor during the teaching, learning, and joint practice of pole-lathe skills. These interactions played a pivotal role in shaping the enactment of executive functions, specifically: working memory, initiation, and self-monitoring. The findings reveal that skill acquisition occurred through a complex web of multimodal interactions, underpinned by the tutor's deep pedagogical understanding and attentiveness to the student's sensory-modal preferences and individual needs.

Summary of Key Findings

- **Agency and Executive Function Development:** Student–tutor interactions fostered agency and executive functions (initiation, working memory, self-monitoring, inhibition) through multimodal, sensory-rich, and embodied scaffolding.
- **Multimodal Pedagogical Support:** The tutor combined verbal, gestural, haptic, and spatial guidance, attuned to the student's sensory preferences and emotional states, enabling effective skill acquisition. Close proxemic and kinesic support facilitated an active triangular dialogue between tutor, student, and material. This interaction

nurtured embodied capacities for working memory, self-monitoring, and inhibition, supporting the student's ability to initiate and regulate actions agentially.

- **Active Embodied Observation and Mimesis:** Observation of the tutor's performance, including role modelling and mimesis, was critical for developing self-monitoring. Through observing demonstrations and guided practice of sequential, rhythmic actions, Student D cultivated embodied working memory and strategic planning. This process reflected all four dimensions of the 4E framework: embodied, embedded, enactive, and extended, affirming the inherently multimodal and situated nature of craft-based learning (Groth, 2024). These findings validate the 4E framework as a lens for understanding how skills, capacities, and agency develop in craft pedagogy.
- **Sensory-Modal Feedback Loops:** Real-time feedback via touch, movement, sound, and vision facilitated error correction, impulse control, and self-regulation.
- **Preferred Modalities:** Hands-on, sensory-rich, and experiential approaches proved more effective than verbal or written instruction.
- **Constructivist Learning:** Errors were framed as constructive, reinforcing self-generated feedback and confidence building.
- **Tutor's Role in Co-Regulation:** Agency emerged through intersubjective scaffolding, shared attention, and embodied negotiation, enabling a gradual transfer of initiative and responsibility.
- **Holistic Outcomes:** Emotional regulation, confidence, and social interaction improved, supporting wellbeing and identity formation.
- **Pedagogical Implications:** Effective craft education requires responsive, multimodal strategies and sensory-rich environments to optimise agency and inclusion.

6.2.3 Demonstrating (Tutor) and Observing (Student) the Skills

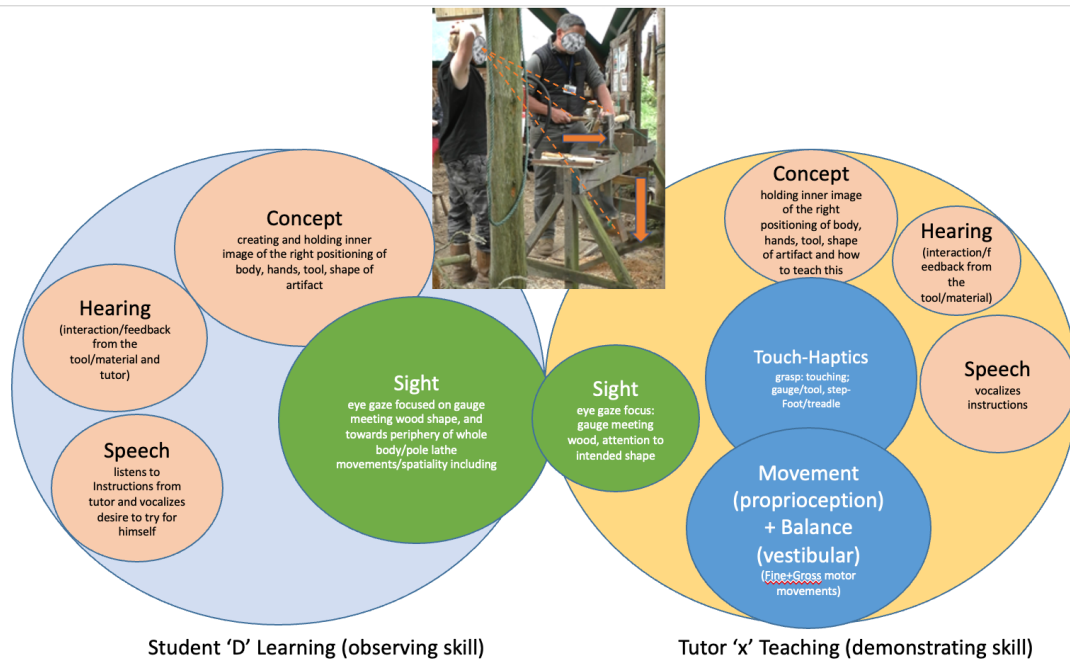
Figure 33 Demonstration and observation of the skills



Figure 33 above illustrates the tutor demonstrating the skill and tool use, explaining each step multimodally, primarily through verbal and gestural communication. This includes body, hand, and finger positioning, as well as tool placement, posture, motion, rhythm, pressure, and movement. The figure draws on transcription and analysis, with conventions outlined in Section 5.3. To support clarity, key aspects relevant to interpreting the findings are summarised below.

In the subsequent figures (video stills and sensory-modal density circles, such as figure 34 below), the large orange circles on the right represent the tutor's sensory modes and their role in teaching and scaffolding the student's learning. The large blue circles on the left represent the student. Smaller coloured circles indicate the intensity (predominance) of individual sensory modes and the complexity (synergy) of multimodal interaction. Overlapping circles highlight shared sensory modes that underpin joint attention during the tutor's demonstration and physical guidance, and the student's observation and practice (larger versions provided for improved readability in Appendix X).

Figure 34 Modal-sensory density circles of student-tutor interaction, demonstrating and observing the skills



6.2.4 The Significance of the 4Es of Embodiment in Observing the Skills

Figures 33 and 34 above illustrates how Student D’s observation of the gauge and pole lathe activated all four dimensions of embodiment: embodied, embedded, enactive, and extended, in a dynamically integrated process (Groth, 2024). This analysis demonstrates that observation within craft pedagogy is not passive but multimodal, situated, and agentic.

Embodied: Student D’s physical body and sensory-modal systems were actively engaged during observation. Mirror neuron activation (Fuchs, 2017; Groth, 2024) enabled simulation of the tutor’s movements, allowing the learner to comprehend and anticipate the actions as if performing them himself. His body’s potential for action informed perception of the skill being observed

Embedded: Understanding of tool use was situated within the immediate physical and social context: the green woodworking shelter, the pole lathe, the gauge, and the purpose of

shaping a stool leg. These environmental and cultural affordances provided the necessary frame for interpreting the observed actions (see Appendix Z for contextual photographs).

Enactive: Observation was an active process, guided by the dynamic flow of the tutor's movements and sensory feedback loops. Student D tracked how the lathe and gauge interacted with the wood, anticipating subsequent steps. Cognition here emerges as a relational, embodied process rather than abstract reception.

Extended: The gauge and pole lathe functioned as cognitive extensions, incorporated into Student D's mental representation of the task. Rather than perceiving them as separate objects, he viewed them as integral components of an action system aimed at shaping the stool leg.

Collectively, these findings affirm that perception and action are intertwined, supporting the relevance of the 4E framework (Groth, 2024) for analysing skill acquisition in craft pedagogy. Observation thus operates as a multimodal, embodied, and situated practice that scaffolds agency and executive functioning.

6.2.5 Cultivating Conceptual Elements of Working Memory Through Active Observation

Student D's observation of lower-level actions (Norris, 2004), including the tutor's adjustments of weight, pressure, momentum, and rhythm, and shifts in gaze between peripheral and focal points, enabled the development of conceptual foundations for skill enactment. These micro-observations supported higher-level actions such as visual-spatial reasoning, focused attention, and the formation of an internal representation of the crafted object (see figures 33 and 34 above).

Through this process, Student D began to strategically plan the sequence of movements required to complete the task, activating executive functions associated with working memory and cognitive flexibility (Diamond, 2013). Rather than relying on abstract instruction, this embodied and situated observation facilitated the enactment of conceptual

and sequential reasoning, reinforcing the study's claim that craft-based learning fosters agency through multimodal, sensory-rich engagement.

6.2.6 Initiation of the Skill and Acceptance of Close Proxemic Guidance

Figure 35 Initiation of student into performance space

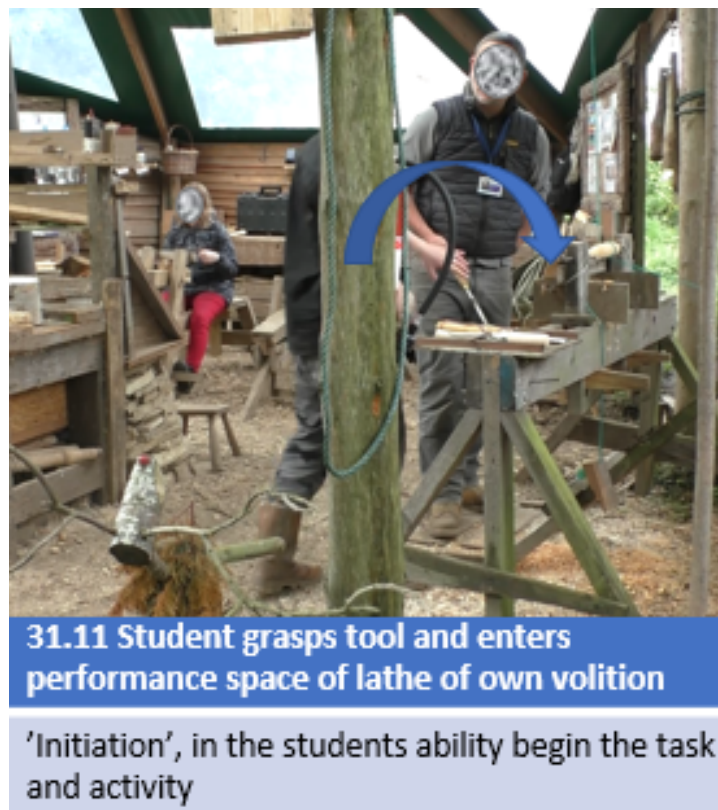


Figure 35 above illustrates a pivotal moment in which Student D transitions from observation to active participation within the performance space. This episode foregrounds the tutor's adaptive pedagogical sensitivity and multimodal responsiveness. By permitting Student D to engage with the pole lathe prior to completing the full demonstration, the tutor acknowledged the learner's agentic desire for autonomy and his proxemic sensitivities, specifically, discomfort with others in close personal space (See student D's profile information in Table 3 of 5.2 and Appendix C, and their comments on their preference for self-directed learning in Appendix T transcript).

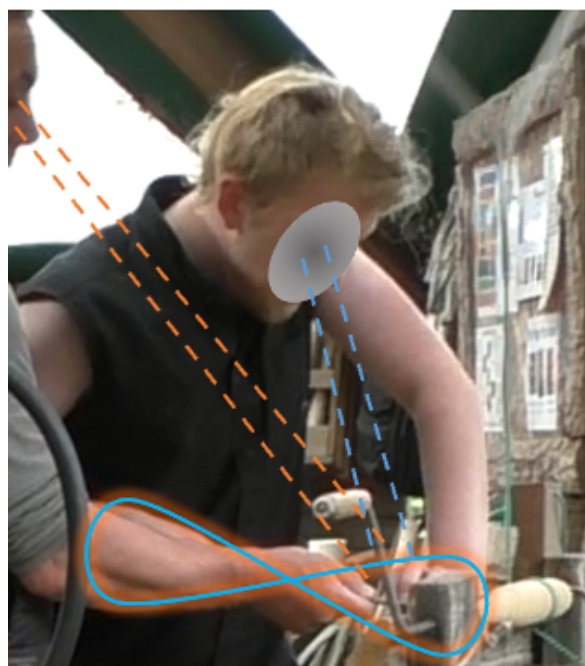
This decision necessitated a shift in pedagogical modality. The tutor moved from verbal explanation to embodied support, combining close proxemic positioning with light haptic

guidance (hand-on-hand) to direct finger placement on the tool (see figure 36 below). This orchestration of proxemic, kinesic, and proprioceptive cues provided essential scaffolding without undermining the learner's sense of control. The tutor's involvement was calibrated to maintain perceived freedom while enabling successful enactment of the technique, allowing Student D to initiate the action voluntarily and later articulate his achievement (see Appendix W).

Multimodal analysis (see figures 36 and 37 below) of this interaction reveals a dense configuration of sensory and semiotic resources: sustained gaze lines for visual calibration, haptic contact for directional precision, and concurrent verbal prompts to reinforce conceptual understanding. These layered affordances collectively supported executive functions, particularly initiation and self-monitoring, while preserving agency. This moment exemplifies Hall's (1966) assertion that spatial perception is dynamic and action-dependent, as Student D's comfort zone expanded through embodied engagement.

6.2.7 Practicing the Skills with Close Proxemic Guidance

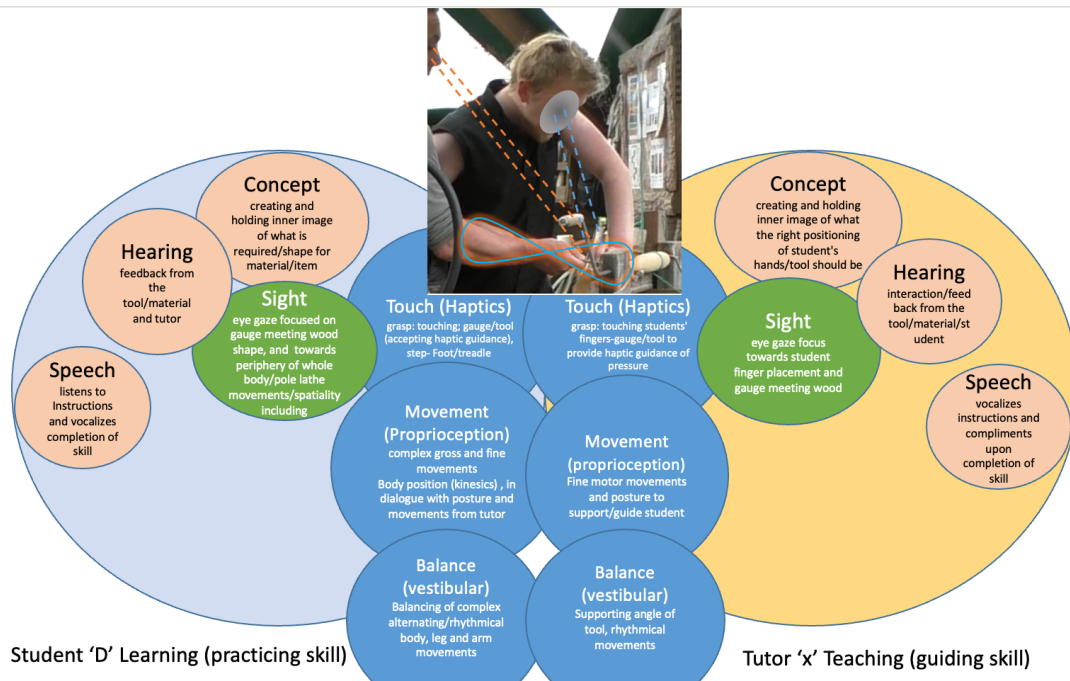
Figure 36 The student-tutor interaction during practice, highlighting close proxemic guidance and multimodal orchestration



In this interaction (figure 36), Student D accepts proxemic and haptic support to position the hand–tool and establish contact with the material, before later requesting to uncouple, a clear act of initiation. The accompanying sensory–modal density circles below (figure 37) and lemniscate (orange/blue loop) visualise the haptic, proprioceptive, and vestibular feedback loops underpinning this coordination. Dotted gaze lines indicate shared visual attention, enabling precise measurement and movement control. Overlapping circles for sight, haptics, hearing, and conceptual focus reveal how these sensory modes operate in synergy, sustaining joint attention on the body–tool–material triad.

This multimodal orchestration does more than transmit technique: it scaffolds executive functions, particularly self-monitoring and inhibition, while reinforcing the learner’s capacity for focused attention and adaptive control. The student’s subsequent decision to disengage from guidance and practise independently signals a pivotal shift toward agency, evidencing the EF of initiation and the progressive transfer of responsibility.

Figure 37 Sensory-modal density circles and video still foregrounding the student-tutor interaction of practicing the skills with close proxemic guidance



6.2.8 Cultivating Lower-Level Actions Toward Self-Monitoring Through Close Proxemic Multimodal Guidance

Student and tutor engage in an interactional triad of body–tool–material, fluidly shifting between learning, enacting, and monitoring through active gestural dialogue. This coordination relies on shared haptic (touch), proprioceptive (movement), and vestibular (balance) feedback loops, visualised in the orange/blue lemniscate. These loops are enacted through lower-level actions: gross and fine micro-movements of posture, arms, hands, and fingers, to achieve correct grasp, spatial positioning, and rhythmic contact between tool and material. Through these iterative adjustments, the learner develops a multimodal embodied awareness of weight, pressure, momentum, rhythm, and angles, forming the basis for skilled performance.

This close proxemic tutor–student–material feedback loop, combining pedagogical guidance and material affordances, lays the foundation for self-monitoring. As these lower-level actions consolidate, they scale into higher-level actions of focused attention and discernment, essential for successful execution and regulation of the overall skill. Evidence of this progression appears when the student uncouples from tutor support to practise independently, a pivotal moment signalling both agency and the executive function of initiation (see section 6.3 for student–material analysis).

6.2.9 Developing Embodied Working Memory

To self-initiate and self-monitor, Student D needed to recruit working memory, an executive function underpinning goal-directed action. Observation cultivated conceptual working memory, enabling him to visualise sequences and anticipate tool–material interactions. Through close proxemic multimodal guidance and active practice, this conceptual base evolved into an embodied working memory and tacit knowledge system.

This development involved complex sequential and spatial reasoning across micro-actions (e.g., shaping with the gauge) and macro-actions (e.g., operating the pole lathe), engaging all three planes of space: sagittal, frontal, and horizontal (see section 6.3). Guided practice supported the formation of an inner conception of the target form (stool leg), allowing Student D to plan actions strategically. He learned to respond to the dynamic affordances of rotating wood through gross motor movements (whole-body coordination) and fine micro-

movements (finger, hand, arm control). These iterative adjustments cultivated sensitivity to rhythm, pressure, and spatial orientation, reinforcing both temporal sequencing and spatial dimensionality.

Consequently, Student D began to integrate conceptual and embodied working memory, enabling him to anticipate, adapt, and regulate performance. This synergy laid the foundation for higher-level actions: focused attention, discernment, and self-monitoring, evident when he uncoupled from tutor support to practise independently. These findings affirm that close proxemic multimodal guidance scaffolds executive functions, aligning with Norris's (2004, p.20) claim that "proxemic behaviour is tightly integrated with the higher-level actions being performed."

6.2.10 Graduated Release: From Co-Regulation to Increasing Agency

A central feature of the student–tutor interaction observed in this study is the process of graduated release, through which guidance is progressively transferred to the learner. If the workshop and its materials are understood as an instrument, the tutor plays it with the learner. In this sense, orchestration refers to the intentional use of proxemics, gesture, gaze, rhythm, posture, and occasional haptics to move gradually from modelling to co-regulation, to graduated release. Through this progression, executive-function processes shift from being externally scaffolded to internally coordinated, supporting the emergence of agency. This dynamic aligns with the embodied, enactive, and affordance-based perspectives outlined in Chapter 3, where agency is conceptualised as emerging through reciprocal sensory–modal–spatial engagement with materials, environments, and others.

Figure 32 illustrates this orchestration in action through a short storyboard sequence, showing how the tutor's moment-to-moment adjustments in positioning, gaze direction, shared attention, and rhythmic cueing shape the learner's focus, timing, and tool control during the pole-lathe sequence. To foreground the sensory-modal fields underpinning this interactional work, Figures 34 and 37 present the associated sensory-modal density-circle analyses of the observation and demonstration phases, followed by the close-proxemic guidance phase. These visualisations make explicit how shared attentional, proprioceptive,

auditory, and haptic modes are coordinated by both tutor and learner as the sequence unfolds.

As competence consolidates, the tutor intentionally increases distance, reduces haptic involvement, quietens rhythmic prompts, and introduces brief, purposeful pauses. These shifts invite the learner to take initiative, check alignment, control pressure, and regulate tempo without external cues. Graduated release is therefore not defined by flawless performance, but by the presence of ownership and reflective control: when a learner can articulate what they are doing, why they are doing it, and what they will do next. In this way, graduated release becomes a tangible expression of agency emerging through multimodal, embodied dialogue, a theme that is returned to in Chapter 7, where the pedagogical implications of these interactional dynamics are synthesised and extended.

6.3. Student–Material Engagements: Sensory Feedback Loops and Embodied Learning

6.3.1 Purpose and Research Question

Complementing the interpersonal focus of Section 6.2, this section examines the student–material dialogue in pole-lathe craft practice, showing how tactile, proprioceptive, and auditory feedback loops shape embodied learning and agency. In this context, the lathe, tools, and wood function as active pedagogical agents, affording iterative cycles of perception and action that scaffold executive functions (EF) such as planning, working memory, self-monitoring, and inhibition (Diamond, 2013). It therefore addresses Objective 2.C: How do student–material engagements and sensory feedback loops contribute to embodied learning and agency formation?

The analysis demonstrates how material affordances and sensory cues (resistance, vibration, sound) function as real-time feedback systems, enabling Student D to calibrate movements, adjust tool angles, and regulate pressure with minimal tutor intervention. This reveals the co-constitutive relationship between learner and materiality, where multimodal orchestration extends beyond human interaction to include the sentient tool-wielding body

and its dialogue with matter. Agency emerges in the liminal space where material transformation and self-transformation coincide.

6.3.2 Overview of Student–Material Interaction and Key Findings

The selected scene shows spatiality operationalised through coordinated engagement across three anatomical planes: vertical, horizontal, sagittal, each recruiting distinct sensory systems and EF processes central to embodied learning (NASM, 2021; ISSA, 2023; Diamond, 2013). Resistance, vibration, and characteristic cut-sound provide immediate cues guiding pressure and tool angle, enabling iterative feedback loops (touch, balance, proprioception) without constant tutor prompts (Norris, 2004). These co-ordinations scale into higher-level actions (planning, inhibition, sequencing) and evidence emergent agency via progressive self-monitoring and adjustment (Ingold, 2000; Mäkelä, 2007; Norris, 2004; Diamond, 2013).

Building on this, the findings demonstrate that the student recognises when he has sufficiently learned the skill, uncouples from tutor support, initiates self-practice, recalls required actions (working memory), and self-monitors and inhibits his actions of his own volition. In short, Student D enacts EF capacities including initiation, working memory, self-monitoring, and inhibition.

Summary of key findings:

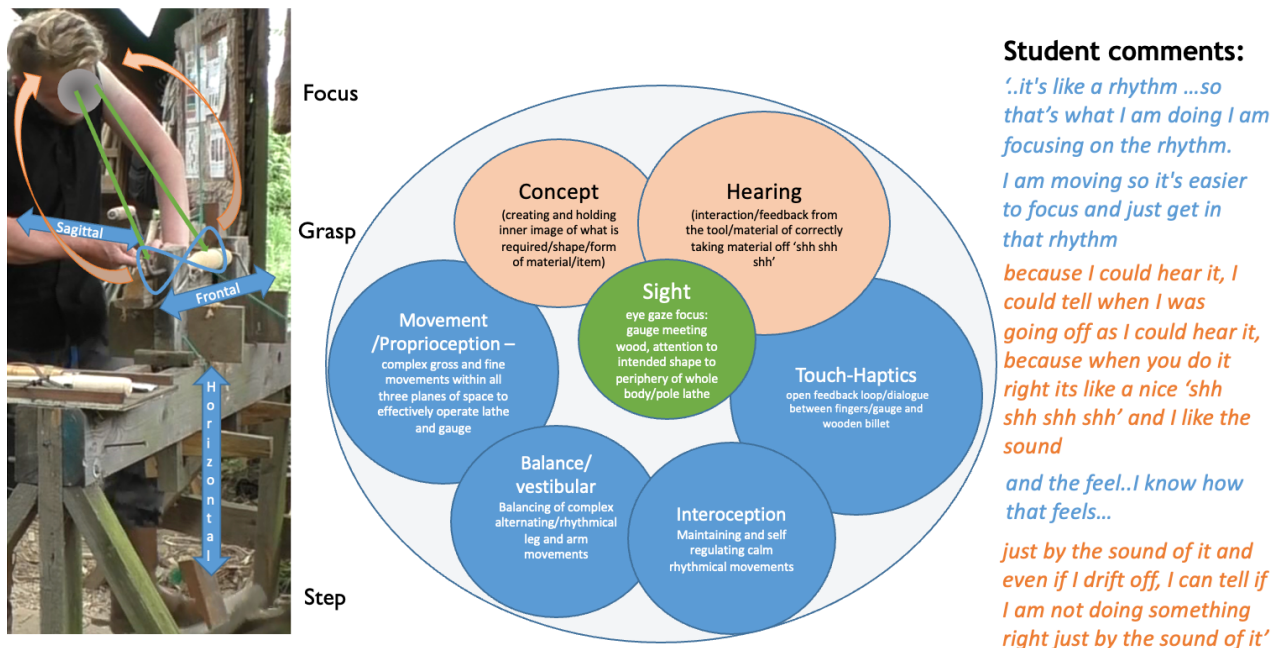
- **Embodied Learning Through Material Interaction:** Craft practice fosters agency and EF (initiation, working memory, self-monitoring, inhibition) via sensory–modal–spatial engagement.
- **Executive Function Development:** Student D demonstrated adaptive planning, working memory, self-monitoring, and inhibition through iterative engagement with tools and materials.
- **Role of Sensory Feedback Loops:** Touch, proprioception, interoception, balance, hearing, and vision operate together to enable skill acquisition, error correction, and self-regulation, forming a superordinate embodied reflexive feedback loop within the body–tool–material triad.

- **Movement Across Spatial Dimensions:** Actions involve sagittal, frontal, and horizontal planes, supporting motor coordination, bilateral integration, and spatial reasoning.
- **Preferred Modalities for Learning:** Hands-on, sensory-rich approaches (doing, feeling, hearing) are more effective than verbal/written instruction.
- **Mistakes as Constructive Learning:** Errors and self-generated feedback are essential for understanding, reinforcing constructivist principles.
- **Agency Through Self-Transformation:** Material transformation mirrors personal growth, integrating physical, cognitive, and emotional dimensions.

6.3.3 Visual Synthesis of Sensory–Modal–Spatial Dynamics

Figure 38 visually foregrounds how sensory–modal–spatial aspects (gross bodily movement through spatial dimensions; visual, haptic, and auditory feedback loops; significant sensory modes) combine with interview insights to shape working memory, self-monitoring, and inhibition during self-practice and successful skill completion. This synthesis highlights the key spatial–sensory–modal aspects of student–material interaction that appear fundamental to agentic acts in crafting, specifically, the development and enactment of self-monitoring and inhibition of the student’s own volition.

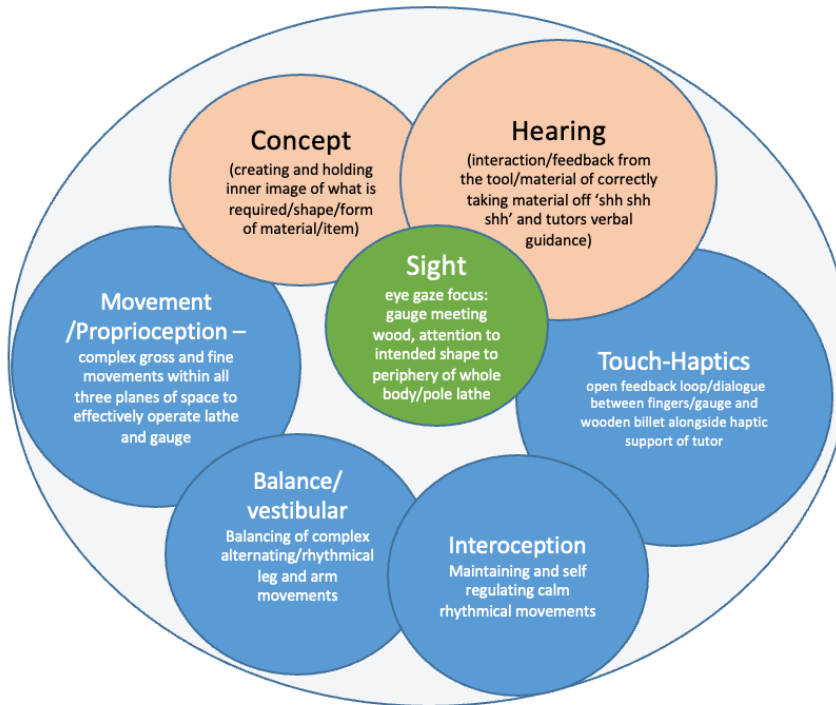
Figure 38 Foregrounding the sensory-modal-spatial aspects involved in working memory, self-monitoring and inhibition within the student-material interactions



6.3.4 Sensory Feedback Loops and Executive Functions

I first examine the sensory modes illustrated by the sensory–modal density circles (figure 39), portraying the densest and most intense modalities and their orchestrations. I then show how these combinations shape and cultivate the enactment of lower and higher-level actions and EF capacities (working memory, initiation, self-monitoring, inhibition) during independent skill performance.

Figure 39 Sensory-modal density circles depicting sensory-modes and feedback loops involved in the student-material interaction



Student comments:

‘..it’s like a rhythm ...so that’s what I am doing I am focusing on the rhythm.

I am moving so it’s easier to focus and just get in that rhythm

because I could hear it, I could tell when I was going off as I could hear it, because when you do it right it’s like a nice ‘shh shh shh’ and I like the sound

and the feel..I know how that feels...

just by the sound of it and even if I drift off, I can tell if I am not doing something right just by the sound of it’

Student voice and insights

“...it’s like a rhythm ...so that’s what I am doing I am focusing on the rhythm..I am moving so it’s easier to focus and just get in that rhythm because I could hear it, I could tell when I was going off as I could hear it, because when you do it right it’s like a nice ‘shh shh shh shh’ and I like the sound and the feel..I know how that feels...just by the sound of it and even if I drift off I can tell if I am not doing something right just by the sound of it” (Student D, Appendix T Interview transcript, timestamp 7.01).

This underscores the high modal density and intensity of sound (hearing), feel (haptics), and rhythm (balance, interoception, movement) in enabling focus on the correct tool–material interaction and immediate self-monitoring (“doing it right” vs. “going off”).

6.3.5 Roles of Individual Sensory Modalities and Feedback Loops

- **Touch (Haptics).** Sensing and enacting correct weight, pressure, and force in response to material resistance, affording active dialogue between fingers–lathe/gauge–material (wood/artifact).
- **Interoception (Life).** Maintaining and self-regulating momentum and calm rhythmic movements, including temporal judgement of action timing.
- **Balance (Vestibular).** Balancing complex alternating leg and arm movements; controlling internal balance and body geometry to operate within and through the three dimensions of space.
- **Movement (Proprioception).** Sensing, understanding, and enacting complex gross and fine movements across all three planes of space to operate the gauge and lathe effectively.

Haptic action feedback loop. These four modalities synergise to form a haptic–vestibular–proprioceptive–interoceptive feedback loop (blue lemniscate in figure 38), enabling self-monitoring of lower-level actions (judging weight/pressure/momentum/rhythm/posture/geometry/ dimensionality/spatiality) and modulating motor actions during skill enactment.

- **Sight.** Gaze oscillates between the cutting interface and the broader body/lathe periphery; a visual–conceptual feedback loop (green arrows in figure 38) supports cutting-angle judgement and efficient material removal.
- **Hearing.** Continuous monitoring of tool–material sound affords an auditory feedback loop (orange arrows in figure 38) that guides corrective actions for successful shaving.
- **Concept.** Maintaining an internal image of the desired outcome allows performance monitoring against the conceptual target, enabling self-monitoring of thoughts/actions/feelings and timely inhibition (built through embodied interaction across the body–tool–material triad and the above feedback loops).

Synergy and superordinate reflexivity. The overlapping density circles (sight, haptics, hearing, concept) illustrate three key loops: visual, auditory, haptic/action, which synergise

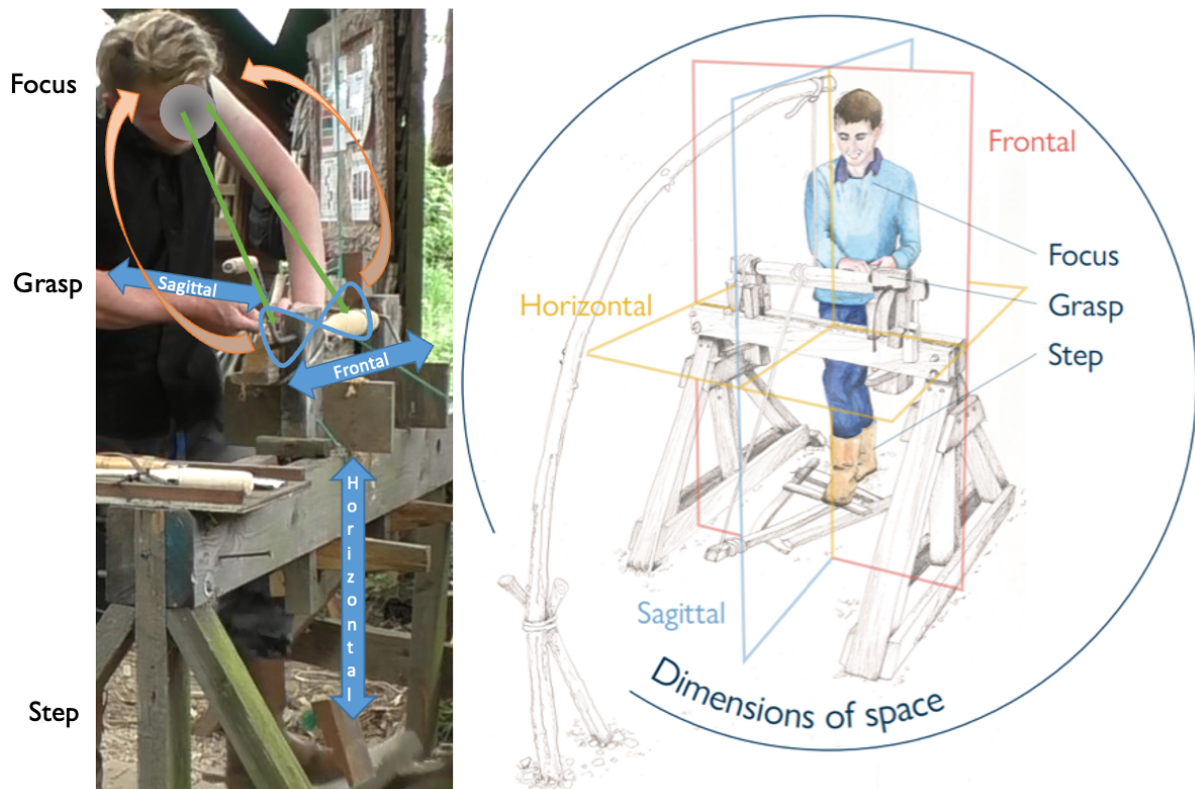
into a superordinate embodied reflexive feedback loop within the body–tool–material triad, affording lower and higher-level actions (focused attention, discernment, responsive action) and enabling Student D to self-initiate, self-monitor, and inhibit agentically and successfully.

6.3.6 Movement and Spatiality: Dimensional Analysis

The prior sections (and Section 6.2) established the importance of movement (proprioception) and visual/haptic feedback in shaping embodied working memory and spatial reasoning. Here, we examine how whole-body co-ordination operates within and through the planes of space during pole-lathe activity, crucial to student–material interaction, and how these movements, integrated with sensory–modal engagement, contribute to the development of lower-/higher-level actions, EF, agency, and skill formation.

Bodily–spatial interactions and planes of space. Pole-lathe operation involves meaningful, rhythmic, repetitive movements across the frontal, horizontal, and sagittal planes, defining directions/dimensions of movement (see figure 40). The diagram contextualises focusing, grasping, and stepping (Section 3.3) in relation to pole-lathe use; the video still foregrounds Student D’s plane-specific movements and the feedback loops.

Figure 40 Student D on pole lathe with the planes of space, actions, and feedback loops superimposed, and diagram by Dilly Williams for context



Frontal plane (front/back halves).

Side-to-side actions: shifting lateral weight, balancing stance, tracking the gauge side to side to create an even surface, supporting cross-lateral stability, dynamic balance, and proprioception.

Horizontal plane (upper/lower halves).

Rotational actions (shoulders, hips, torso) to align tools and reposition wood, supporting dynamic balance and spatial awareness.

Sagittal plane (left/right halves).

Rhythmic forward/back motions: pushing the gauge into the wood (downstroke) and retracting on the upstroke; stepping on the treadle (cord movement reverses billet spin) to coordinate sequencing, bilateral coordination, and core stability.

Key motor functions

- Focus (ocular). Operates mainly within sagittal/frontal planes, enabling depth perception and lateral distinction for micro-level alignment and macro-level adjustments; supports attention control.
- Grasp (tactile). Through sagittal/horizontal planes, enables multidirectional tool manipulation and fine-motor precision (tracking the gauge, subtle angle shifts).
- Step (vestibular). Engages all three planes, integrating proprioception and rhythmic movement to maintain stability while operating the lathe and adjusting complex postures.

These orchestrated movements not only enable functional craft skills but also contribute to EF: working memory, self-monitoring, inhibitory control, by demanding sustained attention, adaptive planning, and controlled action (Diamond, 2013).

6.3.7 Integrating Sensory–Modal–Spatial Contributions to EF

This part integrates the spatial roles with the sensory feedback loops that enable lower and higher-level actions fostering EF (working memory, self-monitoring, inhibition). Within the visual spatial–conceptual loop, Student D applies and consolidates mental/visual mapping and complex spatial reasoning (cultivated through observation and guided practice noted earlier), both recalling and enacting working memory during student–material interaction. Lower-level actions (bilateral judgement, depth perception) and higher-level actions (focused attention, discernment of body geography and environmental dimensionality) synergise to enable visual–conceptual self-monitoring of complex movements, body scheme, and spatiality.

His capacity to conceptualise stool-leg shape and the intricate fine/gross movements of the body in space foregrounds the ability to feel, judge, and discern haptically, enabling a haptic–proprioceptive–vestibular–interoceptive loop for self-monitoring lower-level actions (pressure, rhythm, angles/spatial orientations) required for successful execution.

Collectively, these spatial actions contribute to the haptic, visual, and conceptual loops that mediate the dialogue between material resistance and tool. Tactile judgement of pressure

and cutting angles (lower-level actions) permits subtle discernment and appropriate responses (higher-level actions) across wider body movements (arms, fingers, legs) to increase/decrease force, impart shape/design, or yield to material affordances (e.g., knots/dense wood), as noted by Student D within the interview (Appendix T). This demonstrates how self-monitoring and inhibition arise directly from the synergy between sensory–modal–spatial feedback loops (the superordinate embodied reflexivity) and the appropriate lower-/higher-level actions required during student–material interaction.

6.3.8 Embodied Agency Through Multimodal Action

The analysis shows Student D exercising embodied, sensory–modal–spatial agency through coordinated lower-/higher-level actions across all planes of space. Cognitively, he conceptualises a new stool-leg design by integrating spatial perception, focused attention, and mental mapping. Emotionally, he exhibits self-monitoring, self-regulation, and inhibition of unnecessary actions and thoughts. This physical–emotional–cognitive interplay illustrates how movement and spatial engagement foster agency and aligns with Steiner (1921/1991), Rohen (2007), and König (1989, 2003) on the developmental role of spatial dimensions. Further, engaging in these spatial interactions recapitulates key developmental milestones, enhances sensory integration, and cultivates fundamental capacities essential for autonomy and independence (Sherborne, 1990; Rohen, 2007; König, 1989, 2003).

6.3.9 Spatiality, Movement, and Agency in Craft-Based Education

Student–material interaction at the pole lathe illustrates how sensory–modal–spatial engagement fosters both gross and fine motor skills, enhances bilateral integration, and strengthens sensory integration, motor planning, and EF (working memory, initiation, self-monitoring, inhibition), all key components of agency (Ayres, 1979, 2005; Diamond, 2013). Purposeful operations (carving, shaping, rotating) within meaningful, goal-directed tasks (e.g., stool making) reinforce embodied pathways for coordination (Gibson, 1979; Marchand, 2011). Coordinated sagittal push/pull, frontal side adjustments, and horizontal rotational control enhance proprioception and rhythmic control (Gibson, 1979; Shafir,

2016), underpin motor skills and EF by demanding sustained attention, adaptive planning, mental mapping, spatial reasoning, and controlled action (Diamond, 2013; Michel, 2012). This embodied engagement supports self-regulation and adaptive action in complex spatial environments (Merleau-Ponty, 1945/2012; Fuchs, 2017).

From a theoretical perspective, these findings illuminate how spatial dimensionality enables purposeful movement, goal-directed behaviour, and intentionality, exemplifying phenomenological action (Pacherie, 2008), social cognition (Bandura, 2001, 2006), and embodied cognition (Varela, Thompson, & Rosch, 1991). Spatial awareness is foundational to understanding our physical relation to the environment and how the body shapes the mind (Gallagher, 2005). Movement through space enables active exploration and interaction, developing a proprioceptive understanding of capability and limitation, the basis for agency and self-directed action.

6.3.10 Synthesis and Pedagogical Implications

In sum, student–material engagements during pole-lathe work foster agency through the multimodal orchestration of sensory feedback and spatial movement. These embodied processes cultivate EF (working memory, initiation, self-monitoring, inhibition) and illustrate the pedagogical potential of craft-based education for inclusive, agency-centred learning. By situating craft practice within a spatial, sensory, and embodiment framework, educators can design environments and tasks that make these dynamics visible and intentional, strengthening learners’ capacity for self-regulation, adaptive planning, and purposeful action.

6.4 Craft-Based Pedagogy and Student D’s Aspirations and Needs

6.4.1 Purpose and Research Question

This section interprets findings from the overall case study of Student D, drawing on analyses presented in Sections 6.1, 6.2, and 6.3, and situates them in relation to his identified aspirations and needs (see table 3, Section 5.2). This section therefore addresses

Objective 2.D: How do these dimensions align with Student D's aspirations and needs? The discussion primarily focuses on the three most relevant aspirations, given their alignment with the aims and scope of this research. However, several identified barriers to learning, strategies for learning, and communication needs were also addressed throughout the process. While the purpose of education extends beyond meeting EHCP outcomes (Biesta, 2015), as outlined in Sections 2.5 and 2.6, framing findings through this lens enhances accessibility and relevance within the current SEND framework. Although these findings are not generalisable, they may be transferable to broader educational contexts, as the development of agency is fundamental to all learners (Bandura, 2001, 2006; Emirbayer & Mische, 1998).

1. Independence and Agency Development

Craft-based learning fostered agency through embodied, sensory-modal-spatial engagement. Student D demonstrated executive functions, initiation, working memory, self-monitoring, and inhibition, during craft practice, aligning with research on executive functioning as foundational for autonomy and agency (Diamond, 2013; Diamond & Lee, 2011). The iterative cycles of action and reflection observed in the pole lathe activity mirror constructivist principles, where learners actively generate meaning through experience (Piaget, 1950; Vygotsky, 1930–1934/1978).

The interview (Appendix T) revealed Student D's ability to articulate improvements in impulsivity and concentration, and to identify strategies for continued development. This reflexive process enabled him to reimagine future goals and assume responsibility for his learning, reinforcing agency, independence and Self-generated conscious action (Bandura, 2001, 2006; Gordon & Cox, 2023).

2. Self-Management and Regulation

The findings emphasise the role of sensory feedback loops including touch proprioception interoception vestibular sense hearing and vision in supporting self-regulation and adaptive planning. Student D reported that rhythm and sound in particular provided critical cues for

error correction and impulse control which aligns with sensory integration theory (Ayres 1979, 2005; Schaaf & Davies 2010). Observational and interview data confirmed that these embodied interactions facilitated concentration, self-monitoring, self-regulation and emotional regulation contributing to holistic wellbeing. Mistakes were framed as constructive enabling Student D to engage in self-monitoring and reflection. The findings also highlight a dual process within the student-material interaction conceptualising and creating a unique crafted object (transformation of material) while simultaneously self-cultivating executive functions and agency through the synergy of physical psychological and emotional engagement (transformation of self).

3. Sensory Processing and Preferred Modalities

Student D expressed (Appendix T) a strong preference for hands-on, experiential learning over traditional methods such as paperwork or verbal instruction, stating:

“Doing the real thing... the feel of it and the sounds, it’s more than that... it’s about the sense of it... you need to do.”

This resonates with embodied cognition theory, which emphasises the inseparability of perception, action, and meaning-making (Merleau-Ponty, 1945/2012; Groth 2024 and Jewitt et al., 2025). Craft practice provided direct sensory feedback, enabling Student D to self-monitor performance and self-regulate actions. The successful transformation of material into a finished artefact served as a tangible indicator of progress, reinforcing confidence and identity formation (Andersen et al., 2019). These findings suggest that craft-based pedagogy aligns with multimodal learning principles and offers an effective approach for learners with sensory processing challenges and more widely for learners who wish to improve their sensory integration.

6.4.2 Tutor’s Role and Multimodal Scaffolding

The tutor acted as a facilitator rather than a director, employing proxemic and haptic guidance alongside gesture and verbal prompts. This multimodal scaffolding supported

shared attention and co-regulation, enabling gradual transfer of responsibility to the student D. Such strategies are consistent with research on embodied teaching and the pedagogical significance of spatial and tactile cues (Hall, 1966; Doak, 2018; Norris, 2004). I believe these findings serve as a good example of the tutor applying and responding utilising his sensitive pedagogical intuition, the concept of which I further discuss in the following chapter.

6.4.3 Implications

The case study demonstrates that craft-based, sensory-rich environments can foster agency, executive functioning, and inclusion for learners identified as having SEND, while also supporting these capacities in all learners, as such dimensions are fundamental to broader human experience (Bandura, 2001, 2006; Biesta, 2021; Diamond, 2013; Emirbayer & Mische, 1998). These findings advocate for pedagogical approaches that prioritise multimodal strategies and material affordances, creating conditions for embodied learning and holistic development (Biesta, 2021; Groth et al., 2024). The following chapter provides further discussions to illuminate the pedagogical and educational affordances that arose which speak to the pedagogical potential of craft more generally and how such insights may be applied to the development of pedagogical practice and intuition.

This section has demonstrated how the pedagogical craft interactions appear to have significantly contributed to the development of the skills, abilities, capacities, agency, needs and aspirations that student D and professionals on his behalf sought to enhance and develop.

6.5 Conclusion and Summary to chapter 6

Chapter 6 employed the bespoke hybrid EMBER-S³ approach with Multimodal Interaction Analysis (MIA) to examine how teaching, learning, practice, and successful completion of a pole-lathe skill unfold as sensory–modal–spatial processes. The fine-grained transcription (matrix, annotated stills, density circles), triangulated with interview data, made analytically

visible the intensity, density, and complexity of embodied orchestration, revealing pedagogical affordances in materials, movements, and interactions that shape lower and higher-level actions and support executive functioning and agency. The main findings are summarised below and are further developed in relation to their implications in Chapters 7 and 8.

Executive Function Development

Across student–tutor, student–tutor–material, and student–material encounters, core executive functions (EF) emerged through embodied engagement:

- Planning: sequencing steps and adjusting tool angles
- Initiation: starting tasks independently
- Working memory: recalling and applying prior learning
- Self-monitoring: regulating actions via sensory feedback
- Inhibition: controlling impulses and timing actions

These capacities were essential for progression from skill acquisition to increasingly autonomous, agentic practice.

Agency

Direct material interaction supported self-regulation, adaptive planning, and independence; the learner’s bodily, cognitive, and emotional engagement with wood, tools, and environment exemplified how material transformation can mirror self-transformation within craft pedagogy.

Tutor’s Role and Multimodal Scaffolding

The tutor functioned as a facilitator, orchestrating gesture, gaze, proxemics, haptics, and speech in attunement to the learner’s sensory preferences, enabling:

- Shared attention and co-regulation
- Gradual transfer of responsibility
- A triangular dialogue (tutor–student–material) that supported volition and agentic action

Embodied, Sensory–Modal–Spatial Learning

Hands-on craft practice relied on iterative sensory feedback loops: touch/haptics, proprioception, vestibular/balance, vision, and hearing, coordinated with spatial movement. These loops enabled error correction, impulse control, and adaptive planning, sustaining a dynamic dialogue with materials and space.

Pedagogical and Material Affordances

Agency formation emerged through the interaction of two types of affordances:

- Inherent affordances: The material and functional properties of wood, tools, and equipment that invite and guide action.
- Intentional/pedagogical affordances: The deliberate structuring of tasks, environment curation, and scaffolding that support executive functioning (EF) and agency.

Material Affordances and Spatial Engagement

Direct engagement with tools and materials generated immediate tactile and auditory cues, such as resistance, vibration, and the sound of a clean cut, that enabled the learner to regulate pressure, tool angle, and pace without continuous tutor intervention.

These interactions were reinforced through movement across sagittal, frontal, and horizontal/transverse planes, supporting motor coordination, bilateral integration, and spatial reasoning. This spatial engagement also fostered EF processes such as self-monitoring, adaptive control, and inhibition, thereby enabling the learner to act with increasing autonomy and agentic initiation. This aligns with movement-science accounts of multi-planar functional engagement (NASM, 2021; ISSA, 2023) and with the spatial-embodiment frameworks informing this study (König, 1989, 2003; Rohen, 2007; Steiner, 1921/1991).

Constructivist Learning and Confidence

Mistakes were productively framed as part of learning, strengthening self-generated feedback, confidence, and reflective judgment within the craft context.

Preferred Modalities

The learner emphasised rhythm, sound, and tactile feel as critical for concentration and self-monitoring, underscoring the value of multimodal, sensory-rich environments for wellbeing and identity formation.

Methodological Contribution

The hybrid multimodal toolkit (matrix, annotated stills, density circles), situated ethnographic resources, and interview-based member checking captured nuanced embodied learning and validated a transferable approach for practical skills and therapeutic education.

Implications for Practice

Craft-based, sensory-rich environments and multimodal strategies should be prioritised to foster EF and agency, linking pedagogical affordances to sensory–modal–spatial mechanisms illuminated and illustrated in Chapter 6.

The emerging themes: (1) the workshop as affordance-rich space, (2) intersubjective scaffolding in tutor–student interaction, and (3) sensory–material feedback loops enabling embodied learning, collectively reveal how environmental, interpersonal, and material dimensions orchestrate EF and agency. These insights form the conceptual foundation for Chapter 7’s broader implications for curriculum design, inclusive practice, and methodological innovation, and prepare the ground for the EF-agency model in 7.3 (Discussion and Implications).

Chapter 7 Discussion and Implications: Advancing Embodied, Multimodal Pedagogies for Agency

7.0 Introduction to Chapter 7

This chapter synthesises the findings presented in Chapter 6 and situates them within the broader theoretical, methodological, and practical contexts outlined earlier in the thesis. It interprets how the sensory–modal–spatial orchestrations observed in craft pedagogy illuminate pathways for fostering executive functioning and agency, addressing the refined research question: How does craft shape agentic becoming? Building on the emerging themes identified in Section 6.5, the discussion explores their pedagogical significance, evaluates the methodological contribution of EMBER-S³, and articulates implications for practice, policy, and future research. In doing so, it argues for a paradigm shift toward embodied, multimodal approaches that challenge reductive, outcome-driven models and foreground inclusive, agency-centred education. The chapter concludes by outlining recommendations for applying these insights across diverse educational and therapeutic settings.

Chapter 7 opens by establishing the pedagogical rationale for craft in Section 7.1, demonstrating why craft matters educationally through its rich, embodied, and multimodal environments that foster agency, autonomy, and purposeful action. Sections 7.1 and 7.2 are closely interconnected, forming a ‘why’ and ‘how’ relationship within the study: while 7.1 explains the educational significance of craft, 7.2 examines how sensory integration, spatial interaction, and multimodal engagements scaffold the development of executive functioning and agency. Section 7.3 advances this discussion by analysing the interdependence of these capacities, introducing the executive function–agency feedback loop and proposing a holistic conceptual model grounded in embodied craft practice. Sections 7.4–7.7 provide critical interpretation, connecting findings to theoretical frameworks, existing literature, and relevant fields of application and this study’s contributions towards these, while Section 7.8 reflects on methodological strengths, limitations, and researcher positionality. Section 7.9 foregrounds the study’s methodological contribution, presenting innovations such as the Hybrid Multimodal Framework (EMBER-S³)

and situating them within broader research debates. Finally, Section 7.10 translates these insights into actionable recommendations for policymakers, educational leaders, and practitioners across both SEND and general education, advocating for inclusive, embodied, and craft-based pedagogies.

7.1 Illuminating the Pedagogical Potential of Craft

This section establishes the rationale for the study by foregrounding how craft pedagogy offers rich, embodied, and multimodal environments that foster agency, autonomy, and self-directed purpose and discussing what the findings suggest about the pedagogical potential of craft. In relation to the refined aims, objectives, and research questions outlined in Section 1.2, this section addresses Objective 3:

Interpret and synthesise findings to identify and articulate the pedagogical affordances of craft for fostering executive functions and agency and the broader implications for theory and practice.

Craft is framed as a liminal space (Nasseri & Wilson, 2017) where the transformation of material mirrors the transformation of self, drawing on theories of embodiment (Merleau-Ponty, 1945/2012), affordances (Gibson, 1979; Gibson & Pick, 2023), and holistic education (Biesta, 2015; Steiner, 1921/1991). These perspectives collectively illuminate why craft matters educationally: it provides situated, sensory-rich contexts that invite learners into active dialogue with the world, enabling meaning-making through bodily engagement rather than abstract cognition. Building on this rationale, the findings synthesised in this study articulate how craft-based pedagogy fosters agency, executive functioning, and holistic development within Practical Skills Therapeutic Education (PSTE). Through the bespoke hybrid multimodal framework developed for this research (drawing on phenomenology, multimodal interaction analysis, and ethnographic resources), the analysis foregrounds the orchestration of sensory-modal-spatial interactions between self, world, and others, which collectively shape the pedagogical affordances of craft (Gibson, 1979; Nimkulrat & Groth, 2024). These orchestrations reveal how embodied engagements with materiality and

environment can cultivate capacities such as planning, self-regulation, and intentionality (Bandura, 2001, 2006; Diamond, 2013), thereby promoting agency and self-generated conscious action (Gordon & Cox, 2023).

While the findings are situated within PSTE, their implications extend to wider fields of embodied learning and body-based practices, offering insights into how multimodal pedagogical strategies can increase the pedagogic potential of diverse learning environments and inform the development of future educational practice and practitioner intuition (Jewitt et al., 2025; Groth, Gulliksen & Schilhab, 2024).

7.1.1 Craft as a Multimodal, Embodied Pedagogy

Craft activities, exemplified through Green Woodworking, provide rich multimodal affordances that engage the learner's body, senses, and environment in dynamic dialogue. These affordances include tactile and haptic engagement (touch), proprioceptive and vestibular feedback (movement and balance), and visual and auditory cues, which together enable iterative cycles of action, reflection, and adaptation. Such processes resonate with embodiment theory (Merleau-Ponty, 1945/2012; Thompson & Varela, 2001) and affordance theory (Gibson, 1979; Gibson & Pick, 2023), positioning craft as a fertile site for situated learning and meaning-making. Craftwork thus becomes a liminal space where transformation of material and transformation of self, coalesce (Nasseri & Wilson, 2017).

7.1.2 Executive Function and Agency Formation

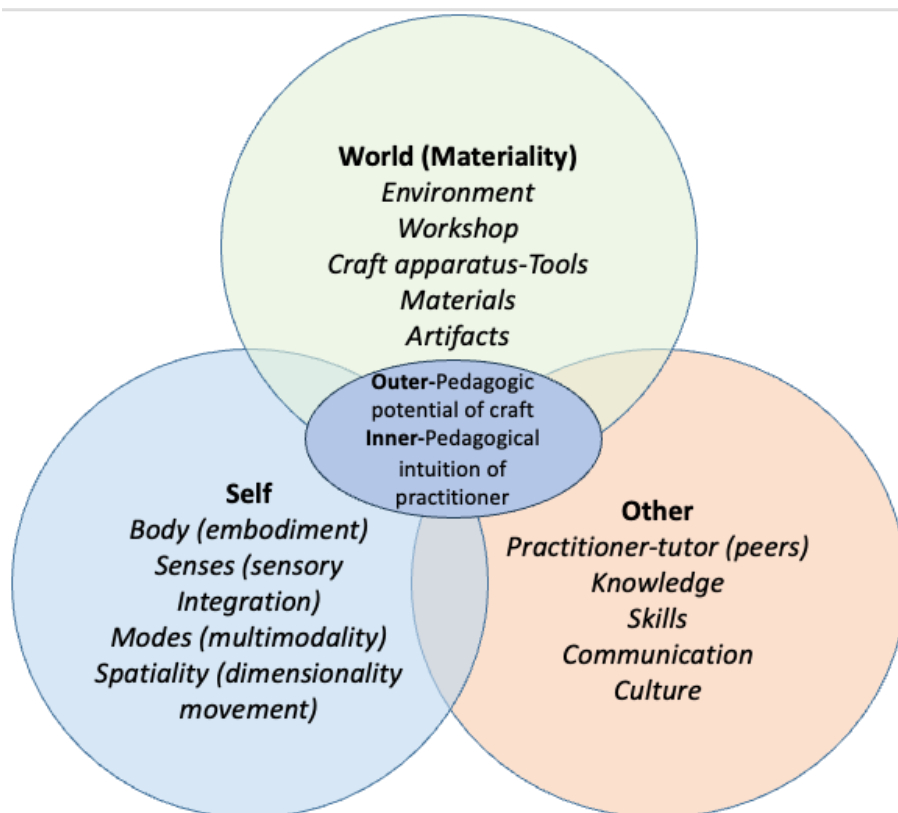
The findings indicate that craft-based learning cultivates executive functions: initiation, working memory, self-monitoring, and inhibition, identified as essential for autonomy and agency (Diamond, 2013). These capacities emerged through the learner's engagement with material resistance, tool feedback, and the rhythmic sequencing of craft processes, which demanded planning, sustained attention, and adaptive problem-solving. Such embodied engagements align with the 'bottom-up' approach advocated in sensory integration theory (Ayres, 1979, 2005), where foundational bodily senses scaffold cognitive and social capacities.

7.1.3 The Pedagogical Liminal Space between Self–World–Others

The Venn diagram below (figure 41) developed in this study visualises the three interdependent domains that underpin the pedagogical potential of craft. However, it is important to recognise that these elements are inherently interconnected and synergise in practice.

- Self: The learner’s embodied sensory-modal-spatial experiences, and agentic direction and regulation of these.
- World: Materiality, environment, and tools that afford sensory feedback and invite action.
- Others: Social and pedagogical interactions, including tutor scaffolding and dialogue.

Figure 41 Venn diagram depicting elements of pedagogical craft practice involved in developing pedagogical intuition and pedagogical potential



The intersections of these domains represent synergistic spaces where multimodal orchestration occurs. For example:

- Self and World: Sensory-motor coupling through tool use and material engagement, fostering bodily and ecological self-awareness.
- Self and Others: Intersubjective scaffolding and co-regulation, enabling confidence and agency, fostering social self-awareness.
- World and Others: Pedagogical structuring of space and material affordances to optimise learning conditions.

At the centre of the diagram lies the pedagogical liminal space, a dynamic zone where sensory-modal-spatial interactions converge, enabling the learner to enact increasingly complex actions and capacities. Therefore, the greater a tutor's knowledge and experience in these domains, the more effectively they can scaffold, synergise and apply this to enhance the pedagogical potential. This can be applied beyond agency and executive functioning to support learners in achieving educational, therapeutic or personal goals. This conceptualisation aligns with embodiment theory and multimodal interaction analysis, highlighting how agency emerges through these layered interactions rather than isolated skills.

7.1.4 Transformation of Material and Transformation of Self

Craft practice can be understood as a dialogic process in which the transformation of material is inseparable from the transformation of self. The study's findings foreground how the material properties of wood, its resistances, textures, and affordances, invite discernment and adaptive responses from the learner. These affordances, as Gibson (1979) and Norman (2013) argue, are not static but relational, emerging through embodied engagement with tools and environment. Hadjimichael et al. (2024) extend this notion through 'solicitation' describing how actionable opportunities arise as the learner acquires the capacity to exploit them.

Within this liminal space between person and world (Nasseri & Wilson, 2017), sensory modalities, haptics, vision, audition, proprioception, and interoception, mediate the dialogue. Merleau-Ponty (1945/2012) phenomenology of perception and Fuchs' (2017) ecology of the brain illuminate how these embodied interactions scaffold meaning-making and agency. Through rhythmic, spatially complex movements (König, 1989, 2003; Rowsell, 2013) and multimodal orchestration (Kress, 2010; Jewitt, 2017a), learners enact chains of lower- and higher-level actions (Norris, 2004) that cultivate executive functions such as working memory, initiation, and self-monitoring (Diamond, 2013). These capacities underpin agency (Bandura, 2001, 2006) and self-determination (Deci & Ryan, 1985), enabling learners to move from reactive engagement toward intentional, goal-directed action.

Thus, the transformation of material becomes a mirror and mediator for the transformation of self, affording opportunities for reflexivity (Gao, 2013), identity formation, and autonomy. As Biesta (2021) suggests, such 'world-centred education' situates learning within authentic encounters, where the craft process offers a pedagogical invitation to 'make-with' the world (Haraway, 2016), fostering both ecological and personal becoming.

7.1.5 Pedagogical Intuition

A key insight emerging from this study is the significance of pedagogical intuition, the tutor's capacity to perceive, interpret, and respond to the learner's multimodal signals and the affordances of the craft environment. Pedagogical intuition involves:

- Attunement to sensory-modal preferences: for example, recognising how learners engage through touch, movement, rhythm, and visual cues.
- Dynamic orchestration of affordances: for example, adjusting material, spatial, and social conditions to optimise engagement and agency.
- Balancing structure and freedom: for example, knowing when to scaffold and when to step back, allowing learners to self-direct and experience autonomy and enact agency.

This intuitive responsiveness is not accidental but grounded in professional experience, reflexivity, and an understanding of multimodal learning processes. It enables tutors to transform educational affordances into pedagogical affordances, thereby maximising the potential for agency and executive function development. This sensory–modal–spatial scaffolding relies on the tutor’s deep understanding of the learner’s individuality, including their aspirations, needs, sensory profile, and EHCP objectives (Ayres, 1979, 2005; Taylor & Trott, 1991). Drawing on Vygotsky’s (1930–1934/1978, p. 86) sociocultural theory and the concept of the Zone of Proximal Development (ZPD), the tutor, as the more knowledgeable other, must intentionally align environmental, material, and social affordances with the learner’s developmental potential (Gibson, 1979; Gibson & Pick, 2023). This involves curating conditions across physical (dexterity and skill), social (proxemic comfort), emotional (mood and triggers), and intellectual (language and sequencing) dimensions (Merleau-Ponty, 1945/2012; Fuchs, 2011). Through these proximal encounters, the learner is enabled to imitate, engage, and reflect, fostering the emergence of agency and executive functions such as initiation, self-monitoring, and working memory (Bandura, 2001, 2006; Diamond, 2013). Ultimately, this multimodal orchestration of affordances and sensory feedback loops empowers the learner to self-direct and mobilize their own capacities and potential (Jewitt et al., 2025; Norris, 2004; Gordon & Cox, 2023). As the findings suggest, tutors who cultivate pedagogical intuition can create conditions for self-generated conscious action (Gordon & Cox, 2023), aligning with holistic educational aims emphasising subjectification and freedom (Biesta, 2015, 2021).

7.1.6 Implications for Practice

The findings advocate for craft-based, sensory-rich environments as inclusive pedagogical spaces that foster agency and executive functioning, particularly for learners with SEND. Practitioners should seek to develop pedagogical intuition by recognising and leveraging sensory-modal affordances, curating environments that support self-regulation, and scaffolding multimodal interactions to meet individual aspirations and EHCP outcomes. This approach moves beyond narrow, outcome-driven paradigms towards holistic education that enables learners to feel ‘at home in the world’ (Biesta, 2021).

7.1.7 Future Directions

Further research should extend this hybrid multimodal framework to diverse crafts and cultural contexts, exploring how variations in materiality and spatiality influence pedagogical affordances. Comparative studies could refine the theoretical model and inform inclusive curriculum design, contributing to broader debates on the purpose of education and the role of embodied, practical learning in fostering agency and human flourishing. Further directions for future research and implications are discussed in more detail in section 7.9 regarding the hybrid framework and more generally in section 7.10.

7.2 Sensory-Modal-Spatial Scaffolding Towards Executive Function and Agency Formation

The pedagogical potential of craft outlined in the preceding section 7.1 finds its practical realisation in the sensory-modal-spatial scaffolding explored in this section 7.2. Section 7.1 established how craft as an embodied, multimodal educational context provides pedagogical opportunities for agency and executive function development through embodied engagement and material interaction. This section 7.2 demonstrates how these affordances may operate through layered sensory, spatial and modal interactions. This transition from theory to practice is crucial: the rich, person-centred environments described earlier provide the conditions for the dynamic orchestration of senses, movement, and spatiality considered here.

Together, these sections reveal a synergistic relationship, craft pedagogy creates the liminal space for transformation, and sensory-modal-spatial scaffolding enables progression from foundational bodily engagements to executive capacities and agentic action. Building on Gibson's (1979) concept of affordances and Kress's (2010) multimodal theory, and synthesising these with embodiment theory (Merleau-Ponty, 1945/2012; Thompson & Varela, 2001) and sensory integration principles (Ayres, 1979, 2005), this section moves beyond identifying affordances to explore how they function as layered, embodied processes that cultivate volition, and self-generated action within craft-based learning, supported by a diagrammatic summary (figure 42 below) to visualise the progression. To

deepen this interpretation, subsection 7.2.2 introduces insights from movement science and spatial theory (NASM, 2021; ISSA, 2023; Steiner, 1921/1991; Rohen, 2007), extending the discussion of sensory-modal-spatial scaffolding by examining how multi-planar movement functions as a cognitive and developmental resource within craft pedagogy.

7.2.1 Integration of Sensory Modalities

Several sensory modalities; haptics (touch), proprioception (movement), vestibular (balance), interoception (life sense), vision, hearing, and conceptualisation were observed to exhibit high modal intensity during key phases of the activity. These modalities underpinned lower-level actions such as judging weight, pressure, rhythm, and adjusting eye gaze between focal and peripheral elements. In turn, these actions supported higher-level processes including focused attention, discernment, temporal awareness, and imaginative conceptualisation of design.

Link to Executive Functions

The orchestration of these sensory and spatial elements appeared to enable the cultivation and enactment of core executive functions:

- Working memory during the acquisition of new skills
- Initiation in commencing and sustaining actions
- Self-monitoring and inhibition during practice and refinement
- Self-regulation of thoughts, emotions, and behaviours throughout the task

These findings align with Diamond's (2013) framework of executive functioning and Norris's (2004) concept of lower and higher-level actions, suggesting that multimodal engagement in craft provides fertile ground for developing these capacities.

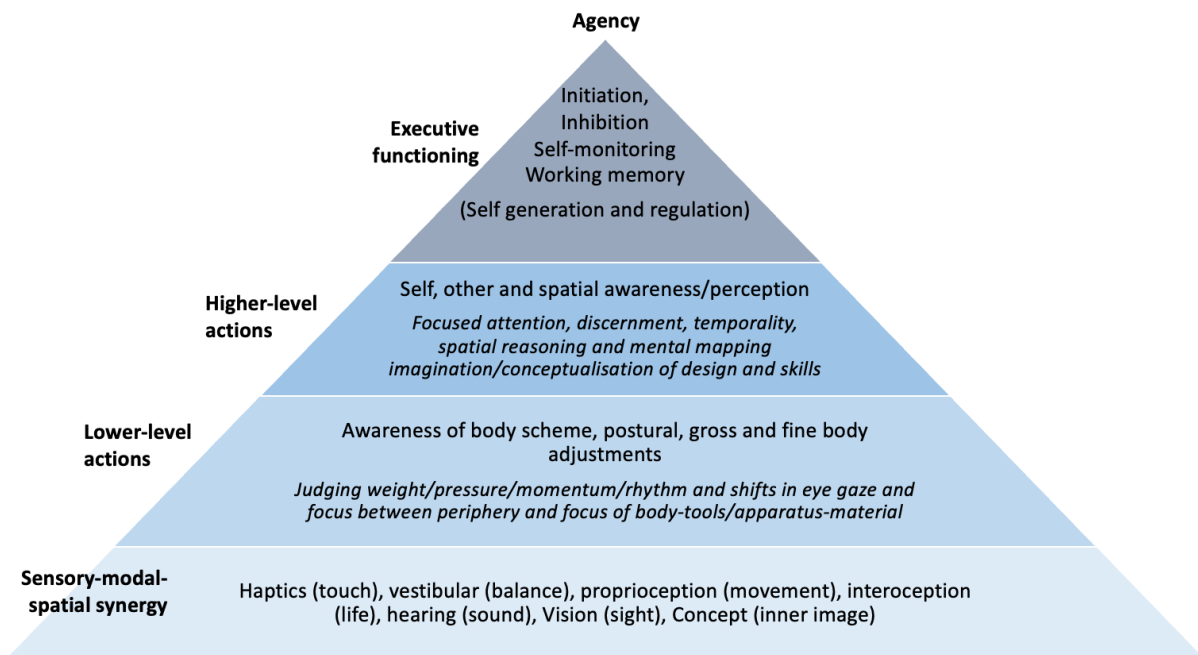
Progression Towards Agency

The observed progression can be conceptualised as a scaffold: initial bodily engagements (e.g., tactile and proprioceptive feedback) coalesced with spatial and conceptual modalities to form increasingly complex actions and capacities. This synergy appears to foster a heightened sense of bodily self-awareness, ecological awareness of the material environment, and social awareness (Thompson & Varela, 2001) through tutor-student-material and direct student-material interactions. Collectively, these processes afford the learner greater volition and agency in shaping and directing their actions, self-regulation and the self-generation of new ideas, thereby expanding possibilities for interaction, and becoming with and into the world.

Visual Model Illustrating Agentic Cultivation via Craft

Figure 42 below (pyramid of agency cultivation via craft) illustrates this progression, drawing on Taylor and Trott's (1991) Pyramid of Learning and integrating contemporary embodiment and multimodal theory. The model depicts how sensory-modal-spatial elements converge to support executive functions and, ultimately, agency. It is important to note that these aspects are not static nor intended to suggest greater importance than another. They are instead interconnected and interrelated with the materiality and context in which they are cultivated, forged, and enacted within the ongoing interplay between ourselves and the world. This model is presented in a hierarchical format because such structures, like Taylor and Trott's Pyramid of Learning and widely recognised frameworks such as Maslow's hierarchy of needs, are familiar to most readers, providing an accessible entry point for understanding the progression, even though the study conceptualises these dimensions as deeply entangled rather than strictly layered (Maslow, 1943; Taylor & Trott, 1991). While this model provides a useful conceptual scaffold, I would have liked to create a more entangled diagram that better reflects the study's standpoint on these dimensions as deeply interwoven; however, this was beyond the scope of the current thesis and remains an intention for future work.

Figure 42 Pyramid of agency cultivation via craft



Implications

These findings suggest that craft-based pedagogy offers more than skill acquisition; it provides a multimodal, embodied pathway for developing capacities essential for autonomy, agency and self-directed learning. The interplay of sensory modalities and spatial engagement may therefore be considered a critical pedagogical affordance in fostering agency.

While Section 7.2 has illustrated how sensory–modal–spatial interactions scaffold executive functioning and agency, these dynamics can be further illuminated by considering the role of spatiality and movement science. The following subsection (7.2.1) extends this interpretation by integrating insights from NASM (2021) and ISSA (2023) alongside theoretical perspectives discussed in section 3.3 (Steiner, 1921/1991; Rohen, 2007) and situated findings in section 6.3. This synthesis reinforces the argument that multi-planar movement is not merely physical but a cognitive and developmental resource, amplifying the pedagogical potential of craft-based education for fostering agency and executive functions.

7.2.2 Integrating Movement Science into Craft Pedagogy: Spatiality, Embodiment, and Multimodal Learning

Building on the preceding discussion, the pedagogical interpretation of spatiality can be deepened by integrating insights from movement-science frameworks developed by the National Academy of Sports Medicine (NASM) and the International Sports Sciences Association (ISSA). Both emphasise coordinated engagement across three anatomical planes, sagittal (forward/backward), frontal (side-to-side), and transverse/horizontal (rotational), to enhance neuromuscular coordination, balance, and adaptability in authentic tasks (NASM, 2021; ISSA, 2023). This principle aligns with this study's emphasis on multi-planar movement as foundational to executive-function development and agency (see section 3.3 Movement, Spatiality and Dimensionality).

This interpretation resonates with earlier pedagogical traditions. Steiner (1921/1991) and Rohen (2007) emphasise that movement through sagittal, frontal, and horizontal planes underpins cognitive, emotional, and volitional domains: depth relates to thinking (head), horizontal bilateral activity to rhythmic feeling (heart), and vertical movement to willing (limbs and metabolism) (Steiner, 1921/1991; Rohen, 2007). These perspectives frame spatial engagement as not merely physical but as deeply implicated in human development and agency (see section 3.3 and table 2).

From an embodiment perspective, bodily engagement with space is central to meaning-making and agentic action (Merleau-Ponty, 1945/2012; Fuchs, 2017). Spatiality is framed here as lived, embodied experience; workshop layouts and tool arrangements actively shape possibilities for intentional action and intersubjective coordination, affording or constraining movement, perception, and interaction (Gibson, 1979; Gibson & Pick, 2023).

Pole-lathe practice exemplifies these principles in situ (see section 6.3 Student–Material Engagements). Learners integrate sagittal adjustments for depth control and stance, frontal bilateral hand coordination for ergonomic manipulation, and transverse rotations to manage rhythmic turning; together these actions activate proprioceptive and vestibular

systems and scaffold EF capacities, planning, inhibition, self-monitoring (Diamond, 2013), under real-time material feedback from resistance, vibration, and sound (Ingold, 2000; Mäkelä, 2007).

In multimodal terms, spatial movement co-orchestrates with gesture, gaze, haptics, speech, and material cues to form configurations of high modal density and complexity, an orientation operationalised here via Multimodal Interaction Analysis and social-semiotic principles (Norris, 2004; Kress, 2010) (see section 5.3 Operationalising EMBER-S³). This methodological stance makes the embodied dynamics analytically visible through staged artefacts (matrix, annotated stills, density circles) and keeps EF indicators tied to sensory–spatial sequences in the craft task.

Synthesising movement science (NASM/ISSA) with embodiment, affordances, and multimodality strengthens the case that spatial engagement in craft is not merely physical but deeply cognitive and developmental: multi-planar activity fosters embodied learning, activates affordances, and orchestrates multimodal resources that scaffold EF and agentic becoming (Merleau-Ponty, 1945/2012; Fuchs, 2017; Gibson, 1979; Steiner, 1921/1991; Rohen, 2007; Kress, 2010; Norris, 2004). This argument extends section 7.2's mechanisms toward the holistic model introduced in section 7.3 and supports curriculum/environment design that intentionally invites sagittal–frontal–horizontal coordination in craft tasks (e.g., pole-lathe sequences) to develop EF capacities and agency under authentic conditions (NASM, 2021; ISSA, 2023).

7.2.3 Summary and Conclusion

Taken together, the preceding section (7.1) established the pedagogical context and theoretical justification for craft as a transformative educational practice, while 7.2 has demonstrated how this potential is realised through multimodal scaffolding and spatial engagement, substantiated by fine-grained analysis and movement-science insights. Together, these sections argue that agency and executive function emerge through embodied, multimodal, and context-sensitive craft experiences, not as isolated traits but as dynamically scaffolded processes. This synergy, reinforced by the EMBER-S³ framework,

links pedagogical affordances (7.1) to sensory-modal-spatial mechanisms (7.2), creating a unified model for inclusive, agency-focused education. The following section (7.3) builds on this synthesis to provide a focused discussion on agency and executive functioning and their implications for educational design.

7.3 Agency, Executive Functioning, and Self-Generated Conscious Action

Building on Section 7.2's focus on sensory-modal-spatial scaffolding, this section examines the core capacities these affordances enable: agency and executive functioning. It argues that these constructs are dynamically interdependent, emerging through embodied, multimodal engagements within craft-based practice. By situating this relationship in real-world learning contexts, the discussion bridges theory and practice, introducing the Executive Function–Agency Feedback Loop, a holistic model of agency formation, and Gordon's concept of Self-Generated Conscious Action (Gordon & Cox, 2023). These insights collectively provide a foundation for reimagining educational design and strategies by positioning craft as a fertile pedagogical space for fostering autonomy and agentic development.

7.3.1 Connecting Theory and Practice

The findings extend existing research on executive functioning and agency by demonstrating their interdependence within real-world craft learning contexts. Previous studies emphasise the role of executive functions in enabling purposeful action, self-regulation, and autonomy (Diamond, 2013; Blair & Razza, 2007). This study corroborates and deepens these insights by showing how agency, the capacity to act intentionally and exercise control over one's life (Bandura, 2001, 2006), emerges through multimodal craft interactions. These interactions progressively scaffold lower-level actions into higher-level capacities such as planning, inhibitory control, and decision-making, forming the foundation for autonomy and goal-directed behaviour.

7.3.2 The Executive Function–Agency Feedback Loop

A key contribution is the identification of a dynamic feedback loop: exercising agency strengthens executive functions, while enhanced executive control enables more effective agency (Diamond & Lee, 2011). This reciprocal relationship was observed in the case study through embodied, multimodal engagements, where body, senses, and materiality coalesced to support increasingly complex actions and capacities. This finding foregrounds the pedagogical significance of sensory-modal-spatial orchestrations in shaping agency (Ayres, 1979, 2005; Norris, 2004).

7.3.3 Towards a Holistic Model of Agency Formation

Building on Ayres' sensory integration theory and Taylor & Trott's learning models (Williams & Shellenberger, 1996), the study proposes an interdisciplinary conceptual model that integrates sensory integration, embodiment (Merleau-Ponty, 1945/2012; Thompson & Varela, 2001), multimodality (Norris, 2004; Kress, 2010), and executive function theory (Diamond, 2013). This model offers a more holistic picture of how sensory and spatial engagements converge to scaffold agency development. It situates craft as a fertile pedagogical context for cultivating these capacities through lived, embodied experiences in the liminal space between material transformation and self-transformation (Nasseri & Wilson, 2017).

7.3.4 Self-Generated Conscious Action

The findings also resonate with Gordon's concept of Self-Generated Conscious Action (Gordon & Cox, 2023), highlighting how agency-related capacities: self-monitoring, reflection, regulation, and determinism, enable individuals to act with purpose and responsibility. By illuminating the sensory-modal mechanisms underpinning these capacities, the study provides insights that can empower learners to advocate for their own educational and therapeutic journeys and inform practitioners seeking to design environments that foster autonomy and agency.

These findings advocate for a paradigm shift in education towards approaches grounded in the indissoluble relationships between body, environment, and social conditions, expanding the pedagogical gaze beyond abstract knowledge to embodied, agentic becoming.

By foregrounding the interdependence of agency and executive functioning within embodied, multimodal craft practice, Section 7.3 has established a robust conceptual and practical foundation for reimagining educational design. Building on these insights, the following sections explore the broader implications of the study, considering how its findings can inform pedagogical strategies, curriculum development, and future research aimed at fostering autonomy and agency across diverse learning contexts.

7.4 Relationship and Contributions to Existing Research, Theory and Knowledge

This section synthesises how the study's findings align with, extend, and contribute to existing research and theory on craft-based pedagogy, sensory integration, embodied learning, and related fields. It begins by defining the three key contributions to knowledge. The implications of these contributions are outlined in Section 7.10 in relation to policy and further expanded in Section 8.3 in relation to learners, practitioners, provision leaders, wider policy contexts, and researchers.

7.4.1 Key Contributions

This research makes three key contributions to knowledge, which collectively advance understanding of embodied, multimodal craft pedagogy and its role in shaping agency.

Case-Based Contribution

It provides a situated, fine-grained interpretation of how multimodal craft interactions cultivate and enact agency and executive functioning. By attending to the sensory-modal-spatial dynamics of a real craft learning encounter, the study offers context-dependent, phenomenologically informed insight into how embodied practices support learner development in situ (Doak, 2018; Norris, 2004).

Theoretical Contribution

It develops a conceptual model that integrates sensory integration theory, embodiment, multimodality, and executive function theory (Ayres, 1979; Merleau-Ponty, 1945/2012; Taylor & Trott, 1991; Thompson & Varela, 2001; Diamond, 2013). This model illuminates how sensory–modal–spatial synergies operate as dynamic mechanisms in the emergence of agency, providing a theoretically grounded explanation for the developmental significance of embodied craft practice.

Practical Pedagogical Contribution

It offers actionable pedagogical insights for designing sensory-rich, craft-based learning environments that enhance agency, autonomy, and self-directed development. The study demonstrates how educators can intentionally shape material, spatial, and relational affordances to scaffold executive functioning and agency (Gibson & Pick, 2023; Nimkulrat & Groth, 2024).

Building on these contributions, the research advances the field by developing and applying a hybrid multimodal framework for analysing embodied craft pedagogy, offering researchers and practitioners a versatile tool for examining sensory–modal–spatial interactions within practice-based learning environments (Jewitt et al., 2025; Norris, 2004). Through this framework, the study reveals how sensory–modal–spatial synergies underpin the formation of agency, demonstrating how movement, material engagement, and relational scaffolding coalesce into developmental processes that support learners' capacity to act with increasing autonomy. Furthermore, it provides a situated account of how craft environments can function as liminal spaces that support reflexive identity negotiation and the development of executive functions, foregrounding craft practice as a powerful context for embodied becoming.

7.4.2 From Senses to Skills: Linking Motor and Cognitive Development

The study demonstrates that craft-based learning fosters intellectual development, particularly executive functioning, supporting Veeber et al.'s (2015) and Diamond's (2013) frameworks. Findings link sensory-motor skill acquisition to cognitive growth, resonating

with neurological research on hand–brain connections (Makin et al., 2012; Warren et al., 2007; Rosenkranz et al., 2007, 2009) and motor–cognitive benefits (Shi & Feng, 2022). Emotional benefits of rhythmic, immersive movements (Pöllänen, 2015) further underscore the holistic impact of craft practices.

7.4.3 Sensory Integration and Embodied Learning

Results confirm and extend Sensory Integration theory (Ayres, 1979; Dunn, 2007; Bundy & Lane, 2020), illustrating how multidimensional craft environments provide rich sensory input that supports perceptual learning and integration. These processes enable nuanced material interactions and promote self-regulation and agency. Findings align with embodied and enactivist perspectives (Fuchs, 2011; Thompson & Varela, 2001) and echo Steiner’s (1916/1990) conception of scaffolding sensory development from foundational bodily senses toward higher cognitive capacities.

7.4.4 Craft and the Formation of Self

Craft pedagogy orchestrates bodily, ecological, and social dimensions of learning. Tactile engagement with tools and materials fosters an ecological sense of self (Gibson, 1979), while dialogic scaffolding supports a social sense of self (Marchand, 2011; Norris, 2004). Spatial awareness and motor coordination develop a bodily sense of self (Merleau-Ponty, 1945/2012). These findings complement Biesta’s (2021) world-centred education and extend Groth & Gulliksen’s (2024) work by providing multimodal evidence of synergistic agency development.

7.4.5 Liminal Spaces and Reflexive Transformation

The study offers situated examples of liminal spaces (Nasseri & Wilson, 2017), illustrating how craft practice creates conditions for reflexive dialogue between self and material. These dynamic interactions enable learners to recalibrate sensory and cognitive modalities, negotiate identity, and engage in transformative meaning-making. This contribution deepens theoretical understandings of embodied knowledge-making (Marchand, 2011;

Thompson & Varela, 2001) and highlights the pedagogical significance of uncertainty and iterative adjustment in fostering agency.

7.4.6 Summary

In summary, the study bridges sensory integration theory, embodied cognition, and craft pedagogy, offering a multimodal lens to understand how craft-based education cultivates agency and executive functioning. It extends prior research by foregrounding movement, spatiality, and dimensionality (Steiner, 1921/1991; Rohen, 2007; König, 1989, 2023), revealing how craft provides open-ended, sequential activities requiring agility, coordination, and interpersonal interaction (Shi & Feng, 2022). These findings confirm ‘bottom-up’ embodied approaches, where cycles of sensory feedback between body, ecology, and social context engender self-awareness, control, and agency (Fuchs, 2011; Thompson & Varela, 2001).

These contributions not only advance theoretical and methodological understanding of embodied, multimodal craft pedagogy but also provide the conceptual foundation for examining its broader educational, therapeutic, and societal benefits, which the following section (7.5) explores in detail.

7.5 The Wider Benefits of Crafts

The previous section (7.4) outlined this study’s contribution to theory by showing how embodied, multimodal craft practices foster agency and executive functioning. These insights underpin the discussion here, as the same sensory–modal–spatial processes that enable agency also support broader cognitive, emotional, and social benefits, linking micro-level pedagogical mechanisms to wider educational and therapeutic outcomes.

Building on the earlier discussions of how multimodal craft pedagogy fosters agency and executive functioning through embodied, sensory–modal–spatial engagements (Diamond, 2013; Thompson & Varela, 2001; Gibson, 1979), this section situates those findings within the broader research landscape on the health, well-being, and cognitive benefits of creative

practices (Fancourt & Finn, 2019; Birau, 2024). It moves from micro-level mechanisms observed in this study to wider implications for educational and therapeutic contexts, highlighting how craft-based approaches can support stress reduction, emotional regulation, and self-management (Corkhill et al., 2014; Elliot, 2016; Kaimal et al., 2017), while introducing novel multimodal insights into the cultivation of agency and executive capacities.

Large-scale reviews (Fancourt & Finn, 2019) and scoping studies (Birau, 2024) consistently show that arts engagement promotes emotional regulation, resilience, and cognitive development, yet these accounts rarely isolate craft or explain the mechanisms behind such benefits. Previous research links craft participation to improved emotional control and reduced anxiety (Corkhill et al., 2014; Kaimal et al., 2017; Pöllänen, 2015), but findings are often generalised or single-perspective. This study addresses that gap by providing a fine-grained, multimodal account of how sensory–modal–spatial orchestration, integrating touch, proprioception, movement, and visual feedback supports executive functions such as inhibition, working memory, and planning (Diamond, 2013). By triangulating student, practitioner, and practitioner-researcher perspectives, it deepens understanding of the processes involved.

More specifically, in relation to executive functioning and self-regulation, Andersen et al. (2019) examined arts-based practices but did not treat craft as a distinct domain. This research builds on that work by focusing exclusively on craft and applying a sensory–modal–spatial lens to illuminate the orchestration of interactions that foster self-monitoring, self-regulation, and broader executive capacities. In doing so, it makes a novel contribution to both theoretical understanding and practical application of craft’s pedagogical potential. Future research should explore these mechanisms across diverse craft practices and learner populations and examine their longitudinal impact on agency and well-being.

While these findings highlight the broad cognitive and well-being benefits of craft, they also invite a deeper consideration of education’s fundamental purpose, shifting the focus from isolated skills to person–world centred approaches that nurture agency, meaning, and belonging.

7.6 Educational Purpose: Person–World Centred Education

Beyond their cognitive and therapeutic benefits, these findings invite a deeper reflection on the fundamental purpose of education. Rather than reducing craft to a vehicle for skill acquisition or functional outcomes, this study foregrounds its potential to nurture relationships between person and world, enabling individuals to feel “at home” in themselves and in the world (Biesta, 2021). This perspective aligns with Biesta’s concept of subjectification, which prioritises education as a process of becoming a free and responsible subject rather than limiting it to qualification or socialisation (Biesta, 2015, 2021). Similarly, Humboldt’s notion of *Bildung* emphasises holistic self-formation through active engagement with the world, advocating for freedom, individuality, and harmonious development of intellectual, spiritual, and physical capacities (Horlacher, 2016; Sorkin, 1983). Steiner extends these principles by highlighting the formative role of embodied, practical activity, arguing that thinking is rooted in movement and that craft-based education cultivates moral and volitional capacities alongside cognitive ones (Steiner, 1923/2014; Steiner, 1919/2004).

The multimodal analysis illustrates how these philosophical ideals manifest in practice: embodied engagements with materiality and environment foster agency, initiative, and responsibility, suggesting that craft pedagogy can serve as a powerful medium for person–world centred education. In this sense, craft-based pedagogy resonates with traditions that advocate education as a process of becoming, emphasising freedom, meaning-making, and ethical participation in shared life. These insights suggest that craft is not only instrumental but existential, offering conditions for learners to develop capacities that support both personal flourishing and collective well-being.

The case study demonstrates how craft-based interactions created conditions for the student to expand reflective capacities, agency, and executive functioning through embodied, sensory–modal–spatial engagements (Diamond, 2013; Thompson & Varela, 2001; Gibson, 1979). These findings strongly echo Biesta’s conception of education as a dialogue between self and world, where learning fosters subjectification, the emergence of

autonomous, responsible individuals, rather than mere qualification or socialisation (Biesta, 2021).

This process was vividly illustrated as the student navigated the “middle ground” of educational dialogue (Biesta, 2021), negotiating the resistance of both material (the wooden billet) and self. It culminated in the creation of a tangible artifact (a turned stool) and the development of internal capacities for self-regulation and self-initiative. Such outcomes exemplify what Arendt (1978) and Biesta (2021) describe as ‘being at home in the world,’ where education enables reconciliation between individual and environment through meaningful, embodied encounters. These observations align with long-standing educational philosophies advocating holistic development: physical, emotional, and cognitive, through active engagement with real-world contexts. Humboldt’s notion of *Bildung* emphasises self-cultivation and freedom (Horlacher, 2016), while Steiner (1923/2014) and Ruskin (1867) foregrounded the formative role of craft in nurturing moral, aesthetic, and practical capacities. Similarly, Gordon and Cox’s (2023) concept of Self-Generated Conscious Action underscores the importance of environments that afford initiative and responsibility, qualities evident in the student’s progression.

In summary, the findings foreground craft as a fertile pedagogical site for person–world centred education, enabling learners to develop agency, autonomy, and ethical responsibility through embodied, multimodal engagement. They affirm the educational purpose of fostering human becoming, not merely for economic utility but for meaningful participation in and with the world (Biesta, 2021; Nussbaum, 2011). These insights advocate for curricula that prioritise situated, sensory-rich, and craft-based practices, particularly within SEND contexts, as a means to cultivate capacities essential for the becoming of people, world and their collective flourishing.

While these findings reaffirm the philosophical and pedagogical significance of craft in fostering agency and holistic development, they also raise critical questions about how such approaches intersect with contemporary discourses on neurodiversity, SEND, and educational policy. Understanding these connections is essential for situating craft-based pedagogy within inclusive frameworks and for addressing systemic challenges that shape

provision for learners with diverse needs. The next section explores these implications in depth, examining how the study's insights speak to current policy landscapes and the evolving priorities of equitable education.

7.7 Neurodiversity, SEND and Wider Policy Context

This study illuminates the pedagogical potential of craft while contributing to wider conversations on neurodiversity, Special Educational Needs and Disabilities (SEND), and the policy frameworks shaping inclusive education. Current SEND policy in England, anchored in the Children and Families Act (2014) and the SEND Code of Practice (DfE & DoH, 2015), prioritises measurable outcomes and employability, often reducing education to functional skills. Such a utilitarian focus contrasts sharply with this research, which foregrounds embodied, multimodal practices as essential for fostering agency, autonomy, and well-being, capacities that extend beyond narrow academic benchmarks.

By evidencing how craft-based pedagogy nurtures executive functioning, emotional regulation, and self-generated initiative, the study challenges deficit-oriented models and aligns with neurodiversity perspectives that emphasise individual strengths and sensory preferences (Armstrong, 2010; Singer, 2017). These findings call for educational environments that move beyond compliance-driven frameworks to embrace approaches honouring diverse ways of being and learning. In doing so, they respond to calls within critical disability studies to disrupt normative paradigms and create spaces for authentic participation and flourishing (Goodley, 2016; Pluqualec & O'Connor, 2023).

The case study reveals the value of multimodal engagement, and preferred modes of communication and learning, as pathways to agency and capacity-building. By enabling neurodivergent learners to identify and understand their own executive-function profiles, this research contributes to practices that support self-directed accommodations (Fletcher-Watson & Happé, 2019), flexible educational approaches (Woods et al., 2018), and self-advocacy (Woods & Waldock, 2021). These insights also inform strategies for requesting workplace accommodations (Wehmeyer et al., 2018) and validate the need for diverse

working styles in higher education and employment (Armstrong, 2018). The study's approach, grounded in 'inside-out accounts' (Daniel, 2023), foregrounds neurodivergent voices and exemplifies inclusive research design through collaboration between a neurodivergent student, a SEND specialist practitioner, and a neurodivergent researcher-practitioner.

While based on a single case and therefore not intended to produce generalisable claims, the study nevertheless provides analytically rich insight that can inform broader debates around inclusive pedagogy and neurodiversity-informed practice.

Policy and Practice Implications

The findings underscore the role of craft-based education in cultivating agency and executive functioning capacities identified in Section 2.7 as central to autonomy and purposeful action. These outcomes resonate with the educational purpose outlined in Section 2.6, which advocates for approaches enabling learners to become subjects in their own right, capable of self-directed learning and meaningful engagement with the world. Situated within embodied, sensory-rich environments, craft practices foster practical skills alongside cognitive and emotional development, complementing the theoretical perspectives on embodiment and sensory integration discussed in Chapter 3.

This approach challenges the dominance of abstract, text-heavy curricula and aligns with the multimodal and phenomenological principles underpinning the bespoke methodology presented in Chapter 4. Through real-world, material interactions, craft-based pedagogy cultivates agency, resilience, and self-regulation, qualities essential for lifelong learning and well-being. These findings reinforce the argument in Section 2.9 that sensory-modal-spatial engagements are not peripheral but fundamental to human development and meaning-making.

From a SEND policy perspective, the enhancement of capabilities and agency aligns with the aims of EHCPs (see Section 2.4). Craft-based learning demonstrates how individuals can

develop self-management and independence skills, echoing the intentions of the SEND Code of Practice (DfE & DoH, 2015). However, as emphasised throughout this thesis, while the study foregrounds SEND contexts, its focus on agency and executive functioning speaks to universal human capacities. Consequently, these findings offer insights relevant to all learners and educational settings.

7.8 Critical Evaluation, Reflexivity, and Limitations

Introduction

This section critically evaluates the study's methodological contribution, researcher reflexivity, and limitations. It synthesises insights from Chapters 4 and 5 to appraise the bespoke hybrid multimodal framework, its theoretical alignment, and its capacity to address the research aims outlined in Section 1.1. It also reflects on positionality and ethical considerations before outlining constraints and future directions.

7.8.1 Methodological Contribution and Innovation

The hybrid multimodal framework developed for this study represents a significant methodological advancement. Designed to operationalise principles of embodiment, sensory integration, and affordance theory within a multimodal analytic lens, it integrates phenomenology (Merleau-Ponty, 1945/2012; Husserl, 1936/1970), Multimodal Interaction Analysis (Norris, 2004), and social semiotic perspectives (Kress, 2010; Jewitt et al., 2025) with ethnographic resources (Taylor, 2014; Doak, 2018). This approach enabled fine-grained observation of sensory-modal-spatial orchestrations in craft-based pedagogy, foregrounding modal intensity and complexity through video-still transcription, modal density circles, and layered annotations.

The findings demonstrate that this framework successfully illuminated the pedagogical potential of craft by revealing how sensory engagements and spatial interactions scaffolded

actions and capacities. Rhythmic tool use and tactile engagement were shown to foster inhibitory control, planning, and self-regulation, capacities central to agency and emphasised in the SEND Code of Practice (DfE & DoH, 2015) and executive function research (Diamond, 2013; Bandura, 2001, 2006). These insights substantiate the argument put forward in Section 2.6 that education should move beyond narrow academic paradigms toward embodied, situated learning environments that promote subjectification and world-centred education (Biesta, 2021).

The methodological innovation lies in its ability to integrate movement, spatiality, and sensory analysis, a gap identified in Section 2.9, into a coherent framework that captures the complexity of embodied learning. This aligns with the theoretical synthesis of embodiment (Thompson & Varela, 2001; Fuchs, 2017), sensory integration (Ayres, 1979, 2005; Williams & Shellenberger, 1996), and affordances (Gibson, 1979; Gibson & Pick, 2023), and responds to calls for multimodal research in SEND contexts (Doak, 2018; Jewitt et al., 2025).

7.8.2 Reflexivity and Researcher Positionality

The researcher's insider status afforded unique access to participants and interpretive depth but necessitated rigorous management of power dynamics and assumptions (Alvesson, 2003; Bourdieu, 1983/1986; Humphrey, 2012). Ethical safeguards included the use of gatekeepers and neutral advocates, iterative consent rituals (Miller & Bell, 2002), and anonymisation protocols, complemented by analytic strategies such as member checking (Birt et al., 2016), critical-friend scrutiny (Costa & Kallick, 1993), and phenomenological observation training (Bortoft, 1996, 2012; Shotter, 2014).

Reflexive journaling and iterative debriefs were employed to 'make the familiar strange' (Erickson, 1986), maintaining analytic sharpness and mitigating insider bias (Wilkinson & Kitzinger, 2013). Strategies included oscillating between concept-free and theory-driven observation, collaborative analysis with supervisors and colleagues (Brinkmann & Kvale, 2015), and triangulation through multimodal tools such as video-still transcription matrices and modal density circles (Norris, 2004; Doak, 2018). These practices, detailed in Chapter 4

and Section 5.3, form part of the study's methodological contribution: a pragmatic template for observational reflexivity in body-based educational research, integrating phenomenology, multimodality, and ethnographic resources.

7.8.3 Limitations and Future Directions

While the study offers conceptual insights and methodological innovation, several limitations must be acknowledged. The single-case design, focused on one student within a Practical Skills Therapeutic Education (PSTE) context, enabled a rich, fine-grained analysis but constrains statistical generalisation. In line with the interpretivist stance outlined in Chapter 4, findings should be understood as conceptually transferable rather than universally applicable (Lincoln & Guba, 1985; Langdridge, 2007). Future research employing multi-case or longitudinal designs could strengthen robustness and applicability.

The scope was limited to Green Woodworking, shaped by practical constraints of time and data volume. While this craft provided a fertile site for exploring sensory integration and embodied learning, excluding other crafts (e.g., textile work, blacksmithing) limits comparative insights into how different material properties and cultural traditions afford distinct pedagogical opportunities (Gibson, 1979; Nimkulrat & Groth, 2024). Expanding the scope could illuminate how modal density and complexity differ across practices and influence agency formation.

Framework validation remains an ongoing need. Although the bespoke hybrid multimodal approach proved effective in this context, its reliance on qualitative, video-based data introduces interpretive subjectivity, despite mitigation through reflexive practice, member checking, and critical-friend review. Future studies could triangulate findings with quantitative indicators of executive functioning (Diamond, 2013; Zelazo, 2015).

Finally, insider positionality and ethical complexities inherent in SEND research require continued scrutiny. While iterative consent processes and safeguarding protocols were implemented, these remain challenging within vulnerable populations and must be

contextualised within broader systemic issues highlighted in Chapter 2 (Pluquailec & O'Connor, 2023).

7.8.4 Conclusion

Despite its limitations, this study demonstrates that the hybrid multimodal framework offers a robust and innovative approach for analysing embodied, sensory-rich learning. It provides a detailed, situated account of multimodal orchestration within craft pedagogy, yielding conceptual insights that practitioners and researchers may critically consider for transferability to their own contexts. By reframing education as a dialogue between self, world, and others, the study advances an educational vision grounded in embodied meaning-making and mutual flourishing. While it does not claim replication or statistical generalisability, its strength lies in the depth and nuance of the findings, enriched by the active participation of the student and practitioner. This remains a core strength of the framework and underscores its potential for future application.

Building on this critical appraisal, the next section foregrounds the methodological contribution, demonstrating how the approach not only navigates these constraints but also introduces innovations that enrich research practice.

7.9 Foregrounding the Methodological Contribution EMBER-S³

Introduction

In relation to the refined aims, objectives, and research questions outlined in Section 1.2, this section addresses objectives 1 and 2:

- 1.Design and validate a hybrid multimodal methodology (EMBER-S³) that integrates sensory, spatial, and situated dimensions for analysing craft-based pedagogy and its materiality.

- 2.Highlight how the hybrid multimodal methodology (EMBER-S³) can be adapted and applied in other contexts.

Building on the critical evaluation and reflexive considerations outlined above, this section articulates the methodological contribution of the study. While acknowledging the constraints and positionality that shaped the research process, this section emphasises how the chosen approach offers innovative value to the field. Specifically, it demonstrates how the design and analytical strategies not only address the challenges identified but also introduce innovative practices that extend existing frameworks and inform future research. By situating these contributions within broader methodological debates, the section underscores the originality and relevance of the study's approach.

7.9.1 A Hybrid Multimodal Methodology EMBER-S³

The methodological contribution of this study is embodied in the development of the Hybrid Multimodal Framework EMBER-S³. Emerging from the reflexive critique of conventional approaches and their limitations, EMBER-S³ integrates multiple research modalities within a unified analytical structure, enabling nuanced interpretation of complex phenomena. Its design responds to the need for methodological flexibility while maintaining rigor, positioning EMBER-S³ as a novel contribution that extends existing frameworks and informs future multimodal research.

The EMBER-S³ framework (Embodied Multimodal-Based Experiential Research: Sensory, Spatial, Situated) was developed to integrate diverse theoretical and methodological strands into a unified approach for analysing embodied learning within craft-based pedagogy. Addressing gaps in existing methodologies, EMBER-S³ provides a scalable and adaptable tool for examining how sensory, modal, and spatial engagements shape agency and executive functioning. Its flexible design allows application across varied contexts, outcomes, and practical or body-based learning environments, positioning it as a versatile framework for advancing research in embodied education.

It draws upon phenomenology to foreground lived and embodied meaning-making, emphasising that learning occurs through our entire being-in-the-world rather than isolated cognitive processes (Merleau-Ponty, 1945/2012; Thompson & Varela, 2001; Varela, Thompson & Rosch, 1991). This phenomenological lens underpins the framework's commitment to exploring pre-reflective, sensory, and spatial dimensions of learning.

To capture the complexity of these interactions, the framework employs Multimodal Interaction Analysis (MIA), which enables fine-grained observation of how learners orchestrate modes such as gesture, gaze, movement, and spatial positioning during craft activities (Norris, 2004; Jewitt et al., 2025; Bezemer & Kress, 2014, 2016; Doak, 2018). MIA's focus on modal density and complexity aligns with the study's aim to reveal how sensory-modal-spatial configurations contribute to higher-level actions and capacities.

The framework is further grounded in affordance theory. It illuminates how material properties and environments invite action and learning opportunities (Gibson, 1979; Gibson & Pick, 2023; Nimkulrat & Groth, 2024). By conceptualising craft environments as rich landscapes of affordances, EMBER-S³ foregrounds the pedagogical potential inherent in the dynamic interplay between learners, tools, and materials.

Sensory integration theory (Ayres, 1979; Schaaf & Davies, 2010) and research on embodiment (Fuchs, 2017; Gallagher, 2005) inform the framework's emphasis on sensory-modal-spatial orchestration as a foundation for agency and executive functioning. Spatiality and movement perspectives (Steiner, 1921/1991; Rohen, 2007; Merleau-Ponty, 1945/2012) provide insight into how dimensional engagement fosters cognitive, emotional, and volitional capacities.

Finally, EMBER-S³ aligns with educational philosophies that advocate for agency, autonomy, and freedom as central purposes of education (Biesta, 2015; Nussbaum, 2011). By synthesising these strands, the framework offers a novel methodological contribution for investigating how embodied, multimodal, and spatial engagements within craft pedagogy can cultivate capacities essential for learners to become agentic beings in and with the world.

7.9.2 Core Features of EMBER-S³

EMBER-S³ integrates phenomenology, multimodality, and sensory integration theory into a coherent analytical approach that foregrounds lived, embodied engagement within craft pedagogy. By drawing these traditions together, the framework enables researchers and practitioners to attend to how meaning emerges through sensory, spatial, and material interactions in situ. Central to the approach is its layered transcription and visual mapping process, which captures modal intensity, complexity, density, and synergy across extended sequences of action. Through this, EMBER-S³ makes visible how embodied repertoires, such as gesture, gaze, posture, and movement, interact with material affordances to scaffold executive functioning and agency. In doing so, it positions pedagogy as an ongoing dialogue between self, world, and others, supporting inclusive practices that recognise and honour diverse sensory-modal preferences and ways of being.

7.9.3 Practical Applications

For practitioners and educators, EMBER-S³ offers a practical tool for designing and structuring craft activities that intentionally target specific movements, sensory engagements, or executive functions such as working memory, initiation, self-monitoring, and inhibition (Diamond, 2013; Gordon & Cox, 2023). The framework also supports educators in attuning teaching to individual learners' sensory-modal preferences and personal aspirations, enabling more responsive and neurodiversity-affirming practice (Groth et al., 2024; Nimkulrat & Groth, 2024). By making affordances visible, whether material, spatial, or relational, EMBER-S³ empowers learners to navigate tasks with increasing autonomy and to cultivate self-generated conscious action (Biesta, 2021; Gordon & Cox, 2023).

For researchers, the framework provides a systematic means of analysing how sensory, spatial, and material resources are orchestrated within embodied practice. This includes examining how these multimodal interactions scaffold higher-level actions and executive functions, extending the analytic possibilities established by Norris (2004) and Diamond (2013). EMBER-S³ also allows for comparative study of affordance structures across craft

settings, supporting investigation into how different material configurations shape agency, learning trajectories, and skill development (Gibson, 1979; Gibson & Pick, 2023; Groth et al., 2024). In addition, the framework contributes to the development of transferable methodologies for studying situated, multimodal environments, promoting analytic parity across embodied resources and guarding against decontextualisation (Nimkulrat & Groth, 2024; Jewitt et al., 2025).

7.9.4 Future Research Directions

Future research should explore how EMBER-S³ can be adapted and extended across a broader range of crafts, cultural contexts, and participant groups, including neurotypical, neurodivergent and SEND populations whose learning processes are closely tied to sensory-modal-spatial engagement.

Comparative and longitudinal studies would strengthen understanding of the framework's efficacy, revealing how agency and executive functioning develop over time within varying pedagogical and environmental configurations. Mixed-methods approaches, combining multimodal analysis with complementary qualitative data, could further illuminate the scalability of the framework and inform its application in designing inclusive, embodied curricula across educational and therapeutic settings.

7.9.5 Key Contributions

- **Advancing Multimodal Inquiry:** Provides tools for fine-grained observation of sensory–modal–spatial orchestrations.
- **Illuminating Agency Formation:** Shows how embodied engagements with materiality, environment and people cultivate agency.
- **Adaptability Across Contexts:** Transferable to body-based practices such as movement, sport, dance and occupational therapy.
- **Promoting Inclusive Methodologies:** Challenges language-centric paradigms and validates diverse ways of knowing and being.

Having established the methodological significance of the study, the discussion now turns to its practical implications, outlining how these insights can inform policy development and guide effective practice within educational and craft-based contexts.

7.10 Recommendations for Policy and Practice

This section translates the study's findings into actionable recommendations for policymakers, educational leaders, and practitioners across both SEND and general education. These recommendations advocate for a shift toward holistic, agency-driven frameworks that embed multimodal, embodied, and craft-based pedagogies at the heart of teaching and learning. By integrating sensory, spatial, and hands-on approaches, they aim to foster learner autonomy, creativity, and meaningful engagement for all learners, regardless of context or ability. The implications of the study are further outlined in section 8.3 in relation to individuals (learners), practitioners (educators), provision leaders, wider policy and educational contexts and researchers.

7.10.1 Integrate Craft-Based Pedagogy into SEND and Mainstream Curricula

The findings of this study demonstrate that craft practices offer multimodal, embodied, and sensory-rich environments that can meaningfully foster executive functioning and agency in learners (Groth, 2017; Marchand, 2011; Mäkelä, 2007). To capitalise on these benefits, there is a strong argument for integrating craft-based pedagogy more deliberately within both SEND and mainstream curricula. Craft should not be viewed as an extracurricular enhancement or niche vocational track, but as a legitimate and valuable educational pathway that sits alongside academic routes. This reframing is particularly relevant for supporting the aspirations and statutory outcomes articulated within EHCPs, especially those related to independence, wellbeing, and self-efficacy (Sigman, 2023; Pollanen, 2011; Niedderer & Townsend, 2016).

Embedding craft within curriculum design ensures that learners, particularly those with SEND, can encounter structured opportunities for hands-on, experiential learning in

real-world, situated environments. Such experiences enable young people to ‘be at home in the world’ by developing embodied autonomy, relational awareness, and practical competencies that academic learning alone cannot provide (Arendt, 1978; Biesta, 2021). The study shows that sensory-modal-spatial orchestrations inherent in craft-based activities create conditions for learners to enact and build agency. Therefore, policy and curriculum frameworks should foreground craft as an educational context that supports learners’ developmental trajectories or becomings, understood here as ongoing, emergent, relational processes rather than fixed developmental endpoints (Deleuze & Guattari, 1980/1987), across cognitive, emotional, social, and practical domains.

7.10.2 Prioritise Multimodal and Sensory Integration Approaches

The study highlights the pedagogical significance of sensory integration and multimodal scaffolding in supporting agency formation and the development of executive functioning. In response, national SEND frameworks and wider educational policy should explicitly incorporate principles from sensory integration theory (Ayres, 2005) and models that address sensory processing and regulation (Williams & Shellenberger, 1996). Such approaches position sensory experience as foundational to learning, self-regulation, and the development of agentic capacities. Complementing this, embodied learning strategies grounded in the work of Thompson and Varela (2001) and Fuchs (2017) reinforce the need to recognise the body as a central site of meaning-making and cognitive emergence. To support this shift, professional development must be strengthened so that educators gain confidence in using multimodal scaffolding, gesture, haptics, movement, spatial structuring, visual cues, and material affordances, to support learning. Research in multimodal interaction analysis (Kress, 2010; Norris, 2004; Jewitt et al., 2025) demonstrates that teachers who can recognise and mobilise multiple modes of communication and engagement provide more inclusive and responsive learning environments. Additionally, curriculum design should be informed by an understanding of how material and spatial affordances influence emotional regulation, sensory load, and the emergence of agency (Diamond, 2013; Gibson, 1979; Gibson & Pick, 2023; Nimkulrat & Groth, 2024). This includes designing environments that balance sensory richness with predictability, provide

opportunities for purposeful movement, and offer materials that invite action, experimentation, and reflection.

7.10.3 Reform Assessment and Accountability Systems

A shift toward embodied, multimodal, and agency-oriented pedagogy requires parallel reform in assessment and accountability structures. Current systems privilege narrow, test-driven metrics that inadequately recognise the forms of progress observed in this study, particularly those relating to executive functioning, agency, and self-directed action. In place of standardised attainment targets, the study recommends adopting person-centred measures that align more closely with EHCP outcomes and individual learner aspirations. These indicators are not intended as deficit-oriented evaluations of individual functioning but as relational, emergent expressions of how learners engage with the world. Within craft-based, sensory-modal-spatial environments, capacities such as emotional regulation, problem-solving, persistence, decision-making, and self-monitoring arise as situated, co-constructed processes that reflect each learner's unique trajectory of becoming.

Broader conceptualisations of achievement are also needed. Creative, practical, and therapeutic accomplishments, such as successfully completing a craft task, regulating sensory overwhelm, initiating a sequence of actions, or demonstrating reflective capacity, should be recognised as meaningful indicators of educational success (Diamond, 2013; Andersen et al., 2019; Kaimal et al., 2017). Such outcomes reflect the real-world competencies that underpin independence, agency and participation in community life. A more expansive approach to assessment would therefore better honour the strengths of diverse learners and provide a more equitable measure of progress.

7.10.4 Embed Practitioner Reflexivity and Co-Research

The study highlights the importance of practitioner reflexivity and positionality in shaping embodied, multimodal pedagogies. Reflexivity enables educators to critically examine how their assumptions, values, and embodied presence influence interpretations of learners'

actions (Finlay, 2002). This is particularly crucial in SEND contexts, where unexamined perspectives may unintentionally reinforce deficit-based or normatively neurotypical framings. Drawing on critical disability studies, Goodley (2016) argues that recognising and valuing diverse ways of being requires practitioners to interrogate their own positionalities and interpretive lenses, ensuring pedagogical decisions remain ethically grounded and responsive to learners' embodied meaning-making.

To support this, professional development programmes should incorporate sustained training in reflexivity, multimodal observation, and inclusive practice. Beyond this, the study advocates for co-research and participatory models in which SEND learners, practitioners, therapists, families, and other multidisciplinary professionals collaborate in evaluating and shaping curriculum design. Contributions from neurodivergent individuals, whose lived experiences provide vital insight into sensory, emotional, and multimodal learning processes, can enhance pedagogical authenticity and ensure that curricula reflect the needs and strengths of their intended learners (Doak, 2018; Daniel, 2023). Such co-constructed approaches shift the focus from "teaching to" learners toward "learning with" them, reinforcing the agency-promoting ethos central to this study.

7.10.5 Align Policy with World-Centred Education Principles

Finally, the study recommends that educational policy align more closely with world-centred educational principles, drawing on Biesta's argument that education should support subjectification, the emergence of the learner as a free, responsible, and responsive agent, rather than treat individuals as objects of intervention or economic units (Biesta, 2015, 2021). A world-centred perspective positions learners in an active relationship with their environment, emphasising encounter, responsibility, and participation. Craft practice naturally embodies these principles through its demands for attention, attunement, care, and purposeful action.

Integrating Gordon's concept of Self-Generated Conscious Action (SGCA) further strengthens this approach, highlighting the importance of learners developing the capacity to act with intention, self-awareness, and relational responsibility (Gordon & Cox, 2023).

This aligns with the study's findings on agency and the pedagogical value of sensory-modal-spatial interactions that support learners to initiate, adapt, reflect, and contribute. Aligning policy with these principles also involves resisting the narrowing effects of neoliberal educational agendas, which often prioritise economic utility over human development. Instead, policy should uphold educational aims that balance individual flourishing with communal and ecological wellbeing, drawing on the ethical and relational insights of thinkers such as Noddings (2016), Arendt (1978), Humboldt (Horlacher, 2016), and Steiner (Steiner 1919/2004), who emphasised the holistic development of the whole human being and education as a transformative, relational process that integrates intellectual, emotional, and practical growth. This shift would help ensure that education cultivates learners who can both shape and be shaped by the world in meaningful and sustainable ways.

7.10.6 Summary

Collectively, these recommendations advocate for a paradigm shift in SEND and wider education more broadly, from deficit-based, outcome-driven models towards holistic, multimodal, and agency-centred frameworks. They foreground the pedagogical potential of craft and embodied learning as vehicles for fostering agency, executive functioning, and meaningful participation in the world.

7.11 Chapter 7 Conclusion

This chapter has argued that craft pedagogy provides exceptionally conducive conditions for the embodied becoming of agency, especially when tutors orchestrate multimodal affordances with sensitivity to learners' sensory preferences. The bespoke hybrid multimodal framework has proven capable of illuminating visible the granular relations between sensory engagement, executive-function enactment, and agentic trajectories, thereby yielding both a research tool and a practice guide for inclusive, body-based education. The study's contributions: methodological, theoretical, pedagogical, and policy-oriented, collectively endorse a person and world centred vision of education in which learners encounter the world through meaningful, material engagements that invite

initiative, reflection, and responsibility. In doing so, it offers a coherent rationale and a practicable set of strategies for cultivating agency and flourishing in and with the world.

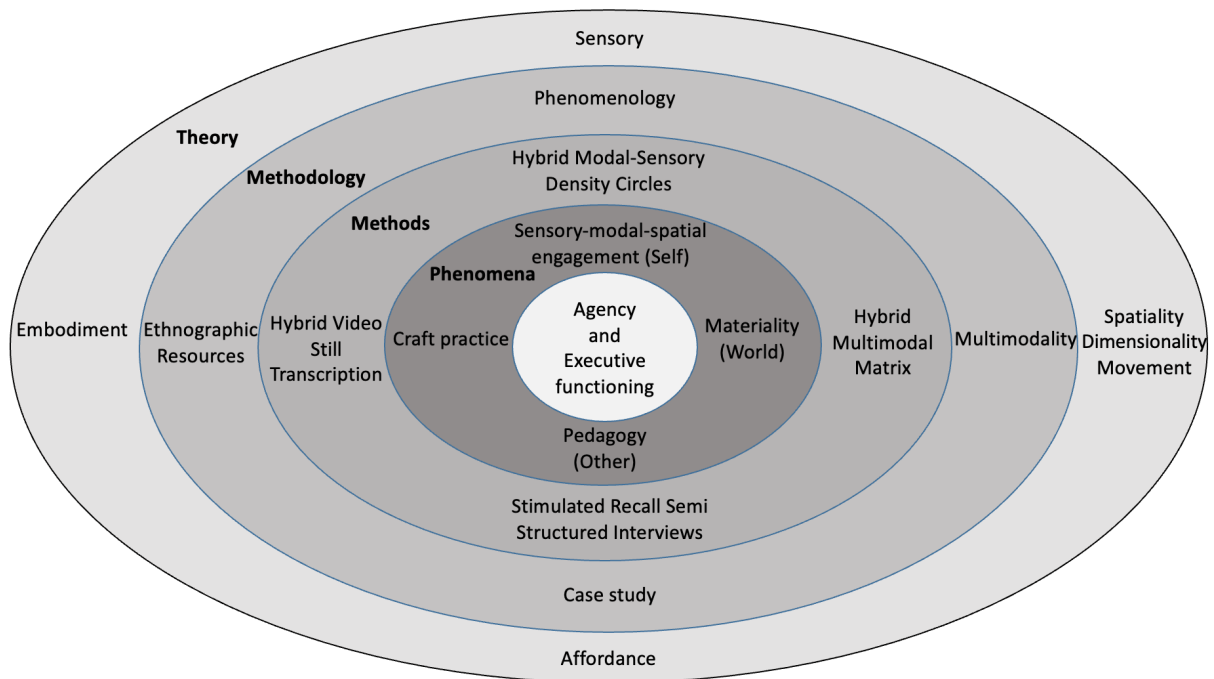
8: Conclusion

Introduction to the Chapter

This chapter synthesises the research journey, reiterates the thesis statement, and foregrounds the new knowledge contributed by the study. The research explored the pedagogical potential of craft as a vehicle for the embodied becoming of agency, employing a bespoke hybrid multimodal methodology within a SEND-focused craft education context. By integrating embodiment theory, sensory integration, and multimodal analysis, the study offers a novel lens for understanding how craft-based practices afford agency and executive functioning capacities in learners. This chapter restates the research questions, summarises key findings, and discusses implications for learners, practitioners, curriculum leaders, and policy influencers. In addition, it reflects on the academic, pedagogical, and organisational impact already generated by the research, demonstrating how elements of the study have begun to inform practice, professional learning, and wider conversations across related fields.

In relation to the wider research framework (figure 43), this conclusion chapter closes the loop by demonstrating the framework's efficacy through a synthesis of key findings, implications, and contributions that emerged from its application in the study. Looking forward, the framework offers a transferable tool for advancing embodied, multimodal approaches in diverse educational, therapeutic, and vocational contexts, supporting inclusive and person-world centred pedagogies.

Figure 43 Research framework



8.1 Research Questions and How They Were Answered

Introduction

This section revisits the refined research questions and synthesises how the study addressed them through the application of the EMBER-S³ framework and multimodal analysis.

Refined Main Research Question:

How does craft shape agentic becoming?

Expanded Research Question:

How do the elements of pedagogical craft practice, its materiality and our sensory-modal-spatial engagements, shape the cultivation of executive functioning and agency?

8.1.1 What did the Workshop Environment Offer?

The Greenwood workshop functioned as an affordance-rich pedagogical space. Its materiality and spatial configuration invited embodied dialogues between learner, tools, and materials, enabling iterative feedback loops that scaffolded higher-level actions such as planning, sequencing, and self-regulation. Movements across sagittal, frontal, and horizontal planes supported motor coordination and spatial reasoning, consistent with movement-science principles and the study's theoretical framing of spatiality (Rohen, 2007; Steiner, 1921/1991). These findings align with Gibson's concept of affordances and embodiment theory, evidencing how environmental design fosters executive functions and agency.

8.1.2 What did Student–Tutor Interactions Offer?

Analysis revealed that intersubjective scaffolding and multimodal communication, including gesture, gaze, rhythm, and haptic guidance, were pivotal in fostering agency. Tutors leveraged pedagogical affordances by attuning to learners' sensory preferences and orchestrating multimodal cues, creating joint-attention frames that supported initiation, confidence, and volition. These embodied teaching practices extended beyond verbal instruction, resonating with multimodal interaction analysis and affordance theory.

8.1.3 What did Student–Material Interactions Offer?

Direct engagement with tools and materials facilitated sensorimotor coupling and iterative feedback loops: resistance, vibration, and sound, that enabled learners to calibrate tool angle and pressure, regulate actions, and refine technique without constant verbal direction. These embodied processes promoted executive functions such as planning, inhibition, and problem-solving, supporting theories of enskillment and thinking-through-making (Ingold, 2000; Mäkelä, 2007).

8.1.4 How did these Dimensions Align with Learner Aspirations and Needs?

Personalised craft encounters aligned closely with Student D's EHCP aspirations, fostering confidence, independence, and self-generated conscious action. The multimodal analysis demonstrated how sensory–modal–spatial orchestration matched preferred modes of interaction, enabling progress toward identified goals and reinforcing agency and belonging.

8.1.5 What do the Findings Suggest about the Pedagogical Potential of Craft?

The study positions craft as a multimodal, embodied, and agentic practice, offering a powerful pedagogical resource for inclusive education. It evidences how sensory–modal–spatial scaffolding within affordance-rich environments cultivates executive functioning and agency as dynamically co-constructed processes. Methodologically, the thesis introduces EMBER-S³ as a transferable framework for analysing embodied learning, providing educators and researchers with tools to make invisible dimensions of craft pedagogy analytically visible and pedagogically actionable.

8.1.6 Concluding Synthesis

Taken together, these findings demonstrate that the refined aim: to investigate how holistic craft-based education, through its materiality, pedagogy, and sensory–modal–spatial engagements, contributes to the cultivation of executive functioning and agency, was fully addressed. The study evidences that agency and EF do not emerge as isolated traits but as dynamically scaffolded processes within affordance-rich environments, intersubjective teaching, and learner–material dialogues. By operationalising the EMBER-S³ framework, the research achieved its objectives: designing and validating a hybrid multimodal methodology, applying it to a detailed case study, interpreting pedagogical affordances, and highlighting methodological transferability. Chapters 6 and 7 collectively move from micro-level analysis to macro-level implications, establishing craft as a multimodal, embodied, and agentic practice and providing a unified model for inclusive, agency-focused education.

8.2 Summary of Key Findings and Contributions

8.2.1 Methodological Contribution

This study introduces EMBER-S³ (Embodied Multimodal-Based Experiential Research - Sensory, Spatial, Situated), a bespoke hybrid framework that integrates phenomenology, multimodal interaction analysis, and sensory–spatial theory to illuminate embodied, practice-based learning. Addressing a critical methodological gap, EMBER-S³ illuminates sensory–modal–spatial dynamics, making them analytically visible and enabling fine-grained observation of how these orchestrations scaffold executive functioning and agency capacities central to inclusive and person-centred education. Applied within a craft-based case study, EMBER-S³ demonstrates practical utility and transferability across educational, therapeutic, and vocational contexts. By synthesising embodiment, affordance theory, and multimodality, the framework offers a rigorous yet adaptable tool for designing and evaluating pedagogies that honour diverse ways of knowing and being. As such, EMBER-S³ stands as both a methodological innovation and a catalyst for re-imagining education as a situated, embodied dialogue between self, world, and others.

8.2.2 Theoretical Contribution

The research advances theoretical understanding of embodied agency, sensory integration, and affordances within craft pedagogy, extending embodiment theory into SEND and neurodiversity contexts. It foregrounds the pedagogical significance of sensory–modal–spatial orchestrations in shaping agency and executive functioning, contributing to contemporary debates in disability studies, inclusive education, and world-centred educational theory.

8.2.3 Practical Contribution

Findings demonstrate that craft-based education fosters executive functions: planning, initiation, working memory, self-monitoring, and inhibition, while cultivating agency through embodied, multimodal engagement. These insights offer actionable implications for curriculum design, therapeutic education, and inclusive pedagogical practice. Craft emerges not merely as a technical skill but as a rich pedagogical site for holistic development, supporting autonomy, confidence, and meaningful participation.

8.3 Implications of the Study

8.3.1 For Individuals (Learners)

Craft-based education offers meaningful opportunities for learners to recognise their strengths, develop executive functions, and cultivate agency through embodied, multisensory engagement with materials and environments. These pedagogical encounters validate diverse ways of knowing and being, resonating with both neurodiversity perspectives and capabilities approaches to human flourishing (Nussbaum, 2011). By working through hands-on, relational processes of making, learners can deepen their self-awareness, confidence, autonomy, and sense of agency.

- Engage in hands-on, sensory-rich craft experiences that honour diverse learning pathways and ways of processing the world.
- Support executive functions, such as planning, working memory, and self-monitoring, through purposeful, embodied, and iterative making processes.
- Build confidence and autonomy by interacting dynamically with materials and tools, fostering self-regulation, experimentation, and initiative.
- Participate in multimodal learning that integrates touch, movement, vision, and sound, enabling richer forms of meaning-making than language alone.
- Develop agency through making intentional choices, negotiating constraints, and exercising creative control in authentic, real-world contexts.
- Strengthen connection with others and the environment through collaborative making and ecological awareness, supporting belonging and well-being.
- Affirm neurodivergent profiles by embracing alternative sensory, cognitive, and communicative styles, aligned with capabilities-oriented and disability-positive frameworks.

8.3.2 For Craft Pedagogy Practitioners

Craft pedagogy can be enriched through multimodal and embodied strategies that attune to learners' sensory preferences and recognise the relational affordances of craft environments. Practitioners can intentionally orchestrate material, spatial, and social interactions to scaffold agency, support executive functioning, and cultivate inclusive learning encounters. Professional development may therefore benefit from training in sensory integration, multimodal communication, and reflective embodied awareness.

- Design sensory-rich environments that leverage materiality, spatial layout, and natural affordances to support embodied learning and the emergence of agency.
- Embed multimodal scaffolding, through gesture, gaze, rhythm, and haptic guidance, to foster confidence, initiation, and self-regulation.
- Support executive functions by structuring tasks that involve planning, sequencing, inhibition, and self-monitoring within authentic craft processes.
- Prioritise agency over predetermined outcomes by creating choice-rich, dialogic learning encounters that enable intentional action and creative autonomy.
- Affirm neurodivergent profiles by offering flexible, multimodal pathways for engagement and meaning-making, consistent with inclusive and disability-positive pedagogies.
- Use iterative feedback loops between embodied action, material, and space to support adaptive learning, problem-solving, and responsive teaching in real time.
- Integrate ecological and ethical dimensions of craft to foster sustainability, responsibility, and world-centred educational engagement.
- Apply reflective tools (e.g., multimodal analysis, sensory mapping, practitioner journaling) to make often-invisible dimensions of learning visible and inform situated pedagogical adjustments.

8.3.3 For Provision Leaders

Curriculum and provision leaders can strengthen both SEND and mainstream education by integrating craft-based pedagogies that promote holistic development. This requires investment in affordance-rich environments and staff development in embodied,

multimodal approaches. Such integration aligns with this study's emphasis on fostering agency and supporting executive functioning as meaningful educational outcomes.

- Embed craft pedagogy in curriculum design by mapping sensory-rich, multimodal activities to statutory and holistic learning outcomes.
- Create affordance-rich spaces that balance sensory stimulation and accessibility, supporting regulation, engagement, and inclusion.
- Align assessment frameworks to incorporate qualitative indicators of agency, confidence, and executive functioning alongside formal measures.
- Invest in professional development on sensory integration, multimodal analysis, and inclusive craft-based pedagogical practices.
- Foster a culture of agency by prioritising learner voice, co-creation, and participatory approaches in curriculum planning and evaluation.
- Integrate wellbeing and sustainability goals into craft-based provision to meet wider educational and societal priorities.
- Support research-informed practice by adopting frameworks such as EMBER-S³ to evidence impact and guide continuous improvement.
- Champion diversity and inclusion by recognising craft-based approaches as legitimate, valued pathways for achievement and flourishing.

8.3.4 For Policy and Wider Educational Context

The study challenges deficit-based models in SEND policy, advocating for frameworks that prioritise agency, autonomy, and capabilities over narrow academic metrics. It aligns with calls for world-centred education (Biesta, 2021) and supports policy shifts toward holistic, person-centred approaches. By foregrounding the pedagogical potential of craft, the research contributes to debates on curriculum reform, inclusive education, and recognition of diverse modalities of learning.

- Recognise embodied, multimodal learning as a legitimate pathway for inclusion and achievement within national and local policy frameworks.

- Embed craft-based approaches into curriculum guidance to balance academic priorities with holistic development and wellbeing.
- Support neurodiversity and capabilities frameworks by prioritising or resourcing pedagogies that validate diverse ways of knowing and being.
- Incorporate qualitative indicators (agency, confidence, executive functioning) into accountability measures alongside quantitative outcomes.
- Invest in teacher training and resources for sensory-rich, embodied pedagogies to meet SEND and mainstream needs.

8.3.5 Broader Applicability Beyond SEND

While this study foregrounds SEND contexts, its principles extend to mainstream and vocational education. Craft-based, embodied approaches can:

- Enhance engagement for learners disengaged from abstract curricula.
- Support vocational and academic pathways by integrating sensory-rich practices and authentic craft processes that enhance engagement, practical skill development, and executive functioning.
- Promote wellbeing and agency in diverse learner populations, aligning with inclusive education agendas.
- Adapt craft pedagogy for mainstream education to foster creativity, resilience, and problem-solving in diverse learners.
- Apply multimodal approaches in early years, secondary, and adult education to support embodied meaning-making and agency.
- Leverage craft for wellbeing and mental health in therapeutic, community, and lifelong learning contexts.
- Use EMBER-S³ as a transferable framework for analysing embodied learning in arts, STEM, and experiential education.
- Promote sustainability and cultural heritage through craft education as part of broader educational and societal goals.

8.3.6 For Researchers

EMBER-S³ offers a structured, emerging and transferable methodology for investigating embodied, multimodal learning and its influence on agency and executive functioning. By integrating phenomenology, multimodal interaction analysis, and sensory integration theory, the framework enables systematic observation of sensory–modal–spatial dynamics and their pedagogical significance. Future research should refine EMBER-S³, apply it longitudinally, and explore comparative studies across diverse body-based practices to advance embodied education research and inclusive pedagogical design.

- Extend multimodal research into embodied, sensory-rich contexts to illuminate underexplored dimensions of learning.
- Apply and refine EMBER-S³ in diverse educational and therapeutic settings to evaluate its adaptability and scalability.
- Investigate EF–agency relationships across disciplines to deepen understanding of cognitive, affective, and embodied development.
- Explore intersections of craft, neurodiversity, and inclusion to contribute to education, disability studies and embodied cognition research.
- Contribute to methodological innovation by developing tools that make invisible sensory–modal–spatial dynamics analytically visible.
- Publish interdisciplinary findings to influence educational policy, curriculum design, and inclusive pedagogical frameworks.

8.4 Impact, Dissemination, and Practice Uptake

Beyond its conceptual and methodological contributions, this research has already generated tangible academic, pedagogical, and organisational impact. Elements of the study have been disseminated through international conference presentations and workshops, an Erasmus+ research project with multiple authored sections, and a peer-reviewed extended abstract and paper presented at the Biennial International Conference for the Craft Sciences, which will inform a forthcoming special issue of *FormAkademisk*. These activities

have helped refine and communicate the study's theoretical and practical findings, as well as the EMBER-S³ approach and its implications for embodied, multimodal pedagogy.

8.4.1 Academic and Professional Dissemination

- International Literacies Conference (2023; 2024): A 2023 paper on forging the self through the pedagogical potential of craft (awarded the Postgraduate Research Prize) and a 2024 workshop that piloted the thesis's sensory-first approach in a practitioner-facing format.
- Erasmus+ Project, Cultural Innovation through Ecopreneurship: Authored sections on craft-based education, place in curriculum design, and embodiment through the senses, situating the thesis within a European practice and policy conversation.
- BiCCS 2025: Presentation of the multimodal exploration of the embodied becoming of agency; this output also informs a scheduled special issue of *FormAkademisk* (anticipated 2026), extending the study's reach into the craft sciences community.

Selected evidence of these outputs is provided in Appendix AA; full outputs are available via the links listed in the introductory "Publications, Outputs and Practice Impact Arising from This Research" section.

8.4.2 Practice and Teaching Impact

Findings have informed updates to organisational practitioner guidance, contributed to MA PSTE course documentation, teaching materials, and lectures, and have been embedded within The Pedagogical Potential of Craft training programme and wider staff development. In these contexts, the study's methodological, theoretical, and practical insights have been adopted as a situated analytic and reflective tool, enabling practitioners to make sensory-modal-spatial dimensions of learning visible and actionable in daily practice (e.g., planning, initiation, inhibition, and self-monitoring through material-body-space feedback loops), while fostering agency.

8.4.3 Emerging Trajectory

Collectively, these outputs illuminate the transferability of the findings and framework and their capacity to shape inclusive, agency-centred craft pedagogy at scale. They also provide a platform for future longitudinal and comparative studies across embodied practices, consolidating EMBER-S³ as a method for illuminating and designing pedagogies that honour diverse ways of knowing and being.

Looking ahead, I intend to further embed the study's methodological, theoretical, and practical insights across internal provision, namely organisational training and development materials, and practitioner programmes from induction through MA level. This will include iterative integration of sensory–modal–spatial tools and reflective analyses to inform session and workshop design, mentoring, and evaluation cycles. In parallel, I intend to extend this work through external research, educational partnerships, and ongoing international collaborations, enhancing embodied and multimodal methods, co-producing practitioner resources, and contributing to the wider exchange of pedagogical knowledge in alignment with the organisation's charitable objects.

8.5 Closing Statement

This research demonstrates that craft is not merely a skill but a pedagogical situation where agency is forged through embodied, multimodal engagement. By illuminating the sensory–modal–spatial orchestrations underpinning craft learning, the study contributes to theory, practice, and policy, offering a transformative vision for education that honours diversity, embodiment, and human flourishing. EMBER-S³ stands as a methodological innovation with potential applications across practical, therapeutic, and vocational education contexts. Ultimately, the study advocates for an educational paradigm that embraces the richness of embodied, multimodal learning as a pathway to agency, autonomy, and meaningful participation in the world.

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Appendices

Appendix A: Participant information and consent forms

PARTICIPANT INFORMATION SHEET

1. **Title of Project: A multimodal enquiry into craft pedagogy**

2. **Opening statement:**

I would like to invite you to take part in this study, which aims to investigate what pedagogical (educational) opportunities that may arise from engaging in craft and how they happen.

3. **Why have you asked me to take part?** [Basis of selection of participants]

You have been chosen as a participant because you are a student or tutor at the provision and site where the research is taking place.

4. **Do I have to take part?** It is up to you to decide if you want to take part. A copy of the information provided here is yours to keep, along with the consent form if you do decide to take part. If you choose to take part you can still decide to withdraw within 14 days of data collection without giving a reason, or you can decide not to answer a particular question or take part at particular times. You may choose to withdraw some or all of your data within 14 days of data collection.

5. **What will I be required to do?**

If you choose to take part after completing the consent form, the researcher will attend your organised craft session for a face to face briefing to familiarise yourself with the researcher and explain what will be involved. This will also give you the opportunity to raise or discuss any concerns you may have.

There is no expectations or requirements for you to do anything different within your usual craft session. The researcher will be present during the duration of your

scheduled craft session observing, taking notes, relevant background information and recording the session using video.

Following the craft session, you will be invited to discuss and review selected parts of the video within a group based semi structured informal interview, which will last no longer than an hour. The discussions will be recorded using an audio recorder and the researcher will make notes.

6. Where will this take place?

The recorded craft sessions will take place at your education provision in the usual session locations. The review and discussion around the selected video clips will take place at a later time, using a laptop to view them.

7. How often will I have to take part, and for how long?

There will be one briefing (no longer than 30 mins), a recording of your craft session and one follow up discussion (no longer than 1hr).

8. Are there any possible risks or disadvantaged in taking part.

Choosing not to take part will not in any way affect your access or entitlement to services at your provision.

9. What are the possible benefits of taking part?

It is hoped that the findings will lead towards increasing the pedagogical awareness of practitioners when designing and engaging in craft curriculum with 16-25 year old Special Education Needs students. The results may also provide insights into justifying a craft based educational approach and may reveal further areas for improvement, enhancement and training.

10. When will I have the opportunity to discuss my participation?

We will discuss your participation and you have the opportunity to ask questions, prior to the briefing, during the briefing and at anytime during the session and follow up

discussion. We will also have a debrief after the craft session and a discussion the following week to ensure you have every opportunity to discuss your participation.

11. Will anyone be able to connect me with what is recorded and reported?

Your information and data will be kept confidentially and your identity will be protected, pseudonyms (false names) will be used to identify your comments and images within the transcription and presentation of the study.

If you give consent and your images/video is used for publishing and you choose to remain anonymous, software will be used to maintain your anonymity (software will be used to hide your identity. i.e. face blurred and voice changed).

12. Who will be responsible for all of the information when this study is over?

The research data will be owned by the university.

13. Who will have access to it?

Only the researcher and supervisors will have access to the video, audio and transcription files, which will be stored on an encrypted drive on the University network (accessible only via password protected computers). The anonymised typed transcripts, video images and still images will be stored in a similar way. Additionally you and the people in your session will have the opportunity to be shown selected video clips that may be used in the study, within the follow up discussion and review.

14. What will happen to the information when this study is over?

The anonymised transcripts, still images and selected video clips will be stored securely for 10 years on the University server. The remaining video data will be deleted following completion of the study, circa 2025.

15. How will you use what you find out?

The findings and data from this study will be presented in a doctoral thesis. The anonymised data may additionally be presented in future conferences, reports, trainings and/or publications.

16. How long is the whole study likely to last?

The study will last between Jan 2021 and July 2022.

17. How can I find out about the results of the study?

If you would like a summary of the findings please provide your contact details on the consent form.

18. Do you have any questions?

If so, please ask them now or contact the researcher via the methods detailed below. Should you wish to participate and give consent you will also be given the opportunity to ask any further questions or seek clarification in the face to face briefing.

19. Legal basis for research for studies. The University undertakes research as part of its function for the community under its legal status. Data protection allows us to use personal data for research with appropriate safeguards in place under the legal basis of **public tasks that are in the public interest**. A full statement of your rights can be found at <https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notice/privacy-notice-for-research>. However, all University research is reviewed to ensure that participants are treated appropriately and their rights respected. This study was approved by a EdD SHU ethics board. Further information at <https://www.shu.ac.uk/research/ethics-integrity-and-practice>

Please use the contact details below if you have any concerns or if adverse effects occur after the study. Additionally you may contact your education learning coordinator/pathways coordinator should you wish to raise any questions or concerns on your behalf before, during or after the study.

Researcher/ Research Team Details:

Matthew Briggs [email redacted]

Supervisors: Dr Helen Donaghue [email redacted]

Dr Roberta E Taylor [email redacted]

Address: Sheffield Institute of Education, Charles St Building

Charles St, Sheffield S1 2LX, England, Phone: 0114 225 5555

You should contact the Data Protection Officer if:

- you have a query about how your data is used by the University
- you would like to report a data security breach (e.g. if you think your personal data has been lost or disclosed inappropriately)
- you would like to complain about how the University has used your personal data

DPO@shu.ac.uk

You should contact the Head of Research Ethics (Professor Ann Macaskill) if:

- you have concerns with how the research was undertaken or how you were treated

[email redacted]

Postal address: Sheffield Hallam University, Howard Street, Sheffield S1 1WBT Telephone:

0114 225 5555

Participant Consent Form

TITLE OF RESEARCH STUDY: A multimodal enquiry into craft pedagogy

Please answer the following questions by ticking the response that applies

- | | YES | NO |
|--|--------------------------|--------------------------|
| 1. I have read the Information Sheet for this study and have had details of the study explained to me. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. My questions about the study have been answered to my satisfaction and I understand that I may ask further questions at any point. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. I understand that I am free to withdraw from the study within the time limits outlined in the Information Sheet, without giving a reason for my withdrawal or to decline to answer any particular questions in the study without any consequences to my future treatment by the researcher. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. I agree to provide information to the researchers under the conditions of confidentiality set out in the Information Sheet. | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. I wish to participate in the study under the conditions set out in the Information Sheet. | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. I consent to the information collected for the purposes of this research study. | <input type="checkbox"/> | <input type="checkbox"/> |

Participant's Signature: _____ **Date:** _____

Participant's Name (Printed): _____

Contact details:

Researcher's Name (Printed): **Matthew Briggs**

Researcher's Signature: _____

Researcher/ Research Team Details:

Matthew Briggs [email redacted]

Supervisors: Dr Helen Donaghue [email redacted]

Dr Roberta E Taylor [email redacted]

Address: Sheffield Institute of Education, Charles St Building

Charles St, Sheffield S1 2LX, England, Phone: 0114 225 5555

Please keep your copy of the consent form and the information sheet together.

PARTICIPANT CONSENT FORM for USE of IMAGES/Videos

TITLE OF RESEARCH STUDY: A multimodal enquiry into craft pedagogy

Photographs and video taken of you would be used to add interest and exemplify the research findings. For example, they may be used as illustrations in website summaries, research reports, summary leaflets, newspapers articles and/or conference or training presentations. They will not be used in any way that would show you in a bad light and your identity will be protected and anonymised, as outlined in the information sheet.

To be completed by the participant:

- | | YES | NO |
|--|--------------------------|--------------------------|
| 1. I agree to have my photograph/video taken. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. I understand that my name will not be used. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. I understand that photographic images will be anonymised. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. I understand that I will not be given credit for my appearance in photograph(s)/video(s). | <input type="checkbox"/> | <input type="checkbox"/> |

Signature of participant: _____

Date:

Name of participant (block letters): _____

Signature of investigator: **Matthew Briggs** _____

Date: _____

Researcher/ Research Team Details:

Matthew Briggs [email redacted]

Supervisors: Dr Helen Donaghue [email redacted]

Dr Roberta E Taylor [email redacted]

Address: Sheffield Institute of Education, Charles St Building

Charles St, Sheffield S1 2LX, England, Phone: 0114 225 5555

Appendix B: Data Management Plan

If your project funder requires a specific form of plan, please ensure that your plan meets the requirements. Please see the [Library Research Support portal page](#) and [this DCC page](#) for examples of funder specific plans.

1. What data will you collect or create?

Physical Data – Field notes (using note books)

Digital files – Video recordings of sessions with participants. The video files (3x2hr sessions) will be recorded on video cameras and selected sections will transcribed into MS Word/Excel/PowerPoint document files. Anonymised relevant background information in word files. Photographs/still images will also be taken and from sections of the videos to highlight/illustrate particular moments and scans of note books (jpeg files) will also be collected and stored. Audio recordings of the video clip review and discussions will be recorded with an audio recorder (3 x 20-30min sessions) (if so this will be 6x) with selections transcribed into MS word/Excel document files.

Video: Format HDV, Resolution 1440x1080, Frame rate 24, Video length 2hrs x 4, Total space for 8 hrs : 87.89 GB (allowing for excess)

Audio: Bit Rate: @ 1411.2 kbps, for 4 x 1hr audio recordings: estimated File Size, 2.54016 GB

Images and transcriptions: jpgs and MS Word documents estimated at 10GB

Approx. total storage required 100GB

2. How will your data be documented and described?

The video and audio data will have sections transcribed onto MS Word files/MS excel/PowerPoint files and stored on a secure password protected network alongside the video files with the same identifiers of date, time and session name followed by numbers to indicate subsequent sections. The photographs and videos of the visual data will be stored in the same place using dates and craft sessions and numbers as identifiers.

3. How will your data be structured, stored, and backed up?

Physical Data – Field notes (note books stored in locked drawer, with no identifying names of participants)

Electronic – video and audio data will be taken and stored on password protected SD cards, before being transferred onto a secure password protected network for storage (the SD card data will be erased after being transferred). A back up will be stored on the Q drive.

4. How will you manage any ethical issues?

Information will be given to participants outlining their rights and consent in relation to the use of their data for the purposes of the research and for future publications, conferences and presentations. Written consent will be gained from participants and stored for future reference on the Q drive.

Digital software will hide the identity and anonymize participants in the videos and images, however due to the nature of the study and video capture there may be a possibility that individuals within the community could be identified, this will be made clear within the consent and information sheets. Transcripts will be anonymized using pseudonyms in the transcription process and a coding system will be used and kept in a separate file.

5. What are your plans for data sharing after submission of your thesis?

The data from the study will primarily be used to inform the thesis. The results may be disseminated via the published thesis, conferences, trainings and publication in academic journals, books or book chapters.

6. What are your plans for the long-term preservation of data supporting your research?

The video/audio files, images and transcription files will be stored on the Q drive for the duration of the EdD programme and thesis stage (Approximate completion 2025). Selected video/audio files, images and transcriptions will be stored securely for 10 years and un-used video files will be deleted at the end of the project.

Appendix C: Student D profile information

Aspirations
Student D wants to live as independently as possible. He has previously had work experience looking after animals - he really enjoyed this, and would like to work outside with animals or plants in the future. Spending periods of time on his own helps him to reflect upon his thinking-feeling-behaviour and enable him to be sociable and friendly later on. Student D has strategies to help him to manage daily experiences- encourage him to let you know what these are as he also wants to develop new ways to self-manage and self-regulate
Medical background and diagnosis
Student D has a diagnosis of ADHD, ASD, Anxiety, depression and OCD... Sensory processing difficulties presenting as tactile defensiveness towards touch, clothing, water, loud sounds, light and shouting. 'Student D' can struggle to moderate between being extremely lethargic and continually restless and active. History of self harm.
Identified barriers to learning
<p>Student D needs relate to a complex combination of attention deficit disorder, autism, anxiety disorder, depression and significant learning difficulties. In 2014 student D also received a diagnosis of OCD. Student D's difficulties are significant and wide ranging and impact on his ability to function in the classroom (i.e. chronic worrying)...student D's general passivity can lead to his needs not being identified or met. Student D struggles with following instructions both in the classroom and at home. Student D has difficulties with his working memory particularly short term acquisition and retrieval... Student D uses a visual time-time and a timeout card when he is angry and needs to move to a calm area to deescalate himself.</p> <p>At times Student D can feel overwhelmed during session and might leave for a break. If he is anxious, he might pace and/or refuse to go back into sessions.</p>
Strategies to Help Learning
Student D likes to have support strategies to manage his temper and will discuss his feelings with a trusted adult. Avoid making physical contact with Student D if possible. If touched by a person/object allow Student D to touch the contact area 5 times so that he can move forward. Overcome his self-critical tendency or self-over-estimation of his

abilities by providing positive messages about learning outcomes. Model use of appropriate personal space. Provide reminders of practical, key points and help him to keep his workspace organised so that he can find what he needs to use easily.

Communication

Student D is able to contribute to discussions, often expressing mature ideas and opinions. However, he is very literal in his interpretation of language and often misinterprets what others say to him and experiences difficulty in following instruction in the classroom and at home.

Appendix D: Pre-analysis selected pole-lathe scene storyboard, video still depiction



Appendix E: Multimodal transcript from a science lesson, (Bezemer et al., 2012, p. 5)

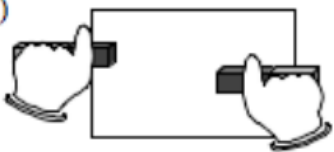
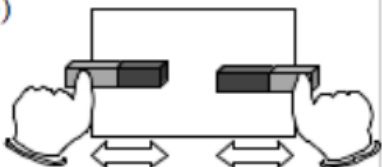

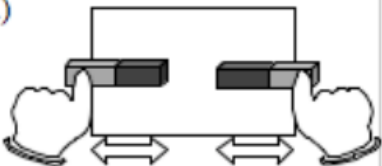

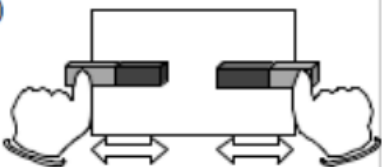


Gesture		Speech
(a) 	places the bar magnets on the visualiser	<i>okay (.)</i>
(b) 	touches each bar magnet and adjusts them slightly	<i>two bar magnets (..)</i>
(c) 		<i>now looking back to what our aim for today was (.) Tom (..) okay (..) we will learn that forces act between two magnets (..)</i>
(d) 	touches each bar magnet and adjusts them slightly	<i>so there are our two magnets okay (..)</i>
(e) 		<i>what do you think (.) think about this (.) don't put your hands up for now (.)</i>
(f) 	touches each bar magnet and adjusts them slightly	<i>if I (..) move them</i>
(g) 	brings fingers together above the magnets	<i>closer together (..)</i>
(h) 		<i>then let go (..) what do you think would happen to the magnets?</i>

Figure 3: A multimodal transcript of a demonstration in a science lesson

Appendix F: Multimodal transcript from a surgical operation, (Bezemer et al., 2012, p. 9)




Example 1: Trainer positions	Example 2: Trainer tells and points out where to position	Example 3: Trainee positions
		
<p><i>"Just hold it there"</i></p>	<p><i>"Slide that one in a bit more laterally"</i></p>	

Table 1: Three different approaches to the positioning of retractors

Appendix G: Multimodal language transcript, (Norris, 2004, p. 67)

(1)	5:06	<i>Web-designer:</i>	when you're trying to publish,
(2)			I think,
(3)			it tries to grab that one page,
(4)			that you made changes to
(5)			so
(6)			I was hop—
(7)			I was thinking,
(8)			if you
(9)	5:14	<i>Baby:</i>	UH UH AH,
(10)	5:15	<i>Web-designer:</i>	[that if you have that
(11)	5:17	<i>Baby:</i>	[UH UH AH,
(12)	5:17	<i>Web-designer:</i>	[if you try to change
(13)			you would know,
(14)			if your publishing had worked,
(15)			I don't know if that's correct though.
(16)			I'M NOT REALLY SURE.
(17)			hhh I guess what I'm saying
(18)			[is try to publish it,
(19)	5:33	<i>Baby:</i>	aAHH
(20)		<i>Web-designer:</i>	hh and then we'll SEE. (4)
(21)			whAT are you doing?
(22)			she's sucking on her fingers,
(23)			she's sucking on her fingers,
(24)			and I just picked her up hh (3)
(25)	5:54	<i>Baby:</i>	AH
(26)	5:54.45		I'm I guess,
(27)			I got off the phone to you,

Appendix H: Transcript, proxemics and posture, (Norris, 2004, p. 70)

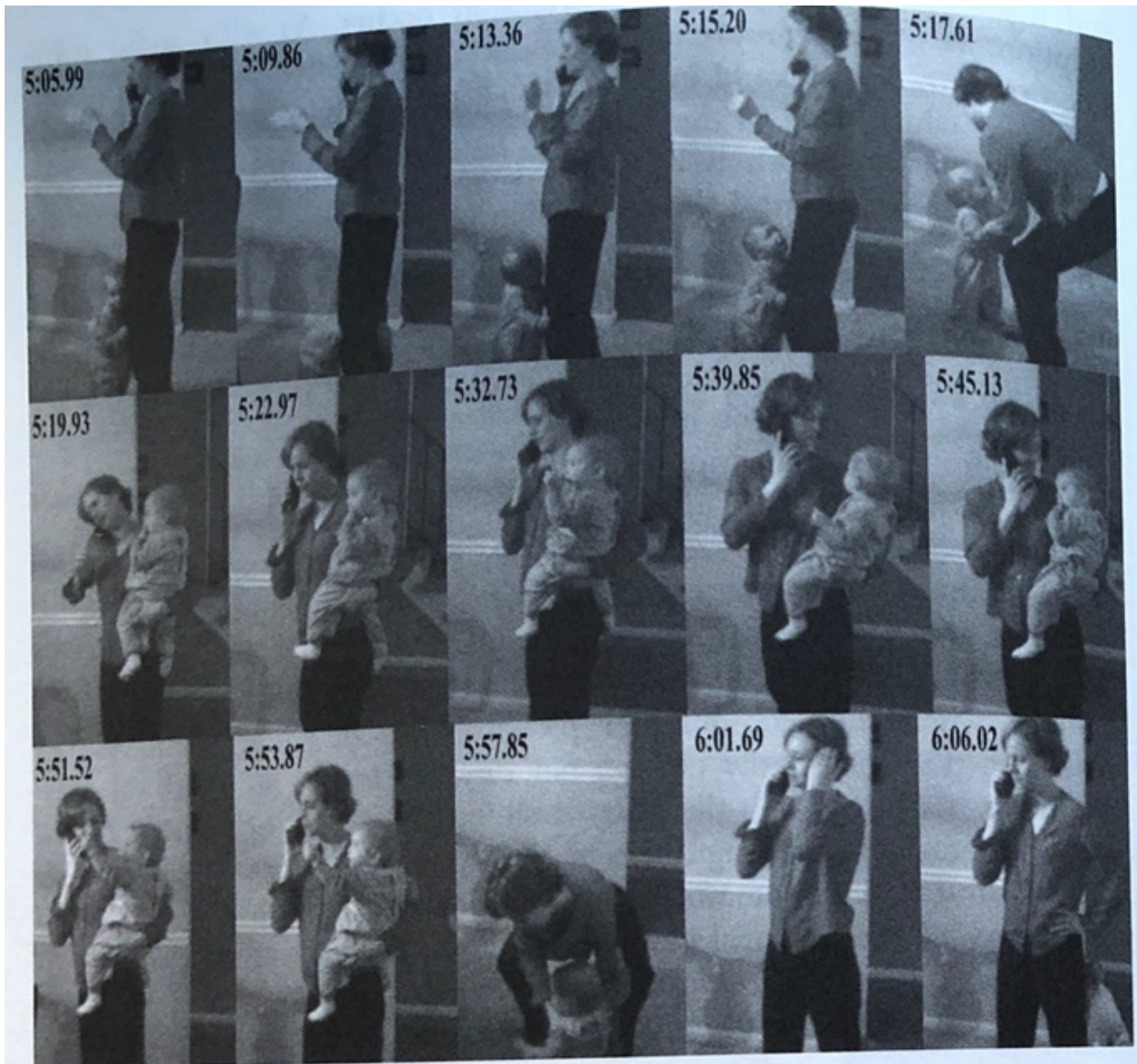
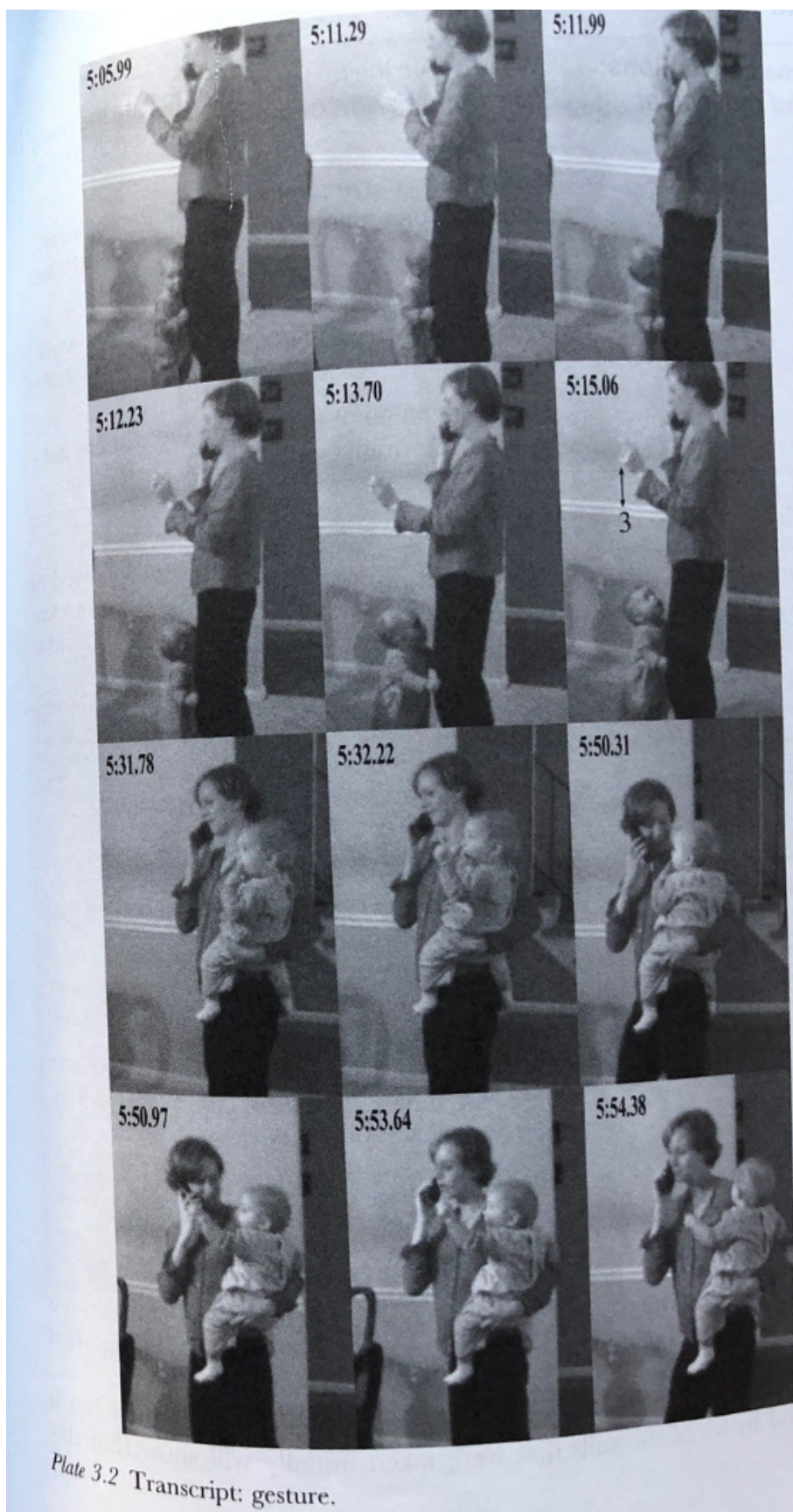
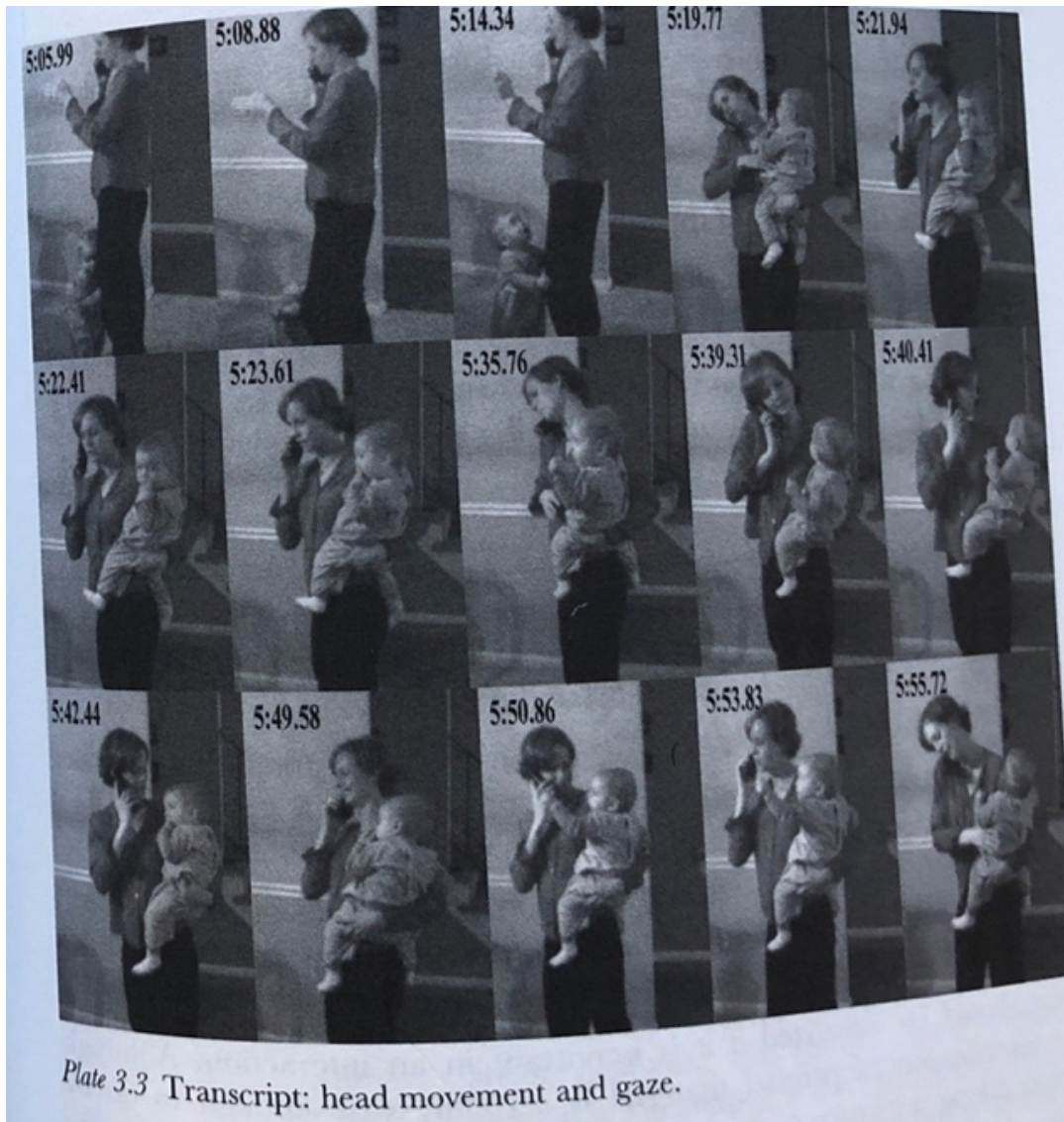


Plate 3.1 Transcript: proxemics and posture.

Appendix I: Transcript, gesture, (Norris, 2004, p. 71)



Appendix J: Transcript, head movement and gaze, (Norris, 2004, p. 73)



Appendix K: Multimodal transcript, (Norris, 2004, p. 78)

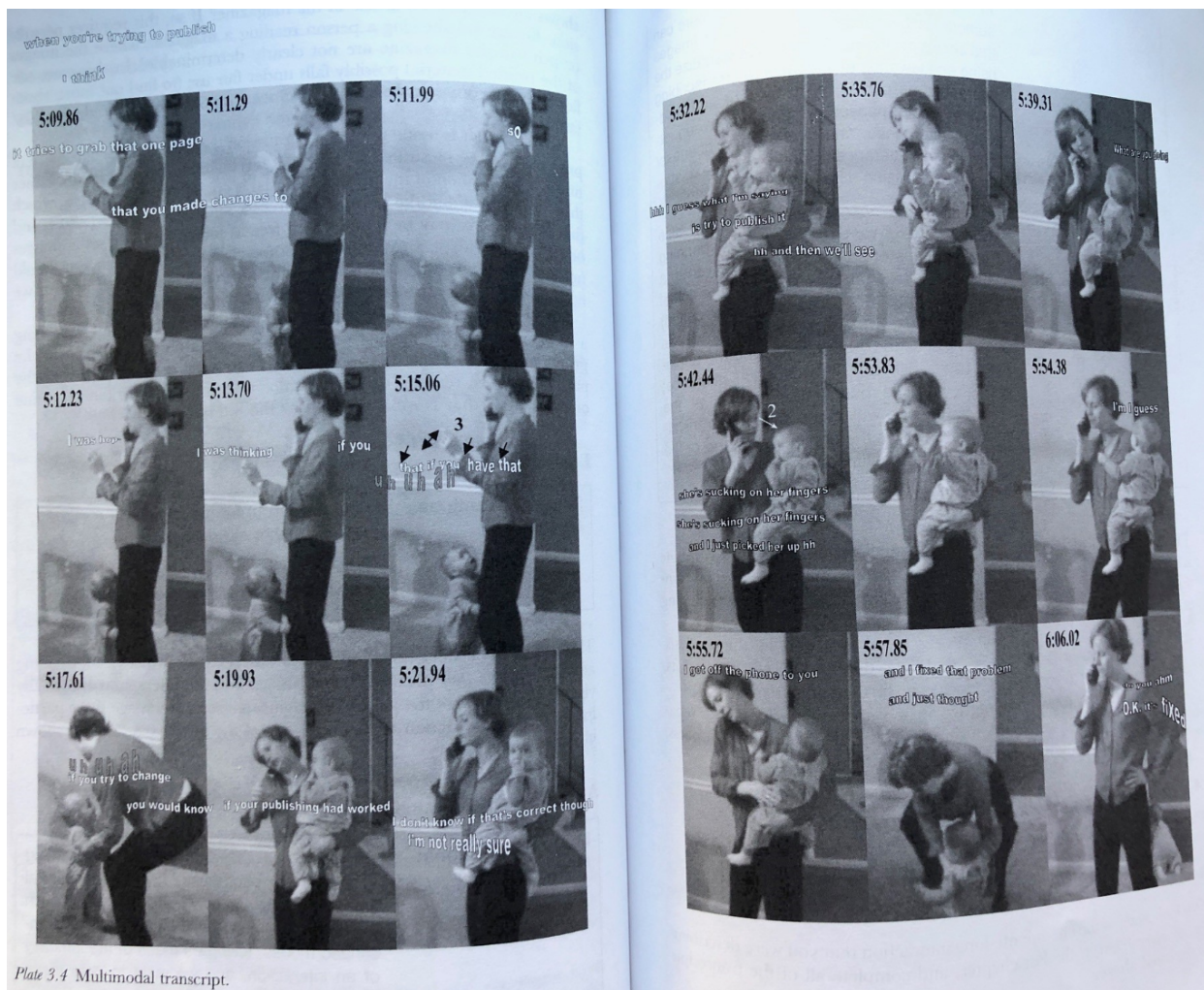


Plate 3.4 Multimodal transcript.

Appendix L: Example transcripts 4 and 5 (Arnold, 2012, p. 17-19)

Example 4.

1.	<(2.4)	<Sebastian aligns wheel>
2. SEBASTIAN;	So that's pretty close>,	
3.	So see if you can –	
4.	just kind of,	
5.	get it perfect.	
6.	So here I'll even,	
7.	<(0.6)	<Sebastian pulls tool into position with
8. SEBASTIAN;	mess it up for you real quick.	right hand and then pulls wheel out of
9.	(0.6)>	alignment with left hand>
10. PACO;	@@	
11.	(4.2)	
12. SEBASTIAN;	There you go@.	
13. PACO;	@@<@@[@@]	<Paco grasps tool and works to align wheel
14. SEBASTIAN;	[Let me gr]ab you a quick	while Sebastian steadies bike frame on
	release for that too>.	stand, then leaves>

Example 5.

1.	<(0.5)	<Sebastian approaches Paco>
2. SEBASTIAN;	'Kay,	
3.	you getting that one b[ack]?>	
4. PACO;	[This] one won't go in.	
5.	<(0.5)	<Sebastian takes parts from Paco, who
6. SEBASTIAN;	Oh yeah.>	steps back, away from bike>
7.	<(3.2)>	<Sebastian checks parts>
8. SEBASTIAN;	Oh yeah,	
9.	cause it's like that.	
10.	So we got to <hold it like that>	<Sebastian demonstrates how to hold part>
11.	<(1.5)>	<Sebastian adjusts parts and tool>
12. SEBASTIAN;	No<w>,	<Sebastian rotates index finger
13.	<drill it in?>	clockwise> <Paco turns screw
14.	(3.2)>	counterclockwise>
15. SEBASTIAN;	O- <other way>.	<Sebastian turns hand clockwise 3
16.	<(5.0)>	times><Paco turns screw clockwise>

Appendix M: Example Multimodal matrix (Doak, 2018, p. 111)






	Student			Teaching Assistant				
	Speech, Vocalisation or AAC	Eye gaze & facial expression	Gesture & object manipulation	Proxemics, posture & haptics	Speech, Vocalisation or AAC	Eye gaze & facial expression	Gesture & object manipulation	Proxemics, posture & haptics
4:52-4:53		On Jane (ctd.)	Upturns palm	(ctd.) Facing forwards, left hand remains resting in raisin space on tray	All gone!	Eye gaze on Luke	Shrugs shoulders	Sitting upright hands clasped
4:53-4:54		Eye gaze downwards towards snack tray	Upturns palm		Gone!		Upturns palms	Reaches to left to lift other student's hand from folder
4:54-4:55		Upturns palm	Upturns palm					
4:55-4:56		Upturns palm	Upturns palm		Gone!		Upturns palms	Facing forwards with left hand loosely resting on PECS folder, right hand on tray
4:56-4:57	Uh	Upturns palm	Upturns palm					
4:57-4:58		Eye gaze on Jane (3 seconds)	Upturns palm		Gone!	Raises eyebrows, looking up	Upturns palms	
4:58-4:59	Gone!	Upturns palm	Upturns palm					
4:59-5:00		Upturns palm	Upturns palm			Eye gaze on Luke		
5:00-5:01	Uh	Eye gaze on snack tray	Upturns palm					

Appendix N: Example multimodal transcription grid (Taylor, 2014, p. 234)

Table 14.1 Multimodal Transcription Grid

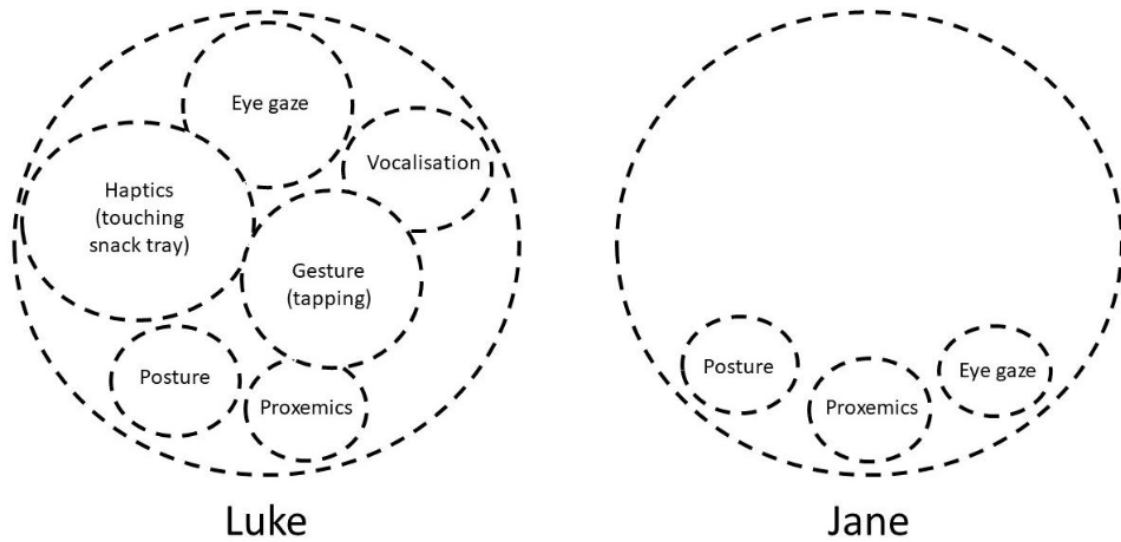
Turn	Speech	Action	Gaze	Gesture/Facial Expression	Posture, Proxemics, Haptics
32	K I'm not a vampire			K fingers in mouth	C stretches hands out to K
33	L they look like fangs				
34	K let's have a look	K Looks in C's mouth	J and L look at C and K	L touches lips	K pushes C's hands back
35	C I haven't got them				
36		K fingers in mouth C fingers in mouth L fingers in mouth	J looks at K		J leans in to look at K
37	K Have you got fangs? (to J)	K turns to C			
38	C I haven't				
39	J kkkkkkkkkk noise	J pulls vampire face	L K C turn to look at J J looks up	J puts 2 fingers momentarily in mouth, shakes head J bares teeth	
40	L I Haven't Mine have fallen out, I think		C K J look at L	J Hand below face fingers splayed K fingers in mouth	J leans to K
41	K Oh I'm a vampire		K looking down C and L look at K		
42	K I'm gonna bite yer	K Biting action to L		K grimaces showing teeth	K bites air towards L L leans back

Appendix O: Example transcription with video stills (Doak, 2018, p. 115)

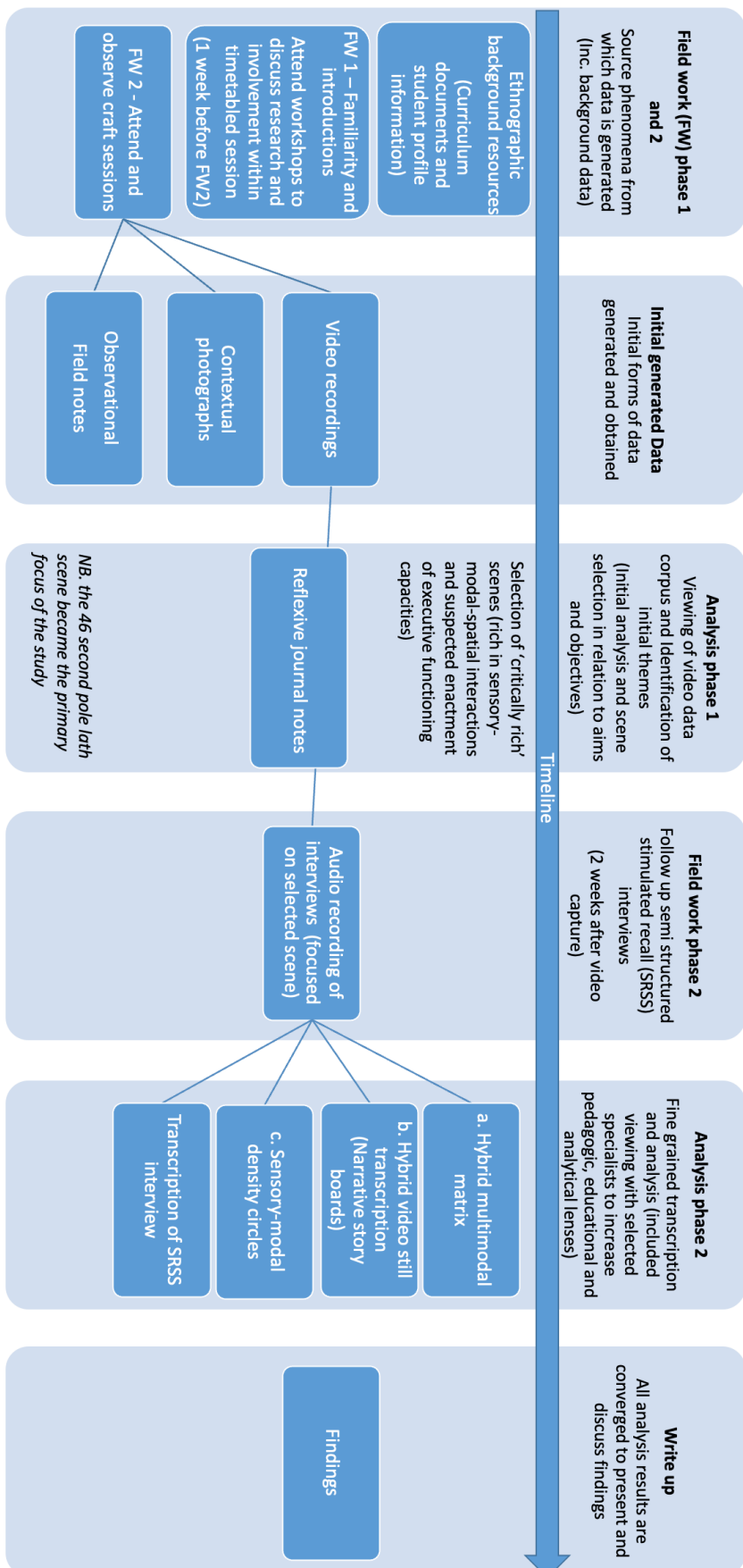
<p>1. Albert is waiting for his turn to come to choose.</p>	
<p>2. The teacher turns to Albert and places the PECS folder before him.</p>	
<p>3. Albert reaches out and selects the 'marshmallow' symbol card.</p>	
<p>4. Still holding the card, Albert shifts his gaze to look directly at the teacher.</p>	
<p>5. Albert and teacher both extend hands for exchange. Eye contact is maintained throughout.</p>	
<p>6. As the symbol is placed into teacher's hand, Albert lowers his gaze.</p>	
<p>7. Teacher says 'marshmallow'. Albert taps twice on card, establishing brief eye contact on second tap.</p>	
<p>8. Teacher says 'please' as a prompt. Albert performs Makaton sign for 'please'.</p>	

Appendix P: Example modal density circles (Doak, 2018, p. 204)

Figure 44: But I'd rather have raisins! (modal density circles)



Appendix Q: Diagram overview of timeline and process of data collection and analysis



Appendix R: Table summarising data corpus overview and how it was used in the study.

Type of data	Quantity	How it was used in study
Video recordings of workshop craft activity/interaction	3 sessions of Green woodwork 45mins-1hr each (GWW) 46 second scene selected and transcribed as described to the right	Provide multimodal data for observation, selection, transcription and analysis, video transcriptions generated from video data; - Multimodal Matrix (General overview of the video scene transcribed into modal/sensory categories) - Annotated Video stills (provide narrative vignette of selected critically rich 26 second scene) - Sensory-Modal Density circles (foreground orchestration of modes/senses in relation to RQs; enactment of EF capacities and agency) Initial notes and time stamps of pedagogically rich moments and observations
Field notes	1 handwritten journal	Provide context of workshop/setting/tools/crafted artifacts
Photographs	5 (Presented in setting/context)	Notes of critically significant observations while viewing the video clip in relation to the research objectives
Reflexive journal	1 handwritten journal	-Provide context and background of organisation, college, curriculum and participants - Exploration of how craft may meet identified needs and aspiration of learners (addressed according to themes arising from video and interview data of student D)
Documents	-PSTE Practitioners guide and GWW curriculum docs -Student profile information for student D (EHCP and LLP individual learning plan)	
Interview with participants: Student D, Tutor and researcher (audio recording)	One 12 min Audio recording Later transcribed	The semi structured recall interview focused on the pole lathe scene - stimulated by playing the 46 second clip and asking semi structured questions with Student D and practitioner in order to member check with participants and gain additional lived experience/outcomes of the craft encounter -Transcript excerpts used in analysis and discussion section to converge with observations

Appendix T: Full transcript of stimulated recall semi-structured interview reflecting on selected GWW pole lathe scene

Stimulated-Recall Semi-Structured Interview Transcript - Student D, tutor, and researcher reflections on the GWW pole-lathe scene, recorded on 13/06/19. (Generated and transcribed by the researcher from the original 12-minute, 48-second recording)

Context: Recorded in the Greenwood Work (GWW) shelter during the same session timeframe and location, one week after video recording of the pole lathe session selected clip. Natural ambient sounds, birds, rustling trees, and the crackle of the fire, formed the backdrop. During this session, we examined and handled the finished stool while viewing the selected 46-second clip of the pole-lathe scene on a laptop, which served as the stimulus for discussion.

Time log	Student	Tutor	Researcher
0.00			So where looking at GWW from the 6/6/19
0.08 - 0.46	Basically I need to make the mistake so I that I know what the person telling me...that i can understand it...if I can't...if I don't make the mistake and you tell me I won't understand what you mean until I do it then I have a better understanding of it.. and also it doesn't matter how many times you talk about it or write about it when it comes to doing the real thing, you know what I mean, its also the feel of it and the sounds, its more than		

	that... its about the sense of it, you can't get that by just talking, you need to do. Plus I am really bad at paperwork, I can't concentrate so it just helps me...		
0.46		What about when you watch me do it, does that help you?	
0.48	..yeah that helps as well, yeah		
0.49	yeah..	but then your keen do it yourself aren't you? Because that is the best way of embedding learning, is to do it yourself?	
0.58	exactly..and the thing is you could tell me a thousand times that.. you know about 'don't do it that way' but until I make the mistake I won't understand what you mean...that pretty much it really, that's why it helps me	yeah..ah	
1.18			what is it about the environment that helps you with that do you think?
1.25	well with me personally I love being outside, I hate being stuck in a classroom I can't		

	handle it...I guess its in an open space.. you know I just like being outside, it really helps me		
			So I have observed you on the video and when I was here last week and this week and what's interesting is, you seem to be able to self-manage, being on different task and then you can recognise it seems when you need a break...so how does that environment help you with that?
	Because everything is not chaotic and overwhelming and not a trapped in feeling..i guess just more relaxing, easier to process and less chaotic		...and what would you say 'tutors name'?
2.09	Yeah..	I think student D...yeah he benefits massively from being up here... he doesn't like being down at college particularly... I think there is a lot of hustle and bustle down there, whereas here all we	

		<p>have got is the sound of the birds, the fire and the smell and if you (directing towards student D) do want to take yourself off, you know that you can just walk outside and your into a woodland aren't you and you have private space</p>	
2.37	<p>..and when I get my name called I just come back</p>	<p>And at college you can't really do that can you..</p>	
2.42	<p>No there is no where to really get away and its crowded and chaotic ..i can't recognise it at the time but I am just so overwhelmed its just like wow...don't get me wrong I still have bad days here but its always less bad days here than college. I have more bad days at college than I do here, and its easier to sort out here as well I would say</p>	<p>..yeah I know where your coming from...yep</p>	
3.07			<p>And how do you think 'tutors name' style of teaching.. or that kind of</p>

			that kind of approach where he is working along side you and showing you things, how does that help you?
	It probably teaches me more patience as I am just dying to do it, but also I guess because someone is physically showing me and also showing me how it feels and because there is not that pressure about messing up I can just make the mistakes and I just feel confident just to do it and make a mistake and yeah, no, I probably learn loads more now by just doing it than I am talking about it because I literally just cracked this out in a day and that's a first for me and I havnt been on it for a while either		
3.48		I think your seeing projects through to the end	
3.50	I am which is greatbecause I couldn't....yeahand when you first started you where having real trouble ... yeah	
3.55	This is probably the first thing I have finished		

4.00	<p>Since the start of term</p> <p>...because I was proud of it then</p> <p>...Yeah I am really proud of it..</p> <p>Yeah</p>	<p>How long did that stool take?... probably at least two full terms and you were not that fussed about finishing it were you until you got towards the end and then you could see... yeah you could see that when you had finished it, It was amazing wasn't it ...</p> <p>And you can see the benefit now of seeing the job to the end</p>	
4.21	<p>I don't know some times I just want to do what I want to but some times when I have to do something just for the task, I don't know maybe it's because when I know I can always just go onto my own stuff, as long as I just do this right it's just fine</p>		<p>So, what gives you that drive? Can I have a look at it?</p>

<p>4.39</p> <p>..Yeah</p> <p>...yeah</p> <p>...well I guess that I know I can just do my own stuff then I don't need to rush because I know I can just do my own stuff, you know, after I have done what I need to do and it just works out that I can focus because I know I can still get to do it but I just need to do this</p>		<p>You do come up with loads of ideas..</p> <p>Some student you don't get that but your full of ideas aren't you..</p> <p>Sometimes you need a hand with working out how we are going to get to the end of that rather than just..</p>	
<p>5.09</p>		<p>Yeah because today, I set up another job for you over there, which was doing the sculpture but you preferred to see that first job all the way through..</p> <p>Yeah..</p>	

	<p>...Yeah I wanted to..</p> <p>Because also doing stuff like that, stuff that I want to do I can still learn certain techniques from doing what I am told to do so I can do what I want to do and know how to have the techniques as well</p>	..yep	
5.28	<p>I guess when I just manage to get started, now because I know that once its done its nice, I just have the determination now to just to not rush but to see it through</p>		
5.37	<p>...I don't know because sometimes imperfection is good because if you do it too neatly people think that it is machine made so sometimes people purposefully do that to make it look like, you know, so people can see</p>		<p>and what happens when you come across like a, because that's quite a knot there isn't it</p>
5.55	<p>.. When I first came here, that's the problem, I did too much and then I had to throw it away but now I have learnt to do, if I am not sure do a lot less because that's easier to fix than doing too much, and I guess with imperfections, I guess I like it and it just represents</p>		<p>I know what you mean but the finish is wonderful ...so when you come across a problem like that that's out of your control</p>

	something about myself and all this		
6.20	<p>...yeah</p> <p>...It's a learning, if I am not sure then I just need to say stop and if I still need to do it then that's fine</p> <p>...yeah</p>		<p>So that's good because what I would say by what you have just described I would say that you have improved your self-monitoring...</p> <p>so you have got that capacity now through kind off doing this craft...</p> <p>that's right yeah</p>
6.32	<p>...yeah because I wanted to put a nice twirl here but I don't want to put a...but the thing is I don't want to do that now because I don't want to mess it up so its fine, its fine how it is...</p>		<p>So you are obviously problem solving by yourself...</p>
6.42	<p>Yeah...</p> <p>I have still got my impulse but I guess that its that if I am not sure I just know how to instinctively stop now, because before I would have just kept going and going but I guess it helped manage my impulse a bit more better</p>		<p>so you know when to stop now?...which is really good, so how would you say that has helped you with your impulsivity?</p>

7.01	<p>...its like a rhythm as well, like a rhythm, so that's what I am doing I am focusing on the rhythm, and you know I am moving so its easier to focus and just get in that rhythm</p>		<p>And I noticed that when you are on the pole lathe...</p>
7.15	<p>..because I could hear it, I could tell when I was going off and that as I could hear it, because when you do it right its like a nice 'shh shh shh shh' and I like the sound and the feel you know so because I know how that feels I like know just by the sound of it and even if I drift off I can tell if I am not doing something right just by the sound of it just by the sound like that</p>		<p>So you appeared very very focused on that pole lathe...</p>
7.37	<p>Yeah..</p> <p>..Exactly yeah, and you carnt get that from writing and also I carnt focus when I have to fit down and write, I find it really hard and then I get more manic</p>	<p>...learning through your senses..</p>	<p>..that's really good, your learning by yourself there aren't you?</p>

	and more chaotic you know but when I am here doing this stuff its easier		
8.00	...well each wood is different some are easier to work, you know mould with and some are easier to cut you know it depends of the grain		So you said you didn't like working with paper so how is it the different materials you work with, how do they, do they teach you different things, how is your experience of working with the different types of wood or the different materials?
8.18	...well wood is softer but still hard but a metal is more rougher and heavier ...well with some you might be able to melt it down but in some if you make a mistake your done, you can try and fix it or your done but in here if you can't fix it you can just use it for fire wood ...no its recycled	What about the difference between using copper and metals an using wood? ... if you make a mistake in metalwork...true its never wasted is it here	
8.48	...signs for the polly tunnels so we know which number is which and that's one of the first projects I worked on that I saw to the end without going on to		So what about your other projects, for example in my observation last week, you where working on, do

	<p>something else, I still got distracted and still took me a long time to do but still even though I got distracted when I came the next day to do it, I still wanted to focus on that</p> <p>...yeah it was my idea yeah</p> <p>Yeah because it was so confusing and I was like, you know what I mean, and even the people who work here find it hard so I was like if we just make signs it will be easier, so if you say can you just wait for me at polly tunnel six and you will know where it is, so its just easier</p>	<p>..and that was your idea wasn't it ...</p> <p>You actually came up with that need for signs ..</p>	<p>you want to describe what you were working on..</p>
9.39	<p>Good I think, yeah no its good because it sought of brought the whole High Riggs together in making of it like the blacksmithing in the woods and wood work so its like both things work together to make it so it was both Green woodwork and blacksmithing</p>		<p>Brilliant, and how is that working between and with different people</p>

	<p>..yeah exactly, basically its all the subjects at High Riggs to help others who are gardening to help that, and its like the High Riggs code to try and do it as naturally as possible you know</p>	<p>...and its helping horticulture</p>	
10.19	<p>No problem that's alright</p> <p>..i guess good, when you think about it and just asks you, you just realise how much you have come on, like massively, it feels like you just don't learn anything until you just do something and then you just think and you realise you have learned something</p>		<p>So thank you very much that's really useful, is there anything else that either you would like to make comment on? Or how has the experience of reflecting on yourself and the experience of seeing yourself ...</p>
10.50	<p>...Exactly</p>	<p>Yeah and its been useful for me to hear your comments about how you learn and how you need to do things practically in order for you to learn...</p> <p>and that has then identified the type of learner...i kind of</p>	

	<p>Yeah, yeah</p> <p>I know yeah</p>	<p>knew that was your style of learning but its good to hear you acknowledging that as well</p>	
<p>11.10</p>	<p>Yeah..</p>		<p>So I can see just from the observations last week and this week that actually you have shown, like through the community project that you have got agency, autonomy and independence to create those ideas yourself, And a good imagination and how you can work together with people which is really impressive and the capacity to put all those different things and materials together to do the project and finish it to the end is amazing and what you have shown today is that your ability to start something by yourself an finish it, and initiating and carrying on</p>

	Yeah...		<p>with that so you showed agency and you have shown your independent working and also your ability to self-monitor and self-manage your impulses which I have been really impressed with, like what I have been impressed with last week and in particular today is that when you have shown to yourself that you have gotten a bit frustrated is to hear that you will take yourself off before you go over the edge if that makes sense</p>
12.15	<p>Yeah if I lose my own temper there is no point as I am not going to do it properly and the thing is I want to do it right so if I am not focused I am going to mess it all up because I am not with it</p>		<p>..and that's such an important skill for life actually, because if we can't do that while we are in the a public situation or a situation where you might have a job in the</p>

	Yeah..yeah		future, if you can recognise when things are getting too much for you and take yourself off and work on a different project, that is one of the most important skills you can have isn't it?
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Appendix U: Sensory first multimodal matrix and glossary

Time (total scene)	Student							Tutor						
	Speech	Gaze, focus and facial expression	Gesture and object/tool manipulation (the planes of space)	Proxemics, Kinetics and haptics	senses: the touch, hearing, balance, movement (proprioception)	Theory/concept (learning)	Environment context	Speech	Gaze, focus and facial expression	Gesture and object/tool manipulation (the planes of space)	Proxemics, Kinetics and haptics	senses: the touch, hearing, balance, movement (proprioception)	Theory/concept (learning)	Environment context
31.03-31.08		Wider gaze observing tutor's full body movement and focusing on the tutor's tool, wooden cylinder (oscillating between peripheral to point focus)				Learning through Mimnesis - Observing new technique - Using executive function 'Working memory', in the information given by the tutor and apply in executing the skill								
31.03-31.08			Hangs back in frontal plane while observing/focusing into sagittal plane	Hands held behind head, gesture towards demonstration	Observes full movement gesture of tutor via peripheral gaze while also focusing on the touch of the tool on the wood providing audio feedback loop	Right ... so when we start 'trekking' Student name ... we do it the same way, we going to push forward like that...	Eyes focused on tool and wooden cylinder (bilateral movement, left foot leading the headle, right hand leading the distal - integrating bilateral movement)	Use of tool/technique communicate through full body, kinetics and haptics, alongside verbal descriptions	Balance and movement of engaging and integrating all three planes of space (feedback) with tool/material/movement interaction focus and grasp into tool/material while stepping rhythmically (skill/tool) (gauge) demonstrating new tool/technique on table, (the second part of the movement is available through tool/material interaction: sensory feedback loop)				Pole lathe faces out towards natural woodland - affording a quiet/calming/individual/non-confrontational work-space, allowing concentration on the craftwork without being distracted from other benches, while connecting the wood being worked on the floor to the second part of the movement (the second part of the movement is available through tool/material interaction: sensory feedback loop)	
31.08-31.11	Ok... Don't do it all for me through		Graps tool from tutor's hands, Steps into frontal/sagittal planes on pole lathe, treatise and engages horizontal with tool on lathe (all 3 planes engaged)	Moves into workspace in front of tutor and Steps towards the lathe, takes tool from tutor's hands		'Initiation', in the students ability, begin the task and activity,	Focus widens to allow student in	Stops using tool, grasp released from tool and handed towards student	Moves by side of student in close proximity in order to allow shared tool use, touches his three fingers (indicating the fingers he is verbally referring to)	well being/life - sensed the agency and concern of the students will to engage and stepped back accordingly				
31.11-31.33		Gaze focused towards finger/tool and tool rest and head moves towards work area as movement begins	Moves little finger onto tool rest and then fingers on top of tool		Sound (hearing)! wood carrying in correct technique is correct, feedback is also correct contact between tool and material also gives consistent feedback of correct movement, balance, flow and technique	'organisation of materials', in his ability to impose order on his work/crafted object	Eyes and gestures focus on the tool/Wooden billet	Tutor provides grasp of the tool edge for the student, lightly guiding (student held distal and with right hand towards wood)					Balance of allowing individual's freedom and agency with semi support of tutor for appropriate technique acquisition/learning.	
31.33-31.39	That's what I did last time... on the other one...	It's head as his focus moves sideways trading tool movement	Twists grasp to the left to allow tool to trade/roll along the wood edge			Split, draw, ability to recall and enact previously learnt skill and apply within another situation		right now just twist it slightly so when angling it into that bottom						
31.39-31.45	Oh... done, done... (tutor comment)... wow	Smiles and relaxes face as head draws back with body	Pulls back tool and hands from work	Steps back from work piece to view completed task	Shows awareness of own competency/learning and pleasure and sense of achievement/well being through successful completion task	Self monitoring! In that the student shows the ability to monitor his own performance and measure it, 'initiation' in the ability to stop his actions at the appropriate time without being prompted		...so you have rounded that end off nicely	Points and touches the completed task on wood					







Glossary of terms
Gaze/focus: where the eyes attention is focused (wide macro gaze to focused micro attention)
Proxemics: Personal space area surrounding the body (Considered extension of self)
Kinesics: Non-verbal behaviour that communicates messages to others via body position, posture and movement
Haptics: Communication through touch, a form of non-verbal communication
Planes of space - Frontal plane: Forwards/backwards and front/back , Horizontal plane: Up and down, Sagittal plane: Left and right
Senses- Touch: Inner sense of where I end and the outer world begins
Life sense: Inner sense of well being and constitutional condition, Movement/Balance/Proprioception: Inner sense of movement

Appendix V: Video stills annotated storyboards

1 of 2 Video still annotated story boards

	<p>31.03 – Tutor explains and demonstrates new tool skill/ Student observes (wide gaze)</p> <p>Tutor begins by explaining and breaks down aspects of new skills before full demonstration</p>		<p>31.06 Tutor demonstrates treadle movement (pushing foot down and pushing gauge into wood)</p> <p>Working memory, in the student's capacity to hold the information given by the tutor in mind</p>
	<p>31.07 cont.. Releasing foot and retracting gauge at the same time</p> <p>Tutor uses complex multimodal orchestration to role model/demonstrate skill/technique</p>		<p>31.10 Student expresses agency to begin task / tutor steps back and allows student into space</p> <p>Student quickly shows understanding of new skill and expresses desire to engage to do it by himself</p>
<p>31.11 Student grasps tool and enters performance space of lathe of own volition</p> <p>'Initiation', in the student's ability begin the task and activity</p>	<p>31.13 Student adopts position (mimesis), engaging tool using new technique/tutor moves to side</p> <p>Tutor response is sensitive and supportive, adopting a position to allow agency while supporting him</p>	<p>31.15 Tutor gently guides student's finger position using gestures, touch and description</p> <p>Attention goes from gaze of wider body orchestration to focus to finer use of proxemics, kinesics, haptics</p>	<p>31.17 Tutor provides accompanying grasp in order for student to focus on fine tune positioning of students technique, grasp and movements</p> <p>Sensitive use of multiple modes to fine tune positioning of students technique, grasp and movements</p>

2 of 2 Video still annotated story boards

			
			
<p>31.19 Tutor encourages correction of finger placement by touching fingers of student</p> <p>Complex multimodal use of gesture, touch, language, proxemics, kinesics and haptics</p>	<p>31.25 Student treadsles lathe down and pushes tool into woodwork</p> <p>'organisation of materials', in his ability to impose order on his work/crafted object</p>	<p>31.30 Student releases treadle while retracting tool</p> <p>Student enacts imitation of tutor's technique / (process of 'mimesis')</p>	<p>31.36 Student tracks and twists tool across woodwork while still operating pole lathe</p> <p>Complex bilateral movements, operating in frontal, sagittal and horizontal planes of space simultaneously</p>
<p>31.40 – student relates technique back to previous experience</p> <p>'Shift' shows ability to recall and enact previously learnt skill and apply within another situation</p>	<p>31.41 Student verbally recognises the technique is almost complete and retracts/stops</p> <p>Self monitoring' in that the student shows the ability to monitor his own performance and measure it</p>	<p>31.42 – Student stops by himself when he is aware of completion via relationship with material/tool</p> <p>'inhibition' in his ability to stop his actions at the appropriate time without being prompted</p>	<p>31.42 Tutor compliments and student expresses wonder/happiness upon completion of task</p> <p>Shows awareness of own competence/learning and pleasure in seeing this</p>

Appendix W: Detailed video still transcription, analysis, and narration of the pole lathe scene.

31.03-31.07 Pole Lathe Scene Narration 1 of 6 Parts



<p>31.03 – Tutor explains and demonstrates new tool skill/ Student observes (wide gaze)</p>	<p>31.06 Tutor demonstrates treadle movement (pushing foot down and pushing gauge into wood)</p>	<p>31.07 cont.. Releasing foot and retracting gauge at the same time</p>
<p>Tutor begins by explaining and breaks down aspects of new skills before full demonstration</p>	<p>‘Working memory’, in the student's capacity to hold the information given by the tutor in mind</p>	<p>Tutor uses complex multimodal orchestration to role model/demonstrate skill/technique</p>

The tutor verbally explains and physically demonstrates the skill. The tutor uses clear, step-by-step verbal instructions with supporting/corresponding gestural prompts for each aspect of using the tool: placing the tool on the tool’s rest at the right angle and position, placing his fingers slowly and sequentially in the right position on top of the tool and indicating the correct grasp, posture, motion, rhythm, direction (downward, forward, and tracking left to right), and haptic hand, arm, and upper body pressure to correctly push the tool to meet the billet of wood, while pushing the treadle up and down with his lower body (leg/foot) to effectively take material off it.




Student D – Stands back, observing the performance of the skill with a wide and focused gaze/line of sight to the various elements being demonstrated (described above).

31.10-3.13 Pole Lathe Scene Narration 2 of 6 Parts

<p>31.10 Student expresses agency to begin task / tutor steps back and allows student into space</p> <p>Student quickly shows understanding of new skill and expresses desire to engage to do it by himself</p>	<p>31.11 Student grasps tool and enters performance space of lathe of own volition</p> <p>'Initiation', in the student's ability begin the task and activity</p>	<p>31.13 Student adopts position (mimesis), engaging tool using new technique/tutor moves to side</p> <p>Tutor response is sensitive and supportive, adopting a position to allow agency while supporting him</p>

31.10 – Student D enters the performance space and grasps the tool from the tutor’s hands, adopting the correct position of his hand on the tool rest (grasping his fingers around the tool). The process of using the tool correctly; the micro movements of his body, more specifically his posture, arms, hands, and micro finger movements, allow the gauge’s sharp edge to meet the wood, taking material off it in the form of wood shavings. Running convergently, the tutor hands the tool to student D and moves out of the performance space to the student’s right-hand side and places his fingers towards the top of the tool and the student’s fingers. After observing and remembering the movements, sequence, and process (enacting EF working memory 31.06), the student enters the performance space of his own agency and volition (enacting EF Initiation) and appears to self-initiate tactile agency by grasping the tool from the tutor’s hand and adopting the perceived correct position of his hand on the tool rest.




31.15-31.19 Pole Lathe Scene Narration 3 of 6 Parts

		
31.15 Tutor gently guides students finger position using gestures, touch and description	31.17 Tutor provides accompanying grasp in order for student to focus on fine tool technique	31.19 Tutor encourages correction of finger placement by touching fingers of student
Attention goes from gaze of wider body orchestration to focus to finer use of proxemics, kinesics, haptics	Sensitive use of multiple modes to fine tune positioning of <u>students</u> technique, grasp and movements	Complex multimodal use of gesture, touch, language, proxemics, kinesics and haptics

The process of using the tool correctly appears to show he was beginning to successfully understand, learn, and enact the gouge skill he learnt through mimesis (enacting EF organisation of materials, 31.25). This student-material interaction is further explored and analysed in more finely grained detail in section 6.3.2.

Running concurrently, the tutor is providing sensitive pedagogical scaffolding and support using complex multimodal orchestration of kinesics, proxemics, haptics, and verbal prompts (31.13 – 31.19), which is further explored and analysed in more detail in section 6.3.1.

31.25-31.36 Pole Lathe Scene Narration 4 of 6 Parts

		
31.25 Student treads lathe down and pushes tool into woodwork	31.30 Student releases treadle while retracting tool	31.36 Student tracks and twists tool across woodwork while still operating pole lathe
'organisation of materials', in his ability to impose order on his work/crafted object	Student enacts imitation of tutor's technique / (process of 'mimesis')	Complex bilateral movements, operating in frontal, sagittal and horizontal planes of space simultaneously

Within this process, the student was successful in operating complex bilateral movements within all three planes/dimensions of space (31.36), allowing for a further layer of

observation and analysis, to foreground not only the senses and modalities that may be associated with the movements, but also the types of potentially therapeutic and developmental movements within spatiality which may be taking place, which is further explored and analysed in section 6.3. For instance, scene 31.36 uses arrows to highlight the student's movements and engagement within the dimensions of space, emphasising the pedagogical significance of the pole lathe's movement affordances within spatiality.

31.40 pole lathe scene narration 5 of 6 parts






31.40 – student relates technique back to previous experience

'Shift' shows ability to recall and enact previously learnt skill and apply within another situation

The student's ability to recall (involving temporality) and relate (via embodied modes) a previously learnt skill towards the enactment of the new modified technique to apply within this new situation demonstrates his enactment of the EF 'Shift' (31.40). He verbally acknowledges and communicates this using language; 'That's what I did last time...on the other one...'.

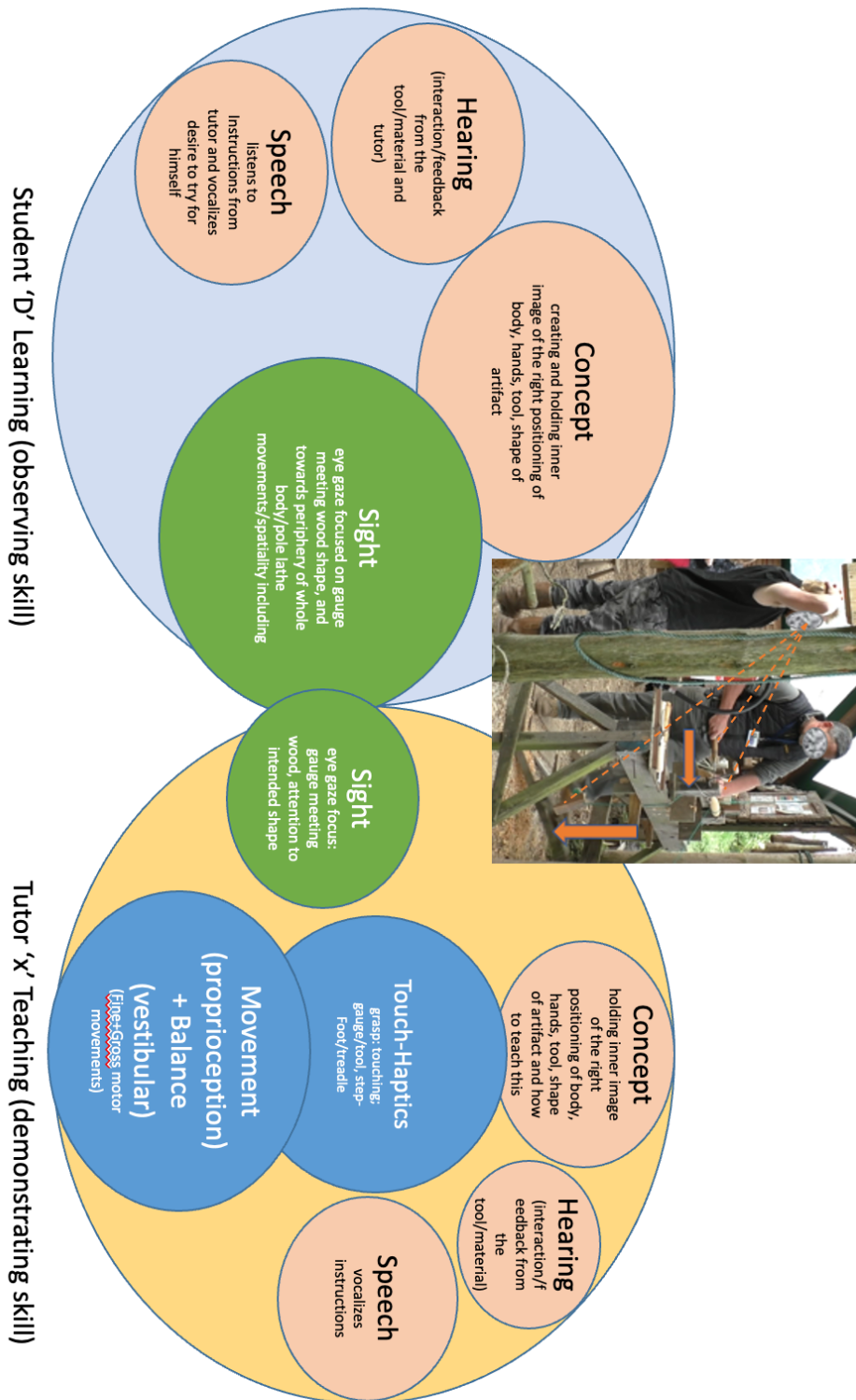
31.41-31.42 Pole Lathe Scene Narration 6 of 6 Parts

		
<p>31.41 Student verbally recognises the technique is almost complete and retracts/stops</p> <p>Self monitoring' in that the student shows the ability to monitor his own performance and measure it</p>	<p>31.42 – Student stops by himself when he is aware of completion via relationship with material/tool</p> <p>"inhibition' in his ability to stop his actions at the appropriate time without being prompted</p>	<p>31.42 Tutor compliments and student expresses wonder/happiness upon completion of task</p> <p>Shows awareness of own competence/learning and pleasure in seeing this</p>

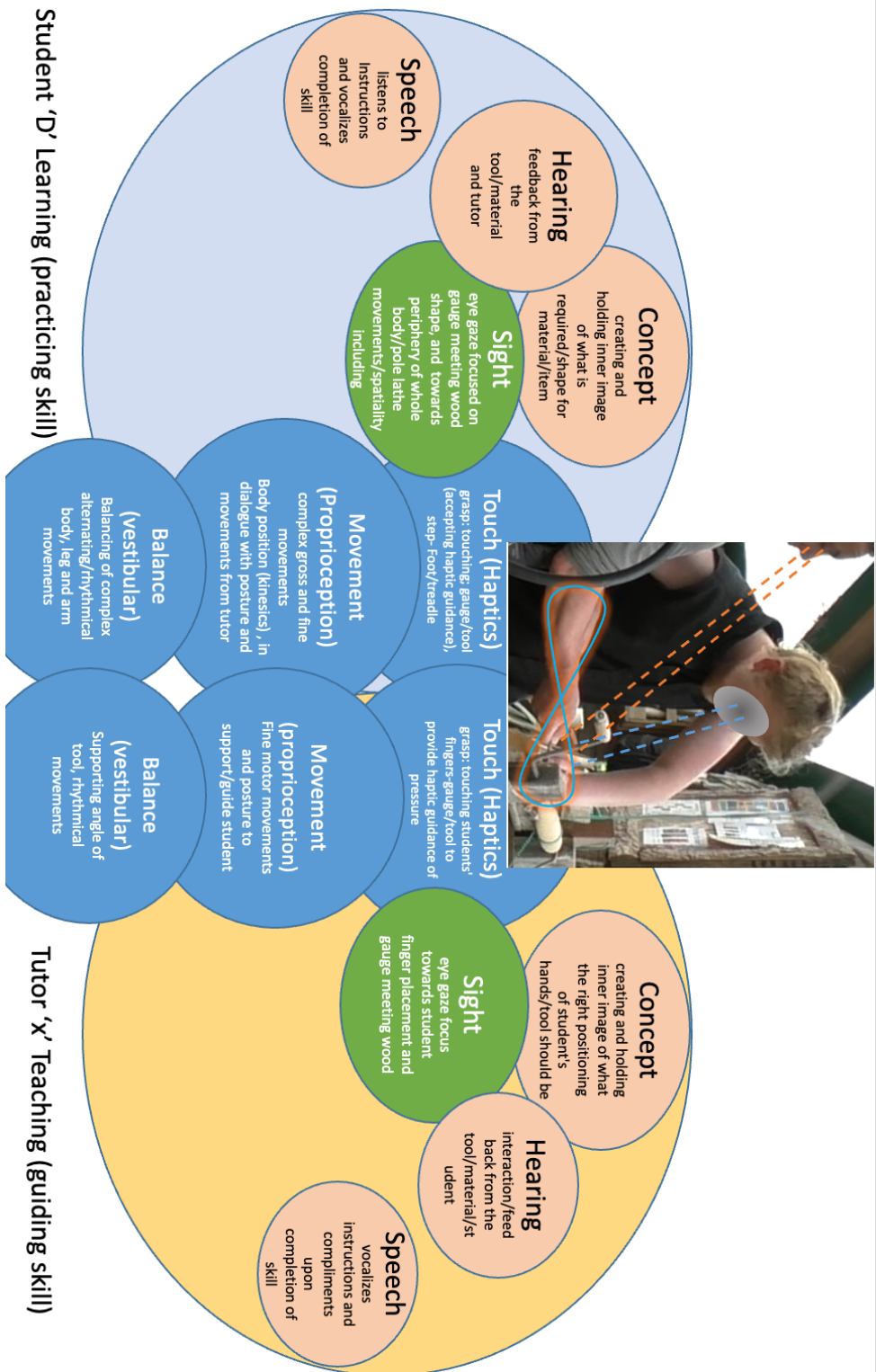
This also sets the conditions within which the student shows the ability to 'self-monitor' (EF) 31.41 his own performance and measure it against his internal image (concept) of what the item should feel and look like. The student's ability to stop his actions at the appropriate time without being prompted demonstrates his capacity for 'inhibition' (EF) 31.42. The scene finishes with the student appearing to take pleasure and satisfaction in seeing his work completed, gesturally (smile and wide open eyes and standing back with open chest posture) and verbally ('wow') recognising his accomplishments enthusiastically and positively, and the tutor also verbally recognising and validating his success ('...so you have rounded that end off nicely').

Appendix X: Full set of sensory-modal density circles

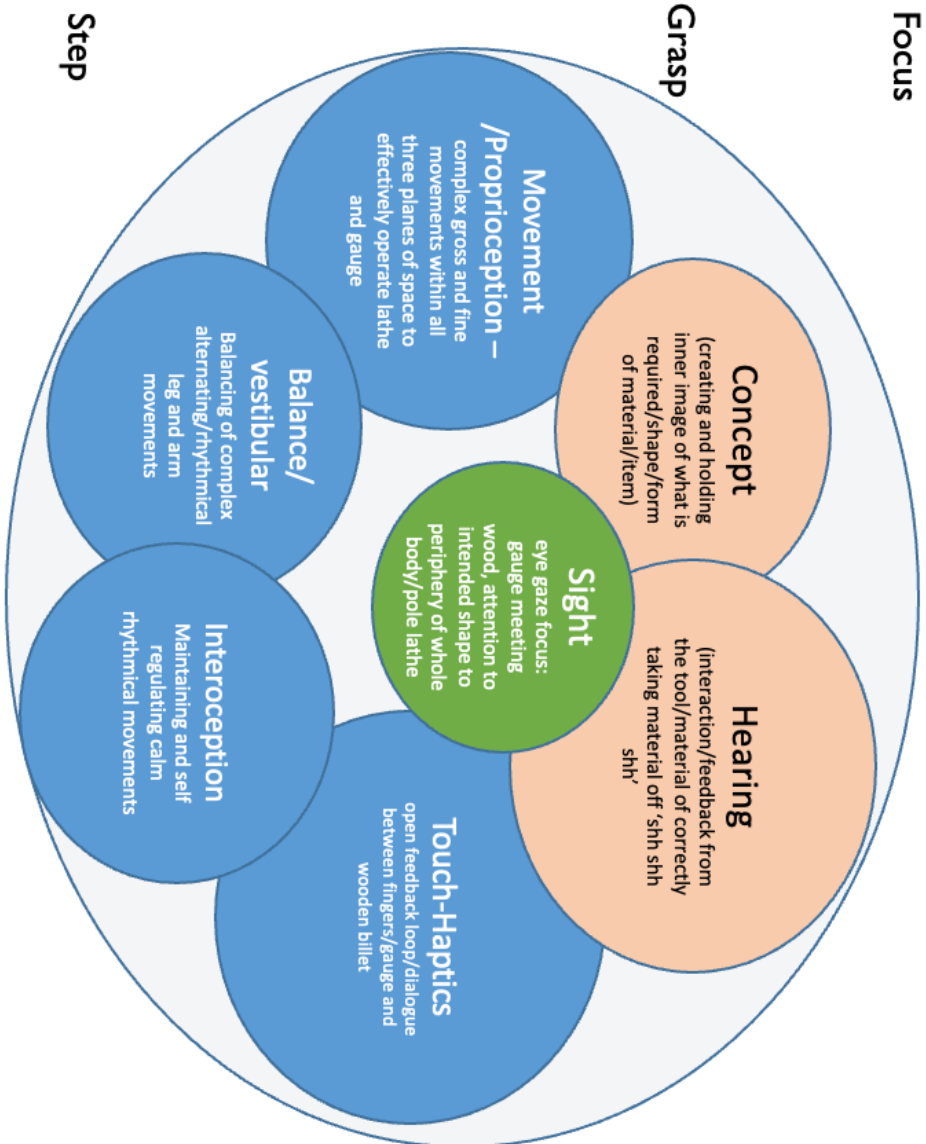
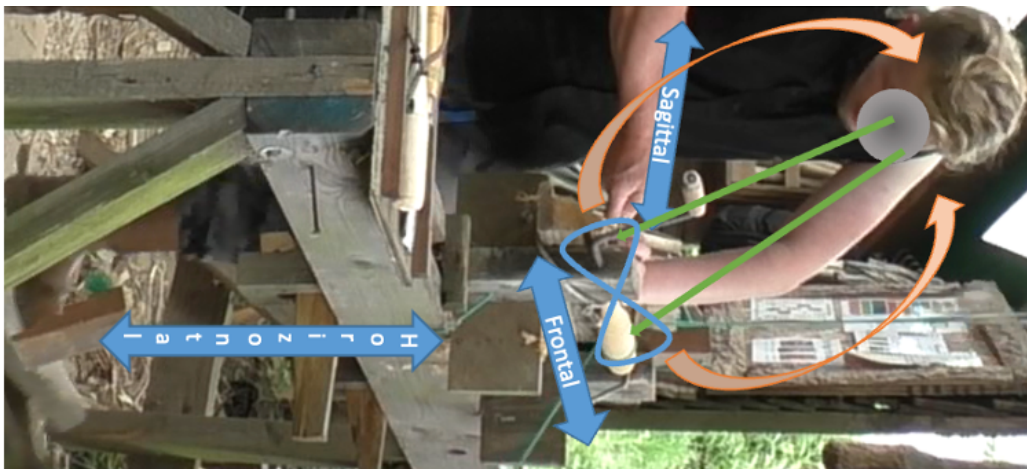
Modal density circles of student-tutor interaction, demonstrating and observing the skills.



Sensory-modal density circles and video still foregrounding the student-tutor interaction of practising the skills with close proxemic guidance.

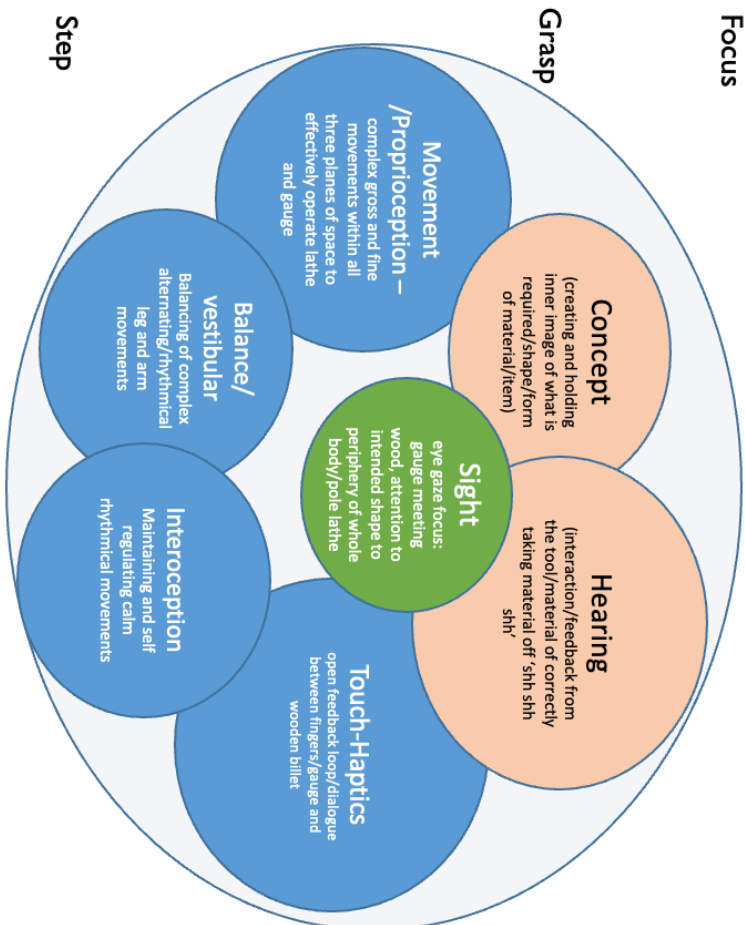
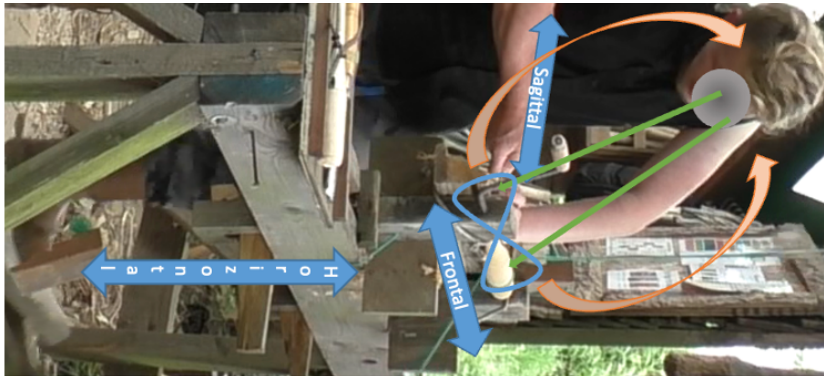


Sensory modal density circles depicting sensory modes and feedback loops involved in the student-material interaction.



Appendix Y: Composite Outputs

Composite image visually foregrounding the sensory, modal, and spatial aspects involved in working memory, self-monitoring, and inhibition within the student-material interactions.



Student comments:

'...it's like a rhythm ...so that's what I am doing I am focusing on the rhythm. I am moving so it's easier to focus and just get in that rhythm because I could hear it, I could tell when I was going off as I could hear it, because when you do it right its like a nice 'shh shh shh shh' and I like the sound and the feel..I know how that feels... just by the sound of it and even if I drift off, I can tell if I am not doing something right just by the sound of it'

Appendix Z: Contextual photographs

Photograph of Green Woodwork shelter and surroundings



Photograph inside Green Woodwork shelter



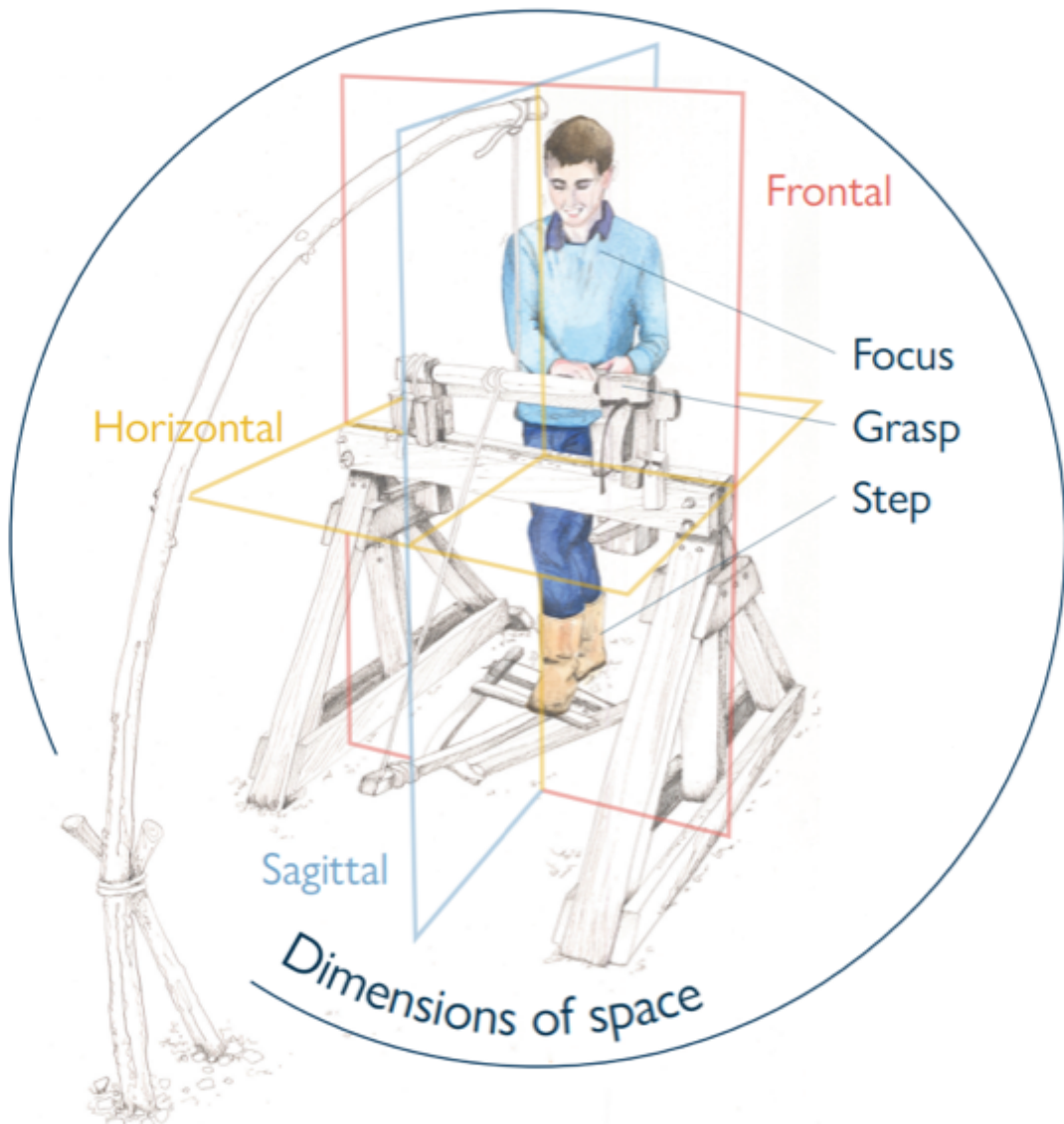
Photograph of pole lathe



Photograph of pole lathe and billet of wood/stool leg



Illustration of a traditional pole lathe in use (Diagram by Dilly Williams).



Photograph of finished 3-legged stool



Appendix AA: Evidence of External Outputs and Impact

Forging Hopeful Literacies 2023 Prize Submission Abstract (awarded the Postgraduate Research Prize at the International Sheffield Literacies and Language Conference 2023).

Forging Hopeful Literacies 2023 prize submission

Matthew Briggs

[email redacted]

EdD, Doctorate in Education

Sheffield Hallam University

Conference paper title: Forging the Self through the Pedagogical Potential of Craft

Craftwork practices and the artifacts produced, provide rich multimodal texts that express and embody a wealth of ideas, beliefs, identities and cultures. This research examines the dynamic processes involved in craftwork which exemplify the relations between mind, body and environment, through the sentient tool wielding body, as described by Marchand (2011). This foregrounds the primordial role of craft as a situation in which multimodal literacies are forged and negotiated. By multimodal literacies, I mean craft artifacts and interactions as a form of text which express meaning. In this way much of our literacies have arisen through craft processes in the liminal space between the transformation of material and transformation of self.

This paper reports on a multimodal analysis of a pedagogical craft activity (green woodworking), exploring the interactions between embodied modes and their contribution towards a sense of self. The purpose of this study is to propose a hybrid multimodal analysis as a tool for practitioners to become more aware and attuned to the agency and capacity forming dimensions of learner's literacy practices. Through the creation of a hybrid multimodal exploration of our dialogues between materiality and individuals, via craft, we can come to recognise the significance that each modality may play in the transmission and acquisition of skills, knowledge and meaning making and draw attention to how this may inflect literacy practices.

The findings contribute towards a conceptual understating of the role of embodiment in education, substantiating viewpoints that students should be provided with real world situated pedagogical environments.

References

Marchand, T. H. J. (Ed.). (2011). *Making knowledge: Explorations of the indissoluble relation between mind, body, and environment*. Wiley-Blackwell. <https://doi.org/10.1002/9781444391473>

Preface page and example of Briggs' authored section (pp. 118–120) from the Erasmus+ CULINECO Handbook (2024) <https://culineco.alta.is/>, illustrating the project's scope and researcher's contribution.

Participants from the project group in Kjerringøy, Norway, September 2022. From left: Morten, Vivi, Ove, Aslaug, Helen, Ragnhildur, Keith, Lars Olav, Matt, Aksel, Matthildur, Børre, Arni, Halldora, Jorunn



Preface

This publication is a major outcome of the [ERASMUS+](#) project “*Cultural Innovation through Ecoprenurship*” (CULINECO). The project officially started in November 2020, and ended in November 2023, including one year “on hold”, due to the Covid pandemic. The aim of the project was to develop a foundation for transformative learning processes in ecological entrepreneurship for schools and for regenerative community initiatives.

The contributors to this handbook represent a truly transdisciplinary consortium of experienced teachers, educators, scholars, community planning consultants, civil society organisations, storytellers and ecopreneurs, from the three partner countries: Norway, Iceland and the United Kingdom.

The coordinating organisation for the project 2020-1-NO01-KA202-076525 is the Norwegian University of Life Sciences, Faculty of Landscape and Society, Ås, Norway.

We would like to thank the Norwegian Directorate for Higher Education and Skills, for practical advice and technical support throughout the project period.

Ås - NMBU, December 2023
Morten Clemetsen
Project coordinator

Corresponding address: morten.clemetsen@nmbu.no
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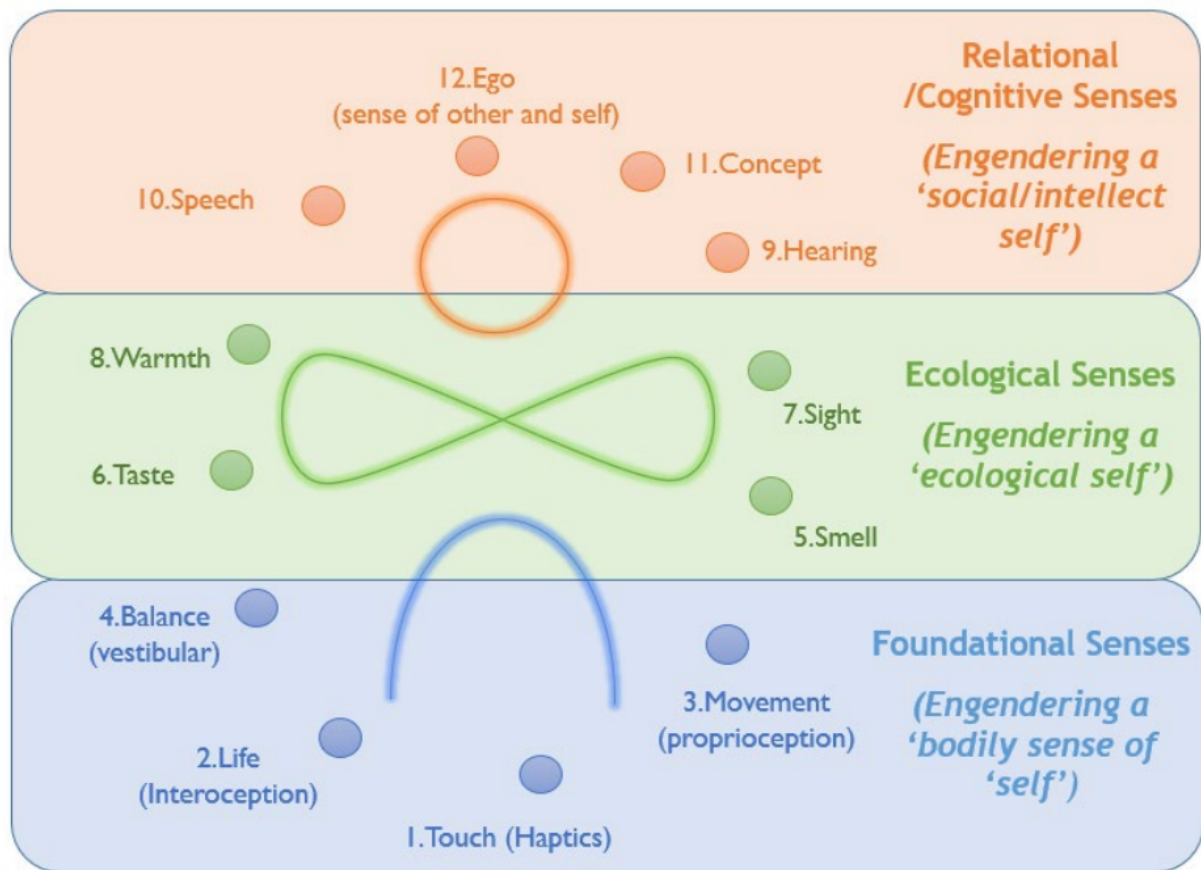
Embodiment of self through the human senses

The capacities developed through craftwork, as presented earlier within Practical Skills Therapeutic Education approach and examples are *self-regulation as autonomy, agency, imagination, innovation, self-reflection and a sense of morality and ethics* (Briggs, 2014). These capacities are more important than ever in helping to develop real meaning and purpose in light of today's sustainability challenges.

The diagram below situates the human senses as one unified conscious embodied sensory organism (Briggs 2023). I have synergised the ideas of Fuchs (2011), Steiner (1916), Thompson & Varela (2001), Williams and Shellenberger (1996) into “modes of embodiment” of the corresponding senses in their orientation towards; (a) the bodily self (blue), (b) the ecological self (green), and (c) a social/cognitive self (orange), using colour to illustrate these dynamic relationships. However, it is important never to forget that the senses often operate in very complex, entangled orchestrations and relationships that go beyond this simplified representation.



Blacksmithing at Brantwood School, Sheffield



By striving for and acknowledging an embodied view of the human being and how we engage, relate, learn and make meaning in the world, we may increase our pedagogical perception and intuition. As practitioners, this may afford us the opportunity of widening our pedagogical toolkit of perspectives, capacities and approaches to education. And in turn it may inform a more holistic curriculum design. How we may curate richer pedagogical experiences and relationships between people, environments and communities.



Gry trying her hand at wood turning at Freeman College in Sheffield.

Screenshot of the BiCCS 2025 webpage showing the abstract and citation for Briggs (2025), *The pedagogical potential of craft*. Biennial International Conference for the Craft Sciences. Version 1. <https://biccs.dh.gu.se/2025/2025-60/1>

Biennial International Conference for the Craft Sciences 2025

Publication date: 2025-09-05

Version: 1 (2025-09-05)

The pedagogical potential of craft

A multimodal exploration of the embodied becoming of agency

Matthew Briggs

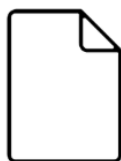
Ruskin Mill Centre for Practice & Sheffield Hallam University.

Abstract

This paper presents preliminary findings from a doctoral research project investigating the intertwined sensory agentic development of individuals through their embodied engagement in craft. The primary focus is on the person-centric potential of craft, which is exemplified through a video-based ethnographically informed case study. The paper reports on the development of a bespoke hybridised multimodal framework designed to illuminate the sensory orchestrations associated with the cultivation and enactment of agency. Specifically, within the provided example, the manifestation of executive function capacities (Diamond, 2013) will serve as the central focus, elucidating how such capacities can be nurtured and facilitated through contemporary pedagogical applications of traditional Green Woodworking practices. Some results are excluded from this paper due to space constraints and relevance to the paper's focus but will be presented in full in the forthcoming doctoral thesis in 2026.

Keywords: craft, multimodality, pedagogical, agency, embodied

Cite as: Briggs, Matthew (2025) *The pedagogical potential of craft*. Biennial International Conference for the Craft Sciences. Version 1. <https://biccs.dh.gu.se/2025/2025-60/1>



Briggs BICCS 2025

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