Grasping the ungraspable. Laying the foundations for an archaeologist's assessment tool for potters' skill using a sensorily informed craftsperson's perspective.

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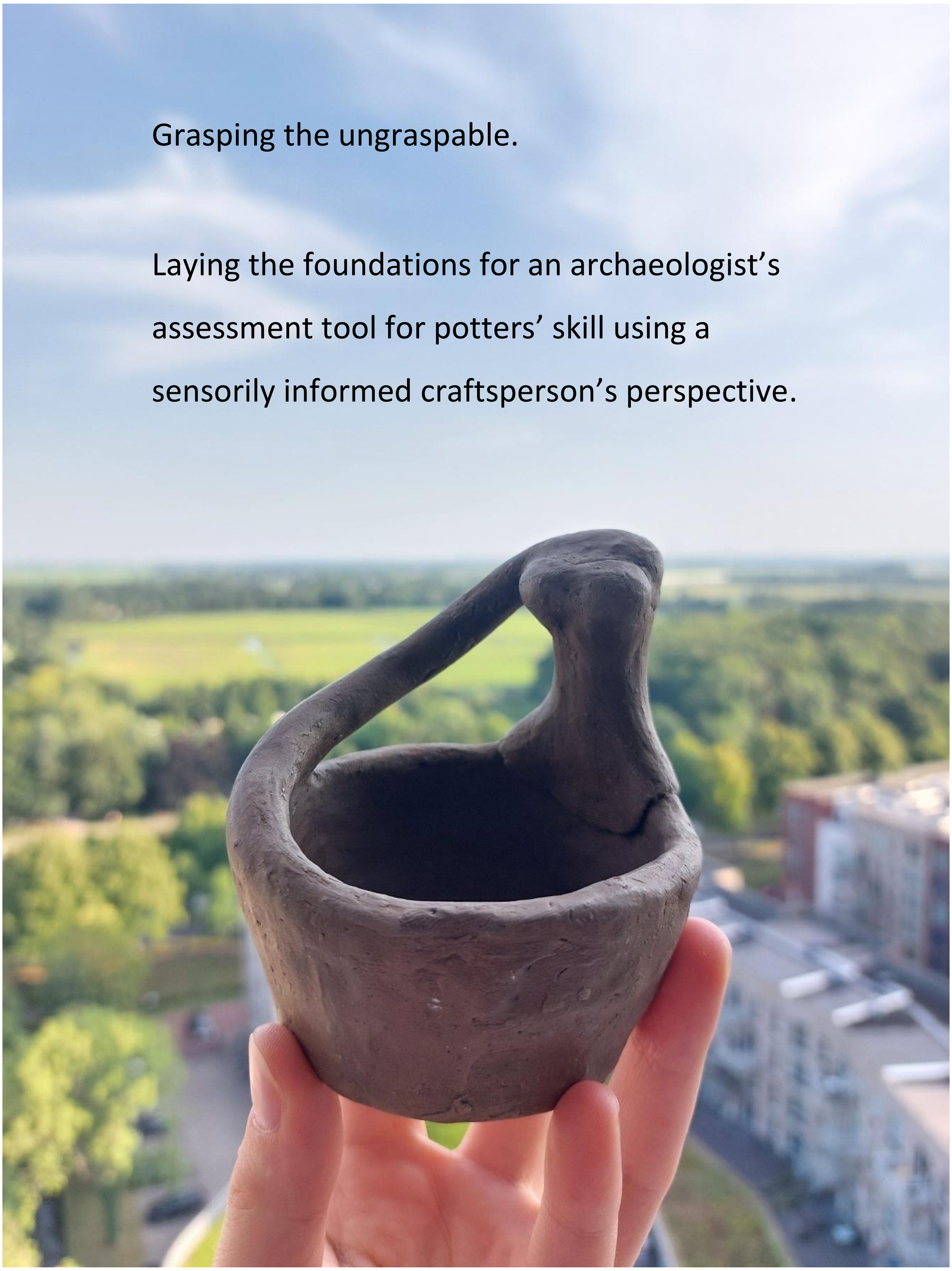

MSc thesis

Archaeological Science

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Archeologie

Figure 1 (front cover image): A hand-formed ceramic vessel that I came up with, and was designed and created by myself. I call it "m'ladypot". At the time of its manufacture, I intended to capture the essence of the intertwinement between a human and the material through which a human might express itself. I did so using a material relatively new to me: clay. Utterly unintentionally, I had captured the very essence of my MSc thesis that I would hand in about a decade later.

Figure 2: Logo of Leiden University, Faculty of Archaeology. (www.huisstijl.leidenuniv.nl).

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“Experience is not a passive interior state, but a mode of active engagement with the world.”

- Alva Noë (2000, p.128) -

Acknowledgements

Supervising a thesis process can be challenging, even more so in light of the many demands university life makes of a PhD / assistant professor already. Upon my return to writing my thesis after a semester of working on an extra-curricular programme, being able to fit me in again for supervision alongside many other master and bachelor thesis-writing students was not a given. Still, Dr. Martina Revello Lami provided me with essential, well-considered, and very valuable feedback, shared in laughter and softened setbacks, and kindly supported me throughout the entire process, including my initial doubts regarding my research topic. For this I am very grateful.

Secondly, I wish to mention here the potters who ever so kindly and patiently allowed me to learn from them more than I could have ever expected. Great thanks are extended to Nirdosh Petra van Heesbeen, Elly van Leeuwen, Roderick Geerts, Ilse Pijper, Hester van Nouhuijs, Diede van Driel, and Matthijs Catsman. Furthermore, my thanks extend to the potters who I did not interview, but who did let me observe them while working.

Several other people supported me during the writing of this thesis. These people kept me grounded, sane, and grateful overall, by showing genuine interest and asking fundamental questions, and by providing me with timely feedback, confusing discussions, and unexpected insights. I will name a few: Louw Feenstra v, Louw Feenstra vi, Louw Feenstra vii, Carla Feenstra – Wagenaar-Hummelinck, Fokko van Duyne, Ermioni van Duyne, Eline Schoonhoven, Bibiana Türkçan, and Tijs Hol.

Important to keep in mind is that the following thesis and, more specifically, its background chapter, guides the reader along just one of many paths to take when looking to grasp skill in craft. Depending on who tells the story, the subject cuts through several academic disciplines. It allows for endless explorations, reflections, and circling back and forth through terminology, thought, and actions. To those interested in a more extensive and elaborated treatment of skill in craft, I would recommend the book "In de vingers" ["In the fingers"] by my grandfather Louw Feenstra v (2021). It was this work that sparked my interest in craft and skill in the first place, and has continued to keep this spark alive for the years thereafter.

Preface

When I started studying archaeology, I did not really know what drew me to it other than that I wanted to study humans. However, I did not want to do this though psychology. I did not think myself quite ready yet for the study of serious mental health issues at the age of eighteen. Nonetheless, I hoped that I could still study humans, but from a little distance for now. This wish led me to the study of artifacts created by humans in the past.

This neatly fit with my general wonder of how humans have come to the point on this planet where they are at currently, in the 21st century. I realised during my first year of study that strangely enough, I never felt as if I were learning about actual people. I found this an odd and misplaced feeling. I was quite literally looking at pictures of someone's physical remains, saw domestic cat paw prints on Roman roof tiles, and learned about a trader's personal finances, intricately pressed into a clay tablet. I did not see how I could possibly miss the past presence of an individual in these items.

I did not manage to lose the idea of there being a remarkable, yet unexplainable (academically induced?) distance between the people of the past and myself. I realised I wanted to know their thoughts, contemplations, reflections – anything, as long as it would enable me to grasp just a piece of past human cognitive processes that had led to the traces archaeologists would find. At their core, there must be some similarities to our current way of engagement with the world around us.

We as modern-day humans experience our sensory perception of our surroundings as very intricate and multi-faceted. This is not a surprise from an evolutionary perspective. A good, adequate perception of surroundings has helped ensure basic survival of any living organism. Thus, adequate sensory perceptive systems are innate and very resistant to change. As such, our modern-day sensory perception must be, in some way, useful in our reconstructing of past human cognitive processes.

When I came across the field of sensory archaeology, it was my hope that a fundamental framework of human sensory perception could inform our understanding of these past cognitive processes. Perhaps, they could even be more accurate than any existing archaeological model on human behaviour, or neatly structured *chaîne opératoires* of production processes in craft. A sensorily informed framework of crafting could allow archaeologists to weave together elements of a past experience in crafting in a way that would help themselves and fellow archaeologists in understanding the production process as an actual process from a craftsperson-centred perspective, rather than as an inferred sum of retrieved parts.

Being familiar with the work of Maikel Kuijpers before this insight, I returned to his idea of the craftsperson's perspective. I now saw it as a framework that bridged part of that gap between objects and their makers by not just tracing back the makers' sensory perception, but reconstructing past embodied processes of material engagement between maker and material. Moreover, he did so from a more individual-centred point of view than I had come across in my archaeological studies thus far. Although the evaluation of human sensorial experience is mitigated by, e.g., physical, sociocultural, and psychological factors, objectivity in sensory experience proved to be a useful analytical tool in reconstructing the cognitive processes occurring in practicing a craft. Perhaps, such an approach could help shed new light on the intricacies of practicing this craft.

I never intended to study ceramics; I wanted to study people. Thus, I found myself studying people through ceramics.

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1 Introduction

1.1 On the archaeological study of ceramics

Ceramics form the first man-made material. Through the firing of dried clay, a ceramic piece is created with distinctly different material properties compared to its original material, clay. The study of ceramic diversity and variability provides archaeologists with insights into virtually all aspects of life in past societies. Luckily for them, ceramics represent the most abundantly present and sturdy category of material culture found in the archaeological record, while being virtually unique in its plastic properties that allow for easily transforming it into new, retained shapes (Browning, 2014). These factors have led ceramics to be the most important material in archaeological analysis (Hunt, 2016). It is this long-standing and continued reliance on ceramics for archaeological interpretations that demands sound, well-understood frameworks to support and contextualize any information derived from them, as well as to strengthen any inferences made based on this information.

1.2 Potters' skill in the construction of archaeological narratives

One topic frequently, but not always clearly, guiding such inferences regarding ceramic variability is that of skill level of the maker (Kuijpers, 2018a; 2018b). Assessments on potter's skill can inform insights into learning processes (Wallaert-Pêtre, 2001; Kamp, 2001; Bamforth & Finlay, 2008; Crown, 2014), identity formation (Crown, 2007; 2014; Mickelaki, 2008; Budden & Sofaer, 2009), craft production (Costin, 2001; Duistermaat, 2017; Roux & Karasik, 2019), and communities of practice within communities (Wenger, 1998; Crown, 2007, Forte, 2019) and in comparison to other communities (Forte, 2021; Sassaman & Rudolphi, 2001), which can be used to study socio-cultural (Budden & Sofaer, 2009; Santacreu, 2017; Gandon et al. 2020), political (Reents-Budet, 1998), and economic developments at large (Vuković & Miloglav, 2018), as well as in tracing technological advancements at various levels in space and time (Roux, 2003; Sofaer, 2010; 2018b; Santacreu, 2017). These insights can be combined into complete narratives for specific periods of time and geographical area (Roux, 2016). Regardless of the type of inferences made based on makers' skill assessments, assigning skill levels to certain groups of people is notably susceptible to cultural relativism (Kuijpers, 2018a, p.1). Such a practice draws on many more researchers' inferences, all of which this thesis does not cover.

1.3 Reevaluating a skewed, skill-based, archaeological narrative

An excellent example of such scientific extrapolation is the craft of metalsmithing in the European Bronze Age. Throughout decades of research, metalsmiths were seen as profoundly skilled, specialist craftspeople having mastered an exceptionally difficult craft, resulting in a heightened, even mystified, social rank in European Bronze Age societies. This perspective has been heavily influencing our past and current perception of these societies and the European Bronze Age at large (Kuijpers, 2018a). Through the development and application of his craftsperson's perspective framework, Kuijpers demonstrated that the foundations of this narrative are in early archaeologists' *subjective assumptions* on the translation of the maker's skill into the final product, rather than rooted in research into *actual* markers of skilful metallurgical manufacture (Kuijpers, 2018a, p. 2-4; p. 25-29).

The scientific search continues for material attributes that could actually be demonstrative of a high level of makers' skill (see "technological signatures of action" in Budden, 2018, p. 370), including reconstructing past craftsperson's choices. However, in-depth research endeavours for (ceramic) craft comparable to that of Kuijpers are lacking, as are applicable frameworks for the use of embodied knowledge (see Groth, 2016, p. 2; O'Brien & Malafouris, 2024) and sensory input in such making processes. Although called for by several researchers (Longacre, 1991; van der Leeuw, 1999; Arnold, 2012, p. xxiii; Botwid, 2013; 2016a; 2016b; for non-ceramic see Ingold, 2000, p. 5), a standardized framework for a potter's perspective on pottery production has not yet been constructed.

1.4 Research questions

Therefore, the main research question is as follows**: *How can skill in the ceramic production realm be captured in an archaeological craftsperson's perspective?***

The following sub-questions will help me addressing the main question:

1) **How has skill in pottery manufacture been studied previously in archaeology?**
2) **How do actual potters view and see skill?**
3) **At which steps in the pottery manufacturing process can the skill of a potter be well-observed? How does this translate into aspects visible / detectable in the finished product?**
4) **How can Kuijpers' archaeological craftsperson's perspective be applied to the pottery manufacturing process?**

1.5 Kuijpers’ craftsperson’s perspective framework

Kuijpers’ framework takes the well-known format of the chaîne opératoire, or step-by-step description of a manufacturing process, as its starting point. Fundamental to his so-called “sensory update” to the chaîne opératoire (Kuijpers, 2018a; 2018b) is the view that craftspeople engage in a continuous conversation with their material to help them decide not just *what* to do with the material next, but also *how* to carry out the following actions in order to achieve the desired end result (Kuijpers, 2018a, p. 75; Thér, 2020, p. 171). Central in the conversation between craftsperson and material is sensory input (sub-)consciously gathered by the craftsperson, and the craftsperson being able to rely on their own embodied knowledge in working with the material (Malafouris, 2013; Kuijpers, 2018a, p. 53-55). For analytical purposes, the sensory experience of the sensory clues that are the most important to the craftsperson are divided into perceptive categories, which correspond to certain sensorily communicated changes in the material’s qualities at a given moment in the production process. Such changes leave permanent traces in the final object (Kuijpers, 2018a, p. 71-72). Through reconstructing the likely perceptive categories a material had to have been categorized in for it to achieve its final look, the craftsperson’s choices in the production process can be retraced (Kuijpers, 2018a, p. 137).

1.6 Research aims

The aim of this thesis is trifold. The first aim is to give an overview and a critical review of previously employed potters’ skill assessment approaches in archaeology. Secondly, I aim to create a description of the wheel-thrown pottery manufacturing process from the multi-sensory potters’ perspective(s) of modern-day professional and amateur potters, including any and all interrelated considerations regarding potters’ choices in their production process. The choice to focus on wheel-thrown as opposed to hand-formed pottery is due to the first kind having a more standardized production process, which makes it easier to study skill therein. The third aim is to lay the foundation for an updated pottery *chaîne opératoire* for wheel-thrown pottery manufacture approached based on Kuijpers’ craftsperson’s perspective framework, which, might serve as an analytical tool for archaeologists seeking to assess skill in ceramic manufacture when presented with (part of) the finished object only.

1.7 Methodology: literature analysis and gathering potters' insights

The methodology for this thesis consists of several parts. Firstly, I will conduct a systematic literature review into previous studies that have been done to study skill in pottery manufacture in an archaeological context. My focus here lies on mapping out the various research perspectives and methodologies that were applied, as well as gaining an understanding of the attributes thought of as demonstrating skilful manufacture in finished vessels. This is followed by the collecting of potters' insights on, and (sensory) experiences with, the wheel-thrown pottery manufacture process, their own considerations before and during manufacture, and their reliance on sensory information therein. I will obtain this data through interviews and observing potters' while working. Finally, the foundation for an updated pottery chaîne opératoire will be pieced together after careful analysis of the description created based on the potters' perspective(s).

1.8 Reading guide

This research is organized in six main sections, starting with the background chapter further divided into four parts. The first part is rooted in philosophy, in which I discuss the constitution of subjective reality through (sub-)conscious sensory perception. After highlighting (challenges in) verbalising (embodied) knowledge, I arrive at Malafouris' Material Engagement theory. Then, in the second part, I present considerations on what skill actually is. Part three follows with a quick overview of relevant epistemological developments in archaeology, leading to an explanation of cognitive- and sensory archaeology and mid-range theory. In the fourth and final part, I explore ways in which to come to an understanding of the view of the craftsperson.

Following the background, I proceed with the methodological chapter by explaining in more detail what Kuijpers' craftsperson's perspective framework is, and how it is applicable to the archaeological and craft record. This is followed by a description of the analytical techniques employed, after which I present the results yielded by the literature review and through interviewing and observing potters.

In the discussion chapter, I discuss and compare these results. After reflecting on the methodology, implications, and relevance of this thesis, I give recommendations for future research and end with a conclusion.

2 Background

2.1 Introduction: from ecology and philosophy to skill and archaeology

This chapter serves as an introduction to key concepts used for judgement of skilled craftspeople, skill development, and the craftsperson's perspective. The chapter can be divided into three main parts: 1) concepts rooted in philosophy, 2) craft skill research within archaeology, and 3) a craftsperson's perspective embedded in archaeological discourse.

1) The first part explains the concept of affordances within one's Umwelt, defined as the environment of any living organism as perceived by itself. This boils down to the subjective constitution of one's environmental reality. What follows is the presentation of different varieties of knowledge that feature prominently in the craftsperson's perspective: tacit knowledge (synonymous with implicit knowledge), (sub-)conscious knowledge, and explicit / implicit knowledge. The potter's use of language is discussed thereafter, which focusses on relative sensory perception (as opposed to objective empirical measured values). It takes us to the concept of embodied cognition, phenomenology, and Material Engagement Theory. Secondly, the chapter reflects on the meaning of doing something well and the quality it entails, the creation of skill through adequate action, attentiveness in action, and physical engagement proper to skill. This implies the description of the trajectory of development from layperson to a skilled craftsperson, a master or even a virtuoso. The section culminates in a definition of skill and the question whether skill in pottery manufacture has been valued appropriately in archaeology at large.

2) After a short digression into archaeological theory, cognitive archaeology, and skill and craft research, I move towards an epistemology of crafts trying to circumvent the 'gap' between the largely subjective nature of craft knowledge (both tacit or even impossible to verbalise at all) and empirical, say scientific methods. In order to try this nonetheless, I propose to turn to the ones that have and hold this kind of knowledge: the potter, or even better still the teaching potter or the (teaching) practitioner-researcher.

3) I then introduce the craftsperson's perspective framework as developed by Kuijpers (2018a), including a technological roadmap as part of an archaeologist's toolbox towards quantifying

the skill of the maker. This will be the runway for the experimental endeavours presented in this thesis.

2.2 Key insights from philosophy

2.2.1 Affordances

In the middle of the last century, ecological psychology viewed the world through a mechanical lens following the bead theory. According to this theory, perceptions and actions were thought to be part of a self-sustaining chain reaction (Holt, 1973, p. 160, after Withagen et al., 2012, p. 1). Animals reacted in logical, predictable ways upon stimuli from their Umwelt[1]. Further nuance was given by the Gestalt psychologists such as Lewin and Koffka, who stressed that the environment could "demand" actions from an animal. Examples include water's demand for a human to drink it (Koffka, 1935, after Withagen et al., 2012, p. 251; Withagen et al., 2012, p. 251).

Gibson revolutionized this worldview arguing that environmental stimuli do not dictate animal's behaviour in a natural cause-and-effect way. Rather, the environment possesses *affordances*. Affordances constitute entities offered to the animal by its Umwelt of an animal, "what it *provides* or *furnishes*", be it for example food or a friend, positive or negative (Gibson, 1986, p. 127, *emphasis in original*, after Rietveld & Kiverstein, 2014, p. 328). Gibson further notes that "Affordances do not cause behaviour but constrain or control it" (Gibson, 1982, p. 411, after Withagen et al., 2012, p. 252). Thus, it is up to the animal to make use of the possibilities and to interact or engage with it or not. The Umwelt becomes a place where actions *can* take place, but it does not *demand* to act.

Affordances exist in a "richly structured environment", in which "the whole organic being (indissolubly mind and body)" lives (Ingold, 2000, p.4). In this context, the organism chooses to interact with the environment or not. In a ceramic production realm, a potter might choose to use or not use a specific type of clay, for instance. Affordances can be thought of in the broadest sense, as multiple actions might be undertaken using the same affordance (Reed, 1993). For example, moist clay allows the potter to pinch the clay, but also to push, pull or drag it. The nature of the potter's action depends on what the potter is capable of doing in relation to the affordances the clay offers (cf. Gibson, 1986, p. 129, after Withagen et al., 2012, p. 251), and the affordances of the clay may

[1] The term 'Umwelt' was coined by the Estonian biologist Jakob von Uexküll in 1934 (von Uexküll, 2010, after Schroer, 2019). It refers to the world surrounding a living organism, as perceived by this organism. Central to this term is the idea that the Umwelt differs between organisms. For example, a human might see a tree as a natural shadow place, while a bird might see it as a safe place to land, protected against ground predators.

change in response to the potter's actions enacted on it (see Groth & Kimmel, 2024). The skilled potter will undertake different actions compared to a layperson, or perform identical action with superior effects.

Affordances always exist according to Gibson, irrespective of whether an organism acts on them or uses them, or not. Indeed, even if the organism does not notice it as all. Thus, the potter might notice an affordance or not, and use it or discard it. The notion of affordances thus takes us to perception.

2.2.2. Perception

2.2.2.1 Perception: subjective experience and objective 'reality'

Perception is defined in this part as an openness to affordances as defined above within the Umwelt of the organism which is studied (cf. Rietveld & Kiverstein, 2014). The 'organism' I study is the potter, its Umwelt is the potter's workshop, and the potter's affordances are within that environment. This seems quite simple. Perception, however, is an area of study of its own, heavily drawing of philosophy of mind, cognition, psychology, and neuroscience with topics such as senses, 'reality', and many more.

Acquired truths are processed in a way unique to the organism at that time, place, and in that cognitive state, based on all of its past experiences. Naturally, the experience of the same sensorial information can differ greatly per organism, leading to a differently construed reality, and one needs to be aware of this when doing research drawing on subjective experience.

2.2.2.2 Sensory perception

A more extensive dive into this topic falls outside of the scope of this research, so I will keep to a few key points here, coming from Feenstra.

The widely known and accepted framework of the (only) five human senses stems from Aristotle. He described that these senses may work together to form a complete perception through the workings of an overarching sense, the *sensus communis* (Feenstra, 2016, p. 31). Philosophers and later natural scientists, too, however, have acknowledged and accepted the existence of many more senses and sensory systems in the human body. Depending on the exact definition used, some examples of additional senses would include the senses of balance, time, and the physical placement in a room, up to the endocrine system and the immune system (Feenstra, 2016, p. 21-25). The various biophysical and philosophical workings of the senses all function together to form a complete, conscious perception.

These (sub-)conscious processes create, shape, and influence (the experience of) sensory perception (Feenstra, 2016). Thus, retracing the constitution of a (sensory) experience poses not only quite an epistemological, but also a linguistic challenge (pers. comm. Feenstra, 19-7-2025; see 2.2.3.1.2 For lack of better words: explicit and implicit knowledge).

2.2.3 On the art of knowing and recalling, the knowing body, and Material Engagement Theory

In sections 2.2.1 Affordances and 2.2.2. Perception, I have briefly touched upon possible actions within the Umwelt to a living organism and the construction of reality. I will now concentrate on the different shapes of knowledge and skill a person draws on when moving through its private, subjectively formed reality and engagement with its Umwelt and affordances.

2.2.3.1 Tacit knowledge

When existing within its Umwelt, a person gathers, stores, and recalls information in variable ways. Different shapes of knowledge, a variety of interactions with different entities in its Umwelt, funded in the person's body and related to many systems within the person's body such as consciousness, agency, creativity, and intentionality have all been topics of interest and research (see Grant, 2007; Wallis, 2008; Malafouris, 2008, 2013; Sajama & Kamppinen, 2013; Zahavi, 2018, Ihde & Malafouris, 2019; Feenstra, 2021). These topics have been discussed extensively by philosophers, psychologists, and neuroscientists.

Currently of interest for this thesis is the idea that some knowledge is tacit, or silent. "Tacit knowledge is knowledge that *cannot* be articulated", in the clear words of Turner (2023, p. 182, *emphasis in original*). The concept of tacit knowledge was coined by Polanyi (1958; 1966, after Lynch, 2013, p. 56), later also referred to as implicit knowledge, and continues to be a topic of exceptional interest in a diverse array of social, cognitive, and management fields and more (Lynch, 2013, p. 56).

Many scholars have debated what exactly falls under tacit knowledge, to which degree different kinds of knowledge are tacit, how tacit knowledge presents itself, and the extent to which it actually *can* be expressed verbally, i.e., made explicit (see Johannessen, 2022; Turner, 2023). A general division, practical and satisfactory for the current purpose, can be made by seeing non-tacit and tacit knowledge as dichotomic terms (see Table 1). As will become clear later in this chapter and throughout the rest of this thesis, understanding the complex interplay of knowledge taking place in the potter acting out their craft is done best through approaching it as a *combination* of both tacit and non-tacit knowledge. The following sections (2.2.3.1.1 Knowing and/or doing: (sub-)conscious knowledge; 2.2.3.1.2 For lack of better words: explicit and implicit knowledge) deal with some of the descriptive terms used in the table, including (sub-)conscious, (embodied) cognition, explicit / implicit, and verbally (in-)expressive.

Table 1: Dichotomies that can be used to characterize two kinds of knowledge. (Adapted from table 2.1 in Kuijpers, 2018a, p. 20 and figure 14.2 in Kuijpers, 2013, p.138. After Apel, 2008; Budden & Sofaer, 2009; Ingold, 2000; Dobres, 2010; Pelegrin, 1990).

Non-tacit knowledge	Tacit knowledge
Beliefs	Actions
Brain-knowledge	Body-knowledge
Conscious	Subconscious
Cognition	Embodied cognition
Etic	Emic
Explaining in words, descriptive	Acting from experience, tacit
Explicit	Implicit
Knowing-that	Knowing-how
Non-discursive	Discursive
Objective (universal)	Subjective (context specific)
Purpose orientated	Action orientated
Static	Fluid
Structure	Agency
Technology	Technique
Theoretical	Practical
Top-down approach (abstract)	Bottom-up approach (concrete)
Verbally expressible	Verbally inexpressible
What we expect	What they did

2.2.3.1.1 Knowing and/or doing: (sub-)conscious knowledge

The dichotomies listed above strongly reflect Cartesian views on mind vs. body, humans vs. nature, which have been widely disputed and rejected in modern times (see Knappett, 2005, p.5). With current insights, we recognize that nuances exist in this framework of opposites and that the borders between different types of knowledge can be blurry and overlapping. For instance, knowledge can switch between levels of consciousness. This becomes particularly apparent when learning a new skill. The process can be illustrated through the Conscious Competency Model (see Cannon et al., 2010; Das & Biswas, 2018) that is now commonly used for personal and professional development in teaching and business fields (see Figure 3). It closely resembles the idea of cognitive integration. This refers to the adopting of thoughts and behaviours until they become internalised through repetition and potentially through external forces, up to the point where they become habits. Typical of habits, they may be carried out subconsciously (Menary, 2007). They have been integrated into the *modus operandi* of a person, as Ingold would put it (2000, p. 5; see also Kuijpers, 2018a, p. 52-53).

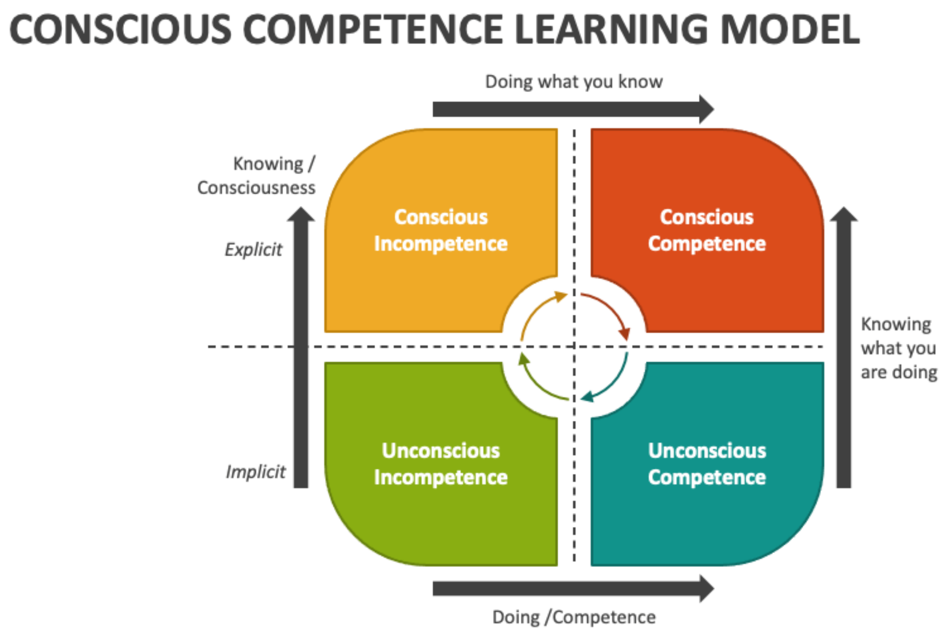


Figure 3: A visualization of the Conscious Competence Learning Model. (www.collidu.com).

2.2.3.1.2 For lack of better words: explicit and implicit knowledge

A similarly blurred line exists between implicit and explicit knowledge. Even when seemingly made explicit, Polanyi recognised persisting limitations to articulation hindering verbalising some pieces of knowledge (1966, p. 9, after Turner, 2023; see also van der Leeuw, 1991, p. 11-12; for an interesting reflection on conveying meaning through ceramics following an adaptation of Polanyi's scheme for production of speech, see Medbo, 2022, p. 324-328). In some cases even, verbal descriptions of actions can get unclear so much that others have a hard time repeating the action upon only reading a written description of it. A quick demonstration with or even without a few words of explanation would be a much clearer, more direct way to convey even more knowledge (see Feenstra, 2021, p.78). This is no different in craft, where some actions can be understood easily by simply watching the teacher perform certain actions in a certain way. Such "silent study" is even typical of "master-apprentice seminars within arts and crafts" (Botwid, 2016a, p. 43). Words may help to explain considerations that are not made visible directly, bringing implicit knowledge to the fore in the form of explicit knowledge. That what we would see as tacit knowledge thus turns out to be at least partially expressible verbally (see also Puusa & Eerikäinen, 2010).

Perhaps then, we may widen our scope of what we see as explicit knowledge. I have come to understand this as the information that reflects the piece of knowledge that is to be conveyed in the closest way to the 'truth' as possible – wrapped in words, as determined by those who study it. However, Molander notes, fittingly, that "knowledge as expressed in practices and their results is often the most explicit, and verbal descriptions the most implicit." (2018, p. 6).

Moreover, it is not always desirable to attempt to articulate all there is to know. Those who are very good and experienced at performing certain actions, do not feel the need to verbally explain their knowledge in minute detail. Indeed, they are not able to explain or express the full extent of their performances in words. Those who are not, are generally not helped by pages of descriptions and instructions to the most basic of actions (see Feenstra, 2021, p. 78-79).

2.2.3.2 Speaking of which: craftsperson's language, Weber fractions, and approximation

The question rises, then, how the craftsperson – in this case, the potter – *does* talk about their craft, actions, and material. They do this through approximation (Pye, 1995, p. 30, after Kuijpers, 2018a, p. 48). The reason behind this lies in the way they receive the type of information they use in acting out their craft: through sensory input. As I described in sections 2.2.1 Affordances and 2.2.2. Perception, sensory input allows the potter to recognize the affordances of their Umwelt, tools, and their material. These always exist, regardless of the potter's ability to recognize them. However, the experience of this input and the reality construed from it are highly subjective.

While recognizing the challenges in quantifying sensorial input through relying on self-reporting of people, the field of neuroscience can help shed light on the quantification of the interaction between a person and an object or material. The increased sensory attunement characteristic of craftspeople is noticeable in an increased ability to detect small differences in sensorial stimuli. Such differences are measurable and quantifiable using principles from natural sciences, more specifically the Weber fraction and the just noticeable difference. The Weber fraction can be defined as follows (Colman, 2015, p. 818):

"In psychophysics, [the Weber fraction is] a ratio, differing from one type of sensory experience to another, representing the smallest increment in the magnitude of a stimulus that can be detected under ideal testing conditions, and that is a constant for each type of sensation according to Weber's law."

The smallest detectable increment in stimulus magnitude forms a sensory threshold or a just noticeable difference.

What the Weber's law tells us is that the consciously perceived sensory input always reflects a range of *absolute* differences. These are understood by people in *relative* terms. People can feel an object to be *relatively hotter* or *colder to the touch than* another object, but they will not describe it as exactly 2.6 degrees warmer or 6 degrees colder. A craftsperson in continuous dialogue with the material they are working with, is thus always collecting *relative* information on the material's physical properties.

2.2.3.2.1 Making sense of differences

Relative comparison relates craft with the continuous everchanging Umwelt conditions, such as affordances and constraints in a workplace: materials with (slightly) unstandardized properties – 'natural imperfections', tools wearing out, temperature, humidity, light conditions etc. Even the intentions of the craftsperson during the process of creation may adapt to the 'response' of the material. Most of these environmental changes are slight, but may have consequences.

Therefore, 'hard' scientific criteria and exact statistics favoured by the material scientist may work with measurable increments so small that they lose their meaning to the craftsperson (see discussion in Kuijpers, 2018a, p. 116-117). The craftsperson (sub-)consciously applies embodied, experiential knowledge that researchers lack. The craftsperson (literally) incorp(s)orates[2] sensory differentiation. Researchers should be aware of these discrepancies, although probably slight. Manufacturing

[2] The craftsperson not only adjusts their (re-)actions based on differences in sensory input, but also integrates this sensory input into their embodied knowledge, coupled to adequate responses of the craftsperson. Sensory diffraction thus shapes the craftsperson's embodied knowledge, situated in the body, or, in Latin, *corps*.

processes should be taken as recipes (Kuijpers, 2018a, p. 48; Feenstra, 2021, p. 78). In summary: 'All craft […] is approximation." (Kuijpers, 2018a, p. 57) and the language of the potter differs inherently with that of the scientifically trained researcher (Botwid, 2016b, p. 71-72), as does their understanding of the same processes.The craftsperson's perspective will be discussed in section 3.2 Introduction to quantifying skill: a craftsperson's perspective).

2.2.3.3 The knowing body: embodied cognition

So far, the body has been viewed as a sensing 'tool' almost as a cognitive person. While not untrue, it does not cover the complete story. For millennia, scholars have pondered the complicated relations between body and mind from most diverse perspectives. Modern research has seen research focusing on embodied, embedded, enacted, and extended cognition, taken together as "4E cognition[3]" (see discussion in Newen et al., 2018, p. 3-4). This subject still continues to spark academic debate (Menary, 2010, Newen et al., 2018; Carney, 2020; Aagaard, 2021). A few semantic examples are presented next as a useful starting point.

The Dutch expression 'iets in de vingers hebben' ['to master something'] means to have a 'grip' or 'grasp' (Schaaf et al., 2019, p. 1), which is used to describe the possessing of a high level of skill. It furthermore carries the meaning of the completion of '*getting* something in the fingers' as the result of training a skill. An action, if countless times repeated, gradually causes the body to 'just know' how to perform that action spontaneously and unconsciously (Oosterling, 2016; see the concept of cognitive integration (Menary, 2007)). This could be anything, from walking to wheel-throwing a pot and performing a martial arts routine (Oosterling, 2016). Embodied cognition "arises from bodily interactions with the world" (Thelen et al., 2001, p. 1). According to 4E cognition thinking, knowledge may be situated in the (knowing) body [embodied], embedded in the body and its movement schemes [embedded], performed with or through the body [enacted], and extended in the environment or Umwelt [extended] (Feenstra, 2021, p. 126).

2.2.3.3.1 Phenomenology of perception and the blind person's walking stick

As 4E cognition may be considered as a phenomenal approach, I will present a very short introduction to the topic.

[3] The term '4E cognition' comes from the four beginning letters of the types of cognition that are understood to fall under the collective terminology of 4E cognition, being embodied, embedded, enacted, and extended cognition.

“Phenomenology is the study of structures of consciousness as experienced from the first-person point of view. The central structure of an experience is its intentionality, its being directed toward something, as it is an experience of or about some object. An experience is directed toward an object by virtue of its content or meaning (which represents the object) together with appropriate enabling conditions” (www.plato.stanford.edu). In simplified terms, it is “primarily interested in the *how* rather than in the *why* of objects” and how an object “shows or displays itself, i.e., in how it appears” (Zahavi, 2018, p. 9). It is therefore important to be aware of phenomenological thinking when theorizing about a person’s perspective.

Interest in the application possibilities of phenomenology to other fields saw a notable increase in recent decades. It has been applied by archaeologists and much debated (see Tilly, 1994; Fleming, 2006; Hamilton et al., 2006; Tonner, 2011; Johnson, 2012; Hamilakis, 2013; Tilley, 2016; Kuijpers, 2018a, p. 69-70; Skeates & Day, 2019, p. 1-14; Sulzmann, 2019).

The phenomenologist Merleau-Ponty, reflected extensively on the processes of perception, consciousness and cognition. In his *Phénoménology de la perception* he introduces the example of extended physical consciousness. He illustrates this through referring to the tip of the blind person’s walking stick. To the brain of the blind person, the point of touch is replaced to the end of the stick, rather than the fingertips (1945). Merleau Ponty’s explanation has been referred extensively.

The conclusion is drawn that the margins of consciousness cannot be drawn sharply. Merleau-Ponty and Malafouris – to whose Material Engagement Theory I shall turn hereafter – share the opinion that the physical consciousness of the blind person is extended, incorporating the stick as a part of the perceiving body (Feenstra, 2021, p. 125). Although seemingly a philosophical theory only, neural networks have been shown to actually change and hold an updated map of the body schema including the (reach of the) tool (Maravita & Iriki 2004; Forte et al., 2025).

2.2.3.3.2 Material Engagement Theory

Like the walking stick, any crafting tool becomes an object of extended physical consciousness (Kuijpers, 2018a, p. 51-52) and therefore also becomes part of the intricate 4E cognition processes. In this way, the border of the knowing body is, so to say, extended into and with its Umwelt. As explained before, these types of cognition are not taking place nor is it stored neatly inside the brain (inter-cranially). The relevance of this type of knowledge for crafting has inspired Malafouris to reflect extensively on knowledge processes taking place between the craftsperson, the craftsperson’s material, and the craftsperson's Umwelt (see Malafouris 2008; 2013; 2014; 2020; O'Brien & Malafouris, 2024). Central to his academic endeavours is the study of cognitive processes that readily occur while practising a craft. In his words: "In tool making, most of the thinking happens where the hand meets the stone." (Malafouris, 2013, p. 236).

The same reasoning applies to manufacturing pottery; most of the thinking happens where the hand meets the clay. This is also the material that has led Malafouris to the creation of his MET ten years after using the potter's clay as a case study for embodied cognition (2008). "The plastic and additive nature of clays and pastes makes pottery highly sensitive to physical alteration" (Santacreu, 2017, p. 105), which makes it highly suitable for researching human-material interaction.

Most important for my study is Malafouris' idea that people are influenced continuously by their Umwelt and vice versa through engaging with it. Indeed, as he states, the environment becomes permeable (Malafouris, 2013, p. 2). Craftspeople are continuously entangled with their material and are therefore deeply cognitively shaped by their craft. The way they understand 'their' material, their craft, and their body within that craft, including all of their different kinds of knowledge, is therefore also shaped through them enacting their craft.

He also proposes a word to verbalise "thinking (and feeling) with, through, and about material things": 'thinging'. This word represents a situated, contextualised flow in crafting. Within the realm of thinging, Malafouris divides special attention to the creation of forms of materials and tools required for that. The process of forming something he sees as "profoundly embodied, situated, and assembled from a variety of material resources spanning the boundaries of the potter's brain and body." (Malafouris, 2014, p. 142-143).

2.3 What is skill?

This section deals with the nature of skill of a craftsperson. When not specified otherwise, skill in craftspersonship is discussed, or at least skill involving handling of a material, tool, or object.

Recognizing a skilled craftsperson at work is not difficult. They move quickly, precisely, goal-oriented, and the results of their actions look nearly perfect to untrained eyes. Their hands may seem to be able to produce just about anything the craftsperson can think of. Yet grasping, measuring or even quantifying skill proves to be much more challenging (Hurcombe, 2000; Ingold, 2000; Dobres, 2006; Budden and Sofaer, 2009; Sennett, 2009; Kuijpers, 2018a; Feenstra, 2021).

Albeit frequently discussed in passing and much more frequently implied, the topic of skill in craft in and of itself has gotten not too much academic attention from an archaeological perspective. This has changed in the wake of the post-processualism movement in archaeology, situating social individuals and their experiences at the centre of archaeological research. I will return to a more in-depth analysis on the research history of skill in archaeology in section 4.1 Results for sub-question 1: How has skill in pottery manufacture been studied previously in archaeology?). For now, I will briefly introduce some important thoughts about skill.

2.3.1 Doing something well

The difference between doing something and doing something *well* can be placed on a more gradual and multi-dimensional scale of "*level of ability* or expertise in doing things with the affordances of the environment" or "*resourcefulness*" (Rietveld & Kiverstein, 2014, p. 326, *emphasis in original*). *Sensu* Rietveld and Kiverstein (2014, p. 334), skill refers to the degrees to which:

1) One recognizes a set of opportunities to use the affordances of a material
2) One possesses the ability to make use of these opportunities
3) One engages in the opportunities that benefit one the most in attaining one's goal

Regarding the third point, mentioned implicitly is the capacity to mentally plan out the (non-) desirable consequences at later stages in the production process of:

- engaging with a specific affordance, such as eliminating the possibility of engaging with other affordances later in the process,
- the specific way in which the engagement will take place,
- the results of these actions during the production process, and
- the results of these actions in the final product.

Thus, what I would add to the abovementioned list by Rietveld and Kiverstein is the degree to which:

4) One engages with the correct affordances in the optimal way(s) for attaining one's goal (see Lehoërff, 2018, p. 76), while simultaneously overseeing the consequences at later stages in the production process and in the final object of their actions and the way they were carried out.

The potter's goal may be to create a high-quality end product. However, the quality of an object should be compared with the standard of the time, place, and socio-cultural context (Kuijpers, 2018a, p. 43-44; p. 76).

2.3.2 How to become skilled: action adequacy, attentiveness in action, and training it physically

Over time, and with practice, adequate engagement with material affordances starts taking place more and more automatically. The act of (non-)engagement and its timing becomes more refined, and increasingly attuned to details within the situation at hand; the (non-)acting individual engages with affordances in an increasingly skilled way. Ingold tells us that:

"skills are not transmitted from generation to generation, but are regrown in each, incorporated into the modus operandi of the developing human organism through training and experience in the performance of particular tasks." (Ingold, 2000, p.5).

This process is never finished. Skills are not static attributes to a cultural group or a skilled person, but rather a dynamic array of ways to engage with a given environment.

Teachers can aid in identifying useful affordances to engage with, which are more inviting than others (see Withagen et al., 2012), and the ways in which to engage with them. They can:

"…assist infants [students] to detect the dynamic coupling of affordances and bodily abilities. . . [They] elicit/promote action by directing infants [students] to notice specific elements, relations, or events over the myriad other possibilities available" (Zukow-Goldring, 2012, p. 573; see also Bruineberg & Rietveld, 2014).

Put into practice, one can think of a pottery teacher instructing their student how to move their hands in such a way that the clay moves upward and keeps its desired shape in the process, rather than creating uneven wall thickness and an unsymmetrical shape. It is this attention to the correct affordances and changes therein that stands out in Molander's understanding of skill, namely as:

"a form of attentiveness in practice… Attentiveness lives by differences, seeing differences and producing differences" (2018, p. 1).

Under the influence of Cartesian dualism, and seeing reflected in these last quotes, skill is easily seen as a mostly cognitive process. Yet the exercising of a skill also fundamentally revolves around "a physical, sensory engagement with materials" (Kuijpers, 2018a, p. 46, see also Malafouris, 2014; 2020). This engagement is ongoing, like a continuous negotiation. The material responds to the craftsperson's action, which changes the craftsperson's idea of what they can and want to do, to which they adjust their following action(s). The material responds again, and so the feedback loop continues. It is in this process of exercising (potentially) skilful actions on a material where the skill learning and training takes place, in direct interaction and negotiation with the material. The physical and sensory experiences and engagement should therefore be considered as a core pillar of an understanding of skill in the context of this thesis.

2.3.2.1 Levels of mastery

Skill levels follow a gradual scale and spectrum. That depends on everything already discussed from material selection, along the complete process to the final product. Kuijpers distinguishes four levels of skill (2018a, p. 231-232)[4]. I almost literally quoted his descriptions of these levels here:

- **Amateurs**: their products demonstrate basic knowledge of the craft, but little refinement. The manner in which certain techniques are applied displays little appreciation of the material, and beginners' mistakes occur.
- **Crafts(wo)men [/ Craftspeople]**: those who have mastered the craft. Their skills have become fully embodied but do not stand out. They produce mostly unoriginal objects at a standard quality. Imitation and repetition are important characteristics of this group.
- **Master crafters**: these individuals produce near-perfect products – though not necessarily original. The potential, limitations, and risks of the material with which they work are clearly appreciated and techniques are adjusted and applied accordingly.
- **The virtuoso**: these individuals are capable of creating original[5], even unique objects by using unconventional techniques. They explore the very limits of the material.

The growth from layman to skilled craftsperson is presented in Table 4. 'Skill' is visualized in an oval without a clear outline; fuzzy and extending in many directions. Engagement, technology, tools, and technique are overlapping, thus are not eclosed, too.

[4] Kuijpers discerns "crafts(wo)men" as a distinct group united by skill level. I have been and will be using the term "craftspeople", unspecifying gender, for all those who regularly spend time crafting, be it professionally or not, as agreed upon with Kuijpers himself (Kuijpers, pers. comm., 4-2023).

[5] Although I understand where Kuijpers comes from, I would argue that originality and uniqueness in a finished product do not have to signify a high level of skill per se. Indeed, having a lower level of skill will result in making more (grave) mistakes during production, which likely leads to a product very clearly deviant from the norm. It will possibly have been subject to attempted reparations using potentially unconventional techniques – making it unique and thus, original, in shape, form, and technology used. What I think Kuijpers means here as characteristic of a very high level of skill is the *control* the craftsperson had over the material while creating new shapes and techniques, exploring the limits of the material, and successfully mitigating the changing affordances of the material, themselves, and the Umwelt in the process. However, originality implies creativity, too. This is another topic entirely that is highly relevant to archaeological interpretation (see Withagen & van der Kamp, 2018; Sofaer, 2018), but which I will not cover in this thesis.

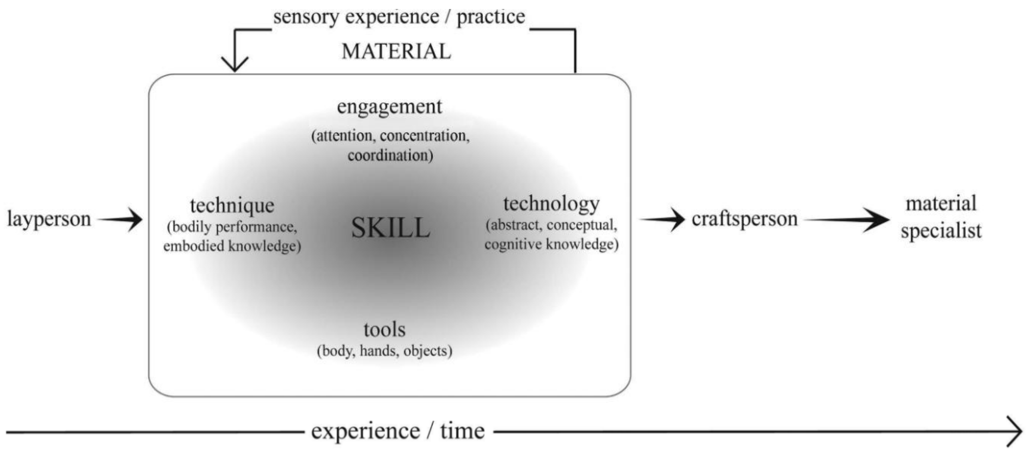


Figure 4: The transformation from layman to skilled craftsperson. (Kuijpers, 2018a, p. 42, including adaptions from Kuijpers, 2013).

Another way to view the rise from layperson to skilled craftsperson is as a "hermeneutic *spiral*" describing an "apperceptive", "recursive", and "vocational" process (Kuijpers, 2018a, p. 56, *emphasis in original;* see Figure 5) Kuijpers mentions the essential parts of skill development: sensory handling, reflection, cognitive knowledge, and embodied knowledge of material. Herein, reflection is closely related to attentiveness to differences as described by Molander (2017, p.1).

Figure 5: The transformation process from layperson to skilled craftsperson as a hermeneutic spiral. (Kuijpers, 2018a, p. 56).

2.3.3 Defining skill

Seen the fairly recent research interest in skill in and of itself and the required interdisciplinarity for such research endeavours, multi-faceted definitions of skill as a whole are sparse. Oftentimes, specific elements of skill are highlighted only.

The most well-rounded definition of skill I have found so far comes from Kuijpers, containing four key characteristics of skill (2018a, p. 41):

1) "MATERIALS - Skill entails an engagement with material in terms of recognition and response through hands-on experience.
2) SENSES - Skill is fundamentally dependent on the senses.
3) TOOLS - Skill involves the body as/and tool(s); foremost the hands[6].
4) APPERCEPTION - Skill is apperceptive and draws upon both explicit cognitive knowledge as well as embodied knowledge in a recursive manner.

Apperception here refers to the fact that the information that is perceived (e.g., an aspect of the material the craftsperson is working with at a given moment) is taken up by the person perceiving and enters an already existing interpretative framework. The latter differentiates (regular) perception from apperception. In the case of apperception, new information can be integrated in the person's previously existing knowledge. A situation is then created in which (becoming) skilled craftspeople learn in and from creating, and create in learning, continuously switching between these, perceiving and creating differences (see Molander, 2018, p. 9).

2.4 Archaeological theory, cognitive archaeology, and skill and craft research

Sections 2.2.1 Affordances and 2.2.2. Perception have explored several key concepts and ideas useful in understanding the concept of skill, drawing on insights from ecology and philosophy. I will now turn to the fields of archaeology and anthropology. After giving a short introduction to the field of cognitive archaeology in relationship to skill, I will discuss the writings of cognitive archaeologist Malafouris about his Material Engagement Theory. These sit at the intersection of archaeology,

[6] The English word 'manufacture' stems from the Latin terms 'manus', meaning 'hand', and 'facere', meaning 'making', and can, thus, quite literally, be translated to 'hand-making', or handicraft (www.online-latin-dictionary.com)

philosophy, and anthropology and have greatly influenced academic thinking about skill in the last decade.

2.4.1 Cognitive archaeology

Cognitive archaeology follows processual archaeology research traditions in taking material remains as a starting point from which further inferences can be made about past cognitive processes (e.g., Renfrew, 1993; 1994). It then seeks to connect these to theories from the behavioural-, philosophical-, and neurosciences, incorporating the strongly self-reflective nature of post-processual archaeology in its analysis. Such theorizing creates so-called 'middle-range' or 'midrange' theories (Currie & Killin, 2019, p. 4).

A cognition-centred archaeology is commonly applied in reconstructing (changes in) cognitive ability and skill of (early) humans in deep history (see Renfrew, 1993; 1994; Davidson, 2010; Coolidge & Wynn, 2016). As such, much academic debate in craft-oriented cognitive archaeology has revolved around the development of cognitive frameworks regarding lithic craft (see Schlanger, 1996; Dobres et al., 2006; Bamforth & Finlay, 2008; Mahaney, 2014). The study of ceramic craft has taken a different direction regarding mostly the application of cognition-centred frameworks, focussing on cultural transmission and craft learning (Bamforth & Nyree, 2008, p. 12; for examples in ceramic studies, see Crown, 2001; 2007; Eerkens & Lipo, 2007, Bowser & Patton, 2008; Roux, 2016; Dulbunova et al., 2023).

4.2.2 Technique versus practice: epistemological division

Another field of study that has been concerning itself with the concepts of embodied knowledge, skill, agency, materiality and Malafouris' Material Entanglement Theory, taking a more experimental and self-reflective research approach, is the field of design, and arts and crafts, dominated by Swedish researchers (Groth, 2016; Heimer, 2016; Medbo, 2022; Westerlund et al., 2022; Nimkulrat & Groth, 2024; for doctoral dissertations on this topic, see Botwid, 2013; 2016a; 2016b; Groth, 2017, Li, 2023). Archaeologists and arts, crafts and design researchers are now seeing increasing opportunities to connect their analyses regarding skill in craft manufacture (see Talaga et al., 2021: Westerlund et al., 2022). The connections are sought *despite* fundamental historical and epistemological divide in their understanding of technique and practice, let alone research traditions and discourse[7]. Table 2 gives a very brief, but effective summary of "a nuanced conceptual dyad of embodied "technique" and "practice"" dividing scholarly research from fields such as archaeology and history from those of the fields of arts, crafts, and design (Talaga et al., 2021, based on work by Foucault and Crossley[8]). The technique-centred approach can be related to an etic perspective, whereas the practice-centred approach can be related to an emic perspective.

Table 2: A summary of the conceptual dyad of embodied technique and practice. (Talaga et al., 2021, p.166).

Technique	Practice
Knowledge	Action
Repeatable	Unique
Transmissible	Ephemeral

However, Spatz (2015, p.41) states that:
"[Similarities between practices] can be seen as an area of technique, or as the **knowledge** content of specific practices. In other words, the relationship between technique and practice is epistemic."
In the context of this thesis, it suffices to say that this insight allows researchers to reconstruct past lived experiences, and thus experiences in the practice of crafting, through relying on
"the same **knowledge of what is reliably possible** given the similarities we find in our bodies and environments." (Spatz, 2015, p.41).

It is following this line of thought that firstly, the development of a craftsperson's perspective, to be used in archaeological analysis, is theoretically possible and useful. Secondly, it also allows the technique-oriented researcher, such as the archaeologist, to gain a more reliable understanding of the human experience in, and of, past craft practice, which can be used to more accurately reconstruct past craft production processes. A completely truthful reconstruction is inherently impossible (see the discussion on authenticity in the reconstruction of embodied practices in Talaga, 2021, p. 171-174), but a framework aimed at reconstructing an "affordance landscape" (Talaga,

[7] Constrained by the focus and size of this thesis, I will not dive further into this most interesting topic. For a concise account of relevant diverging epistemological developments and a convincing discussion of how they might converge, see Talaga et al. (2021). For more a critical note, see Alberti (2018) and Molander (2022).
[8] No references were provided in the article. Talaga et al. mentioned that "ideas from Foucault's diachronic analyses of embodiment as an interplay between power and knowledge and Nick Crossley's concept of body-mind interactions "by indirect means"" shaped the discussion that is summarized in Table 2.

2021, p. 174) would be most insightful in this regard. This brings me to section 2.4, in which challenges, opportunities, and a helpful field in archaeology for the construction of such a framework are discussed.

2.5 The view of the craftsperson

In this section (2.4 Archaeological theory, cognitive archaeology, and skill and craft research, I will demonstrate that such a framework centred on the experience of the craftsperson, situated in its landscape of affordances, is called for by both archaeologists and arts, craft, and design researchers, and that archaeologists might approach such a framework through a sensory approach of the archaeological record.

2.5.1 Towards an epistemology of skill in craft

Not only does the proposing of a craftsperson's perspective follow logically from epistemological developments in- and outside of archaeology, but it also reflects the demand for such a framework. A call for an archaeology of action by Longacre (1991) and involving the potter's point of view on pottery production (van der Leeuw, 1999) have since been echoed in by others, for example by anthropologist Ingold who envisions "…a perspective which situates the practitioner, right from the start, in the context of an active engagement with the constituents of his or her surroundings." (2000, p. 5). In a similar vein, design researcher and practitioner-researcher ceramist Groth mentions a current "lack of a comprehensive empirical model for how the designer or craft practitioner uses his/her embodied knowledge in his/her design or making process" (2016, p. 2). After a long career as an ethnoarchaeologist, Arnold strongly emphasises involving the potter's perspective in reconstructing pottery manufacturing techniques (2018, p. xxiii). An experienced potter herself, Botwid, likewise strongly emphasizes the wealth of additional information to be extracted from pottery upon assessment by a skilled potter (2013; 2016a; 2016b)

Seen from the other side starting at a study of objects, Currie and Killin note a comparable lack of theoretical frameworks to go from material remains to cognitive processes related to these remains. Midrange theories offer too little constraints as of yet (Currie & Killin, 2019). Without such constraints, inferences about the supposed quality of objects and makers' skill levels are made rashly (Costin, 2001, p.283). They are based off of eyeballing and hunches stemming from theory, which Dobres termed "visceral appreciation" (2006, p. 29)

Constructing a craftsperson's perspective thus proves challenging. The core issue remains in the pitfall of a lack of practical experience in a craft, which leads researchers to quickly recognize crafted objects as skilfully made (Dobres, 2006) and surpassing a craftsperson's intricate knowledge and experience in skilful crafting. Academically trained researchers simply do not possess this type of understanding. They might hold a wealth of theoretical knowledge or know-that, or have access to scientific tools and methods that yield information down to the smallest of measurements. Yet they lack a true "feeling" for the material and production processes. Malafouris described this as "a feeling *for* and *of* the clay" in the case of potters (2013, p. 149; 2014). This would require a way of "navigating the landscape of affordances" in which academics have not been trained (Malafouris, 2020, p. 6; after Rietveld & Brouwers, 2017; Rietveld & Kiverstein, 2014). Molander even goes as far so as to say that "an epistemology of practice does not fit the crafts, not to speak of even more artistic practices" (2018, p. 11; see also Feenstra, 2021, p. 76-79).

2.5.2 Turning to those who are knowledgeable

Acknowledging the above described scepsis, researchers like Kuijpers have not felt held back to at least try creating an epistemology of craft. Supported (or burdened? See Feenstra, 2021, p. 127-128) by a strong theoretical foundation in craft research and material studies, they turn to those who possess the practical, experiential, and tacit knowledge they lack:

1) Expert or master craftspeople. They practice the craft on a (very) high level, drawing on years, if not decades of experience.
2) Craft teachers. They are highly skilled, while also more trained in verbalising skill and recognizing skill levels in others (Botwid, 2016b, p. 5).
3) Practitioner-researchers. They possess varying skill levels and have studied them / their learning process from an academic perspective. Like craft teachers, they are trained in verbalising their actions, considerations and (partially) tacit knowledge. Their academic outlook makes it easier for fellow researchers to understand their (written) testimonials.

While strongly heterogenous in experiences and skill level, these groups may overlap. Of particular relevance here is that craftspeople share an "amplified potential […] to interpret crafted artefacts" (Medbo, 2022, p. 334). This potential extends beyond contemporary practices, as demonstrated in Botwid (2013; 2016a; 2016b; 2022) – present-day craftspeople are able to identify (aspects of) technological choices made millennia ago by looking at, and handling of, a crafted object.

Central to a craftsperson's framework is the fact that "a craftsperson needs to understand the material in itself *as a material*, in order to make anything from it" (Kuijpers, 2018a, p. 40, emphasis in original). Thus, as researchers, we also need to understand the material with all of its affordances before, during, and after the production process in order to essentially look over the shoulder of the craftsperson in the past. One way to do that is to lend from phenomenology thought and start at the physical, sensory perception of the material by the craftsperson.

2.5.3 Sensory archaeology

The idea of an archaeology enhanced by insights and data on sensory perception as a means to reconstruct past experience is not new. It is closely intertwined with the increased interest in the application of phenomenology in archaeology in the last decade of the nineteenth and the first decade of the twentieth century. The foundations for sensory archaeology were laid in the latter half of this period, from where the perspective gained traction (see Skeates, 2010; Fahlander & Kjellström, 2010; Day, 2013; Hamilakis, 2013; Harris, 2019; Metheny, 2022; Lorenzon, 2024).

Just like in phenomenology, sensory archaeology faces the challenge of quantifying and objectifying subjective experience (Lorenzon & Ahola, 2024). Following this logic, one can doubt how closely present-day interaction with objects represents interaction with the same object by people in the past, an issue likewise raised by Talaga et al. (2015, p. 171-174). Memories can significantly impact analysis and evaluation of sensory input. Aside from hindering relating to experience in the past, they can also create a sense of sharing experiences with individuals or a larger collective in the past (Lorenzon, 2018). The individual's physical experience is furthermore altered by the possibilities and constraints of the body; its affordances to the individual inhabiting the physical body, so to say (Brück, 2005). A partial solution to this lies in diversifying the data, for instance in collecting the experiences of a diverse group of people with relevance to the research topic (Moilanen & Sahramaa, 2024). Nonetheless, finding objective, collectively shared truth in subjective experience remains complicated, unattainable even. A pragmatic approach would be to simply "acknowledge its constant presence" (Lorenzon & Ahola, 2024, p. 6) and try to mitigate and highlight biases as much as possible.

On that note, this chapter is concluded. What follows is a recapitulation of chapter 2.

2.6 Recapitulation

In chapter 2, I explained how a person moves through a person's Umwelt through both an understanding of the Umwelt's affordances, and what that specific person's body and mind afford doing in relation to these affordances. Through combining (sub-)consciously perceived sensory input into one coherent perceived experience, a person creates a highly personal reality. In the creation of its own reality, the person draws on various kinds of knowledge that the person already possesses, gained in previous experiences, for example. Such knowledge can theoretically be divided into non-tacit, explicit, verbalizable knowledge, and tacit, implicit, non-verbalizable knowledge, as described by Polanyi. In reality, the division between these types of knowledge within a person proves to be unclear, as information can move between the conscious and subconscious mind, and between the verbalizable and non-verbalizable. Moreover, sensorily perceived information is understood by the person in relative terms, as opposed to absolute differentiation favoured in the natural sciences. As such, when a craftsperson, who relies on (sub-)consciously perceived sensory information and prior knowledge and experience, is asked to verbalize their thinking and acting while performing their craft, they will respond from the perspective of their internalized framework of potentially overlapping sensory ranges that are relevant to their craft experience and knowledge. The intricate, recursive, and continuous processes of integrating external, sensorily perceived information within the various types of internal embodied, embedded, enacted, and extended knowledge of a person, and subsequent (sub-)conscious considerations and actions following these processes, are central to phenomenological thinking and Malafouris' Material Engagement Theory.

Being skilled in a craft entails knowing what to act on, how to act on it, and how to do this in a manner than benefits the most in attaining one's end goal. The skilled craftsperson furthermore simultaneously oversees the consequences at later stages in the production process and in the final object of both these actions, and how they have been enacted. Such a level of understanding and the necessary embodiment of knowledge can only be attained through extensive, decade-long, physical training and continuous learning. Following Kuijpers, skill in craftspersonship can be defined as in terms of materials, senses, tools, and apperception.

The technique-oriented epistemology historically at the heart of archaeological research, including at the heart of the cognitive archaeology field, prohibits a fully accurate understanding of these highly complex, inherently personal practices, that cannot be grasped to their full extent in experimental research either. However, re-enacting, and experimenting with, these practices by researchers *do* allow for approaching the experience of these practices in the past more closely than describing techniques inferred from the archaeological record only. Most helpful in that regard is the creation of a craftsperson's perspective framework, called for by both archaeologists and arts, craft, and design researcher(-practitioner)s. A suitable starting point for such a framework can be found in the field of sensory archaeology. In order to understand how craft processes are commonly described in archaeology, and thus, what our starting point would be in the construction of such a framework, the concept of the *chaîne opératoire* is discussed.

The following chapter is concerned with the research methodology.

3 Methods

Before describing the methodology applied in this research, chapter 3 provides considerations to the archaeological concept of the ceramic chaîne opératoire and discusses a sensory update to the chaîne opératoire concept.

3.1 Introduction to skill in ceramic manufacture

3.1.1 The ceramic chaîne opératoire[9]

Naturally, the exact steps of the ceramic production process differ across for example geographical locations, cultures and time. Universal steps exist nonetheless, albeit described in more and less detail in academic literature. An example is the following description by Sofaer (2018b, p. 82; see Figure 6): "The basic stages of pottery production can be identified as digging clay, cleaning and purifying the raw clay, mixing it with temper (filler), wedging (kneading) the clay, shaping the vessel, air-drying it to a leather-hard state, decorating and adding handles (if required), firing, allowing to cool, and removal from heat."

However, intermediate steps can be thought of happening between and within the above mentioned ones, such as the different ones required to reach a certain vessel shape (see Palmer, 2020, p. 162-185). Some may be repeated, as in the case of glazed vessels. These are fired twice and at different temperatures; first without glaze, then with glaze. Some steps may also be carried out less thoroughly or omitted completely, for instance the collecting, preparing, and adding of temper[10]. As such, any and all chaîne opératoires of ceramic manufacture presented as universally applicable can best be seen as a useful theorization of an otherwise virtually ungraspable sequence of actions, rather than an absolute truth.

[9] The French term '*chaîne opératoire*' refers to an analytical tool commonly used in archaeology to describe and understand the sequential technological transformations of a raw material in order to arrive at a final product, displayed in a sequentially segmented manner (Sellet, 2016).

[10] Temper refers to any organic or inorganic non-plastic matter that is deliberately added to potter's clay in the wedging stage to achieve a desired property later in the production process or during use. Such properties can help in making the vessel stronger or more porous, for example. Types of temper include grog (finely crushed fired clay), shells, straw, et cetera (Orton & Hughes, 2014, p. 122-124).

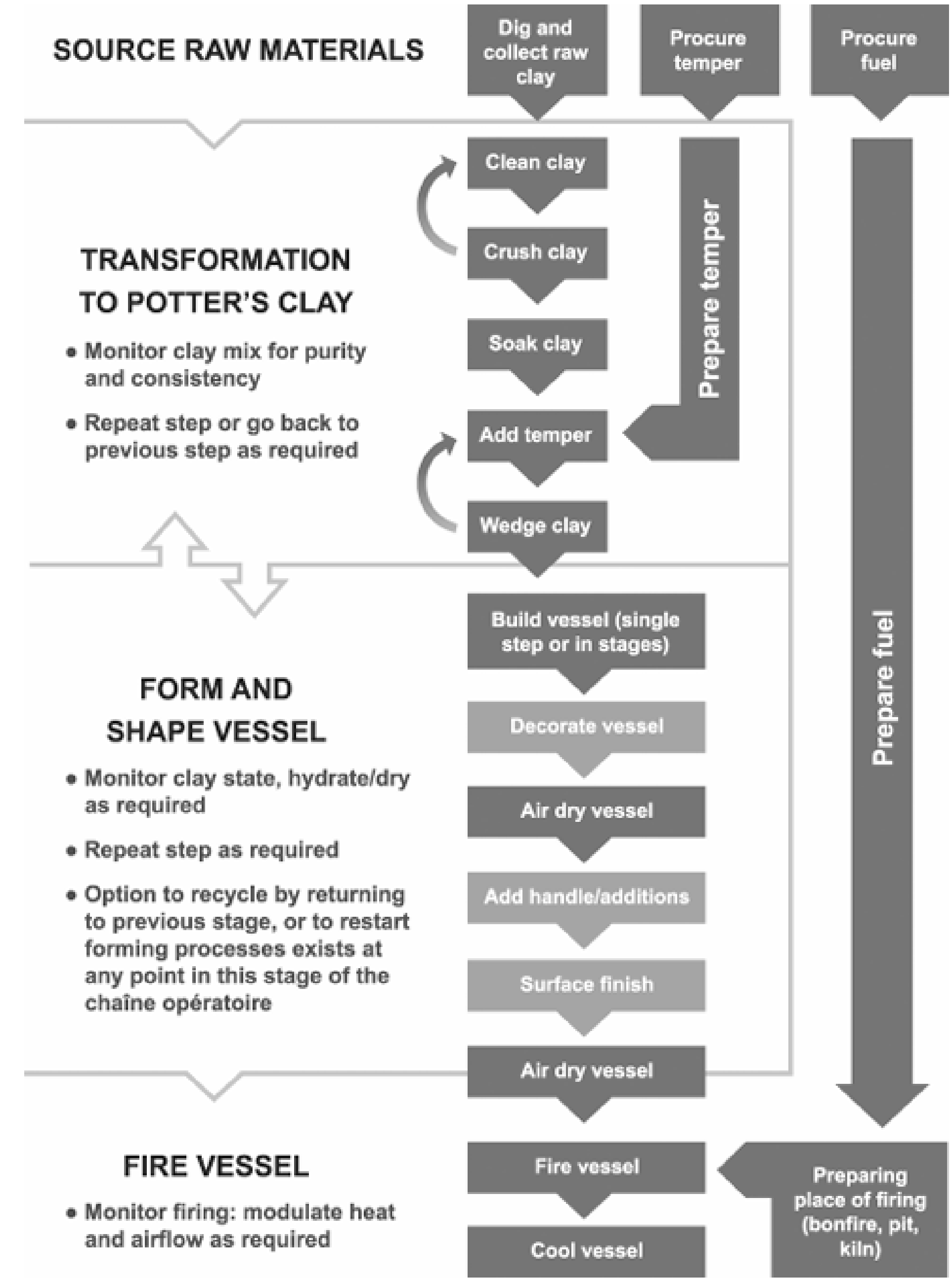


Figure 6: A visualization of the pottery chaîne opératoire. (Sofaer, 2018b, p. 83).

The chaîne opératoire as visualised by Sofaer. (2018b, p. 83; see Figure 6) served as my personal point of reference while collecting data for this research. The reason for this was that it combined various processes described by other researchers, and its visual presentation made it easier for me to follow. This particular chaîne started with sourcing raw materials. They consisted of raw clay, temper, and fuel for firing. In modern times, most of these steps were applicable to varying degrees and might not come up in the data collection at all when working with potters living and working in the 21st century. I will quickly highlight why sourcing these is less applicable for modern-day potters than it was the case in pre-industrial, or even prehistorical times:

- CLAY[11]

  Clay can be sourced in nature, but industrially processed clay is also an accessible option today. Industrial clay is standardised in terms of inclusions and their size, and clay particle size (1). Contrary to clay found in nature, it does not have any organic or inorganic impurities as well and therefore acts much more predictable in the baking process. Most potters and potter students today prefer industrial clay over "natural" clay (pers. comm. Roderick Geerts, 6-3-2025).
- TEMPER

  Organic and inorganic tempers bring forth differing properties in unbaked and baked clay. Adding temper to clay has many uses including strength and toughness (Müller et al., 2010), thermal conductivity (Allegretta et al., 2014), abrasion resistance, portability, thermal shock resistance, and ease of manufacture (Skibo et al., 1989). Collecting and preparing temper therefore constitutes an important step in preparing clay for a ceramic piece that will require specific qualities. Whereas in the past, temper sourcing and preparation would have costed considerable time and effort, it has now become much easier to simply buy varying types of temper requiring minimal to no preparation at all or even buy pre-tempered clay.
- FUEL

  Sourcing the correct type of fuel is necessary when baking pottery over an actual fire. Different types of wood fuel generate different temperatures (Wolf et al., 2013) and wood type and moisture levels mitigate flame spreading and burning speed (Wang et al., 2023). Other types of flammable organic matter may also be used because it is available and potentially culturally preferred, such as specific types of dung (see Sillar, 2000). On the other side, modern-day pottery kilns run on gas or hot air and do not require knowledge of fuel choices and -preparation. This also explains the lack of need to prepare a place of firing in modern contexts.

Having explained why certain production steps are less, or not at all, relevant to present-day potters, I continue with a sensory update to a chaîne opératoire useful in craft skill assessment.

[11] The word "clay" is used here in two ways. Pure clay is "a type of fine-grained natural soil material containing clay minerals", as defined by Wikipedia. Silts are "fine-grained soils that do not include clay minerals." (see www.minsicam.org for more information on clay mineral nomenclature) Clay is further distinguished from silt based on size with clay particles generally being smaller than silt particles. Depending on the academic field, the line is drawn anywhere between five and one nanometres. Finding pure clay in nature is uncommon. It is oftentimes mixed with silt and/or sand (www.wikipedia.org). Of industrially processed clays, it can be guaranteed that only clay is present.

3.1.2 Recognizing skill in ceramic manufacture

A certain degree of skill is required in the execution of all production steps. One could be inclined to assign degrees of skill necessary for successful completion of certain actions. However, skill is difficult to quantify. Moreover, a high level of skill can be present in the seemingly simplest of movements and (unverbalised) considerations. The skill of the master craftsperson is in everything, and in nothing in particular. This is one reason for why it is challenging to define the specific features or attributes that set apart the final pieces of a more and a less skilled potter.

Nevertheless, some attributes more readily showcase control over the material, knowledge, insight, and/or mastery of techniques than other attributes. They are not easily characterized, not in the least because they vary for different shapes, base materials, use purposes, aesthetic values, cultural preferences, et cetera.

3.2 Introduction to quantifying skill: a craftsperson's perspective

In this section (3.2 Introduction to quantifying skill: a craftsperson's perspective), I will discuss several key concepts of the craftsperson's perspective as designed by Kuijpers (2018a). The strength of this perspective lies in the fact that it seeks to understand the creation of an object through the physically lived and cognitive experience of the maker, rather than either through the exact-scientific approach of the material sciences, or through placing it in a highly context-dependent sociocultural framework. Kuijpers is one of few researchers attempting to very systematically develop a structured representation of sensory perception for reconstructing skill levels of past craftspeople.

3.2.1 Constructing perceptive categories

Kuijpers uses Weber fractions to quantify differences in perceived sensorial input. However, firstly, Weber fractions rely on *direct* comparison, which would have been unrealistic and too precise in the context of the craftsperson's workplace. Secondly, the Weber fraction of one sensory stimulus cannot capture a complete experience (Kuijpers, 2018a, p.71, *emphasis in original*). Kuijpers acknowledges these issues, yet uses the concept anyway to demonstrate hypothetical perception, and rid archaeological analysis of unnoticeable differences in material properties (Kuijpers, 2018a, p. 71).

As craft is approximation (Pye, 1995, p. 30), Weber fractions are too precise to hold much value in indirect comparison contexts, as is the case in a craftsperson's workplace. For example, a potter will not be able to name a water percentage in a piece of clay, but they will know when it is almost too dry to work with, exactly humid enough for hand-forming, or slightly too humid for throwing already. Such partially overlapping *ranges* of perceived differentiation represent blurry-bordered categories with possible sub-categories of absolute measurements (see Kuijpers, 2018a, p. 108).

In the constructing process of perceptive categories four questions need to be answered:

1) What qualities (of a material) are perceivable?
2) Why would a specific quality be a matter of concern to the people/society in question?
3) How is the quality recognised? Which senses are used and how does this relate to the type of information we are able to draw from the archaeological data? I.e., how do the properties we can measure translate into the perceivable quality?
4) Can the perceptive category be positively applied to the data and organise them sensibly? If it is a poor fit, the perceptive category made in the first step needs to be redefined (and subsequently the following steps). (Kuijpers, 2018a, p. 72-73, p. 77).

Perceptive categories thus form a categorisation of a representative aspect of each step in the chaîne opératoire. This can be visualized as a vertically listed chaîne opératoire with horizontally placed perceptive categories for each step. This approach shows not only *what* techniques were used, but also *how*, and to what extent these were adjusted to the material at hand (Kuijpers, 2018a, p. 75-76, *emphasis in original*). As such, it unites "two different perspectives towards technology: the distant, formalised, decontextualized, rational approach of the material sciences and the subjective, contextualised, cultural approach that takes the actors as its epistemological starting point." (Kuijpers, 2018a, p. 77; see also Kuijpers, 2015). Figure 7 demonstrates what this could look like for the metalsmithing process of Middle European Early Bronze Age (EBA) axes.

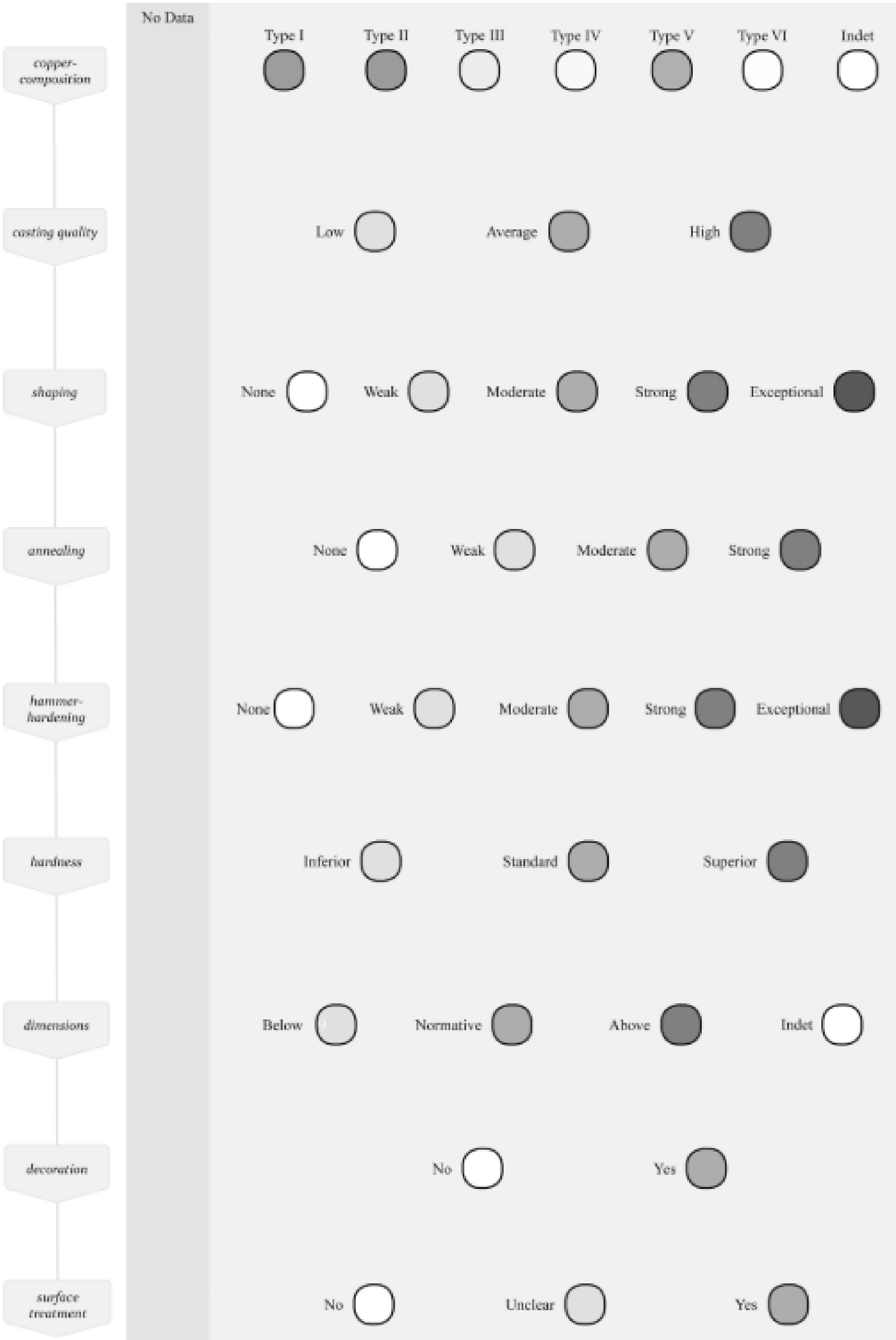


Figure 7: An example of an updated chaîne opératoire (vertically) making use of perceptive categories (horizontally). Besides only describing the techniques that were applied, the perceptive categories give insight in how these techniques were carried out, allowing for an assessment of skill. (Kuijpers, 2018a, p. 75).

3.2.1.1 Using the updated chaîne opératoire as a technological pathway

The updated chaîne opératoire is used best when applied to an archaeological assemblage. A finished object, in this case a Middle European EBA axe, is to be 'scored' along the chaîne opératoire. For each step in the production process, one chooses the dot that represents the category in which the object fell during that stage of its production process. Close observation and subsequent insightful interpretation, enriched by experiential and intimate knowledge of a highly skilled craftsperson, allows for this. Doing this for the whole production process creates a technological pathway of the object's manufacture.

Each line towards a next dot in the production steps are seen as a direct result of the actions of the craftsperson in a given context, making use of the affordances at hand. The final product thus holds a testimonial to conscious and subconscious decisions of the maker, potentially also of the maker's considerations and reflections. This means that scoring an entire assemblage of similar objects will create a network of *choices* made by craftspeople, possibly one, most likely more.

3.2.2 Analysing skill in a network of choices

The recognition of skill takes place in the analysis of the choices that were made by the potter, as demonstrated through the actions they undertook during the production process. These actions left permanent traces or "technological signatures of action" (Budden, 2018, p. 370) in the material, which can now be interpreted by modern-day potters helping researchers. Indeed, lasting traces in the object left by the potter during its production process can be recognized today. Examples of this include a spiral running from the base to the rim of the pot or on the interior of the base, a forgotten fingerprint, or uneven application of a glaze. Once baked in the kiln, they remain permanent. On another, more critical note, clay is polysemic in nature (Roux, 2016, p. 106); similar traces can be caused by different actions (Gandon et al., 2013) or the use of different tools. Moreover, the same tool can be used to create different traces. This makes the exact *how* of the production process uncertain at times (Thér, 2020, p. 171). Unfortunately, it is in the *how* just as much as in the *what*, arguably even more so in the *how*, where a high level of skill shows itself.

Nonetheless, interesting conclusions on skill of the maker can be inferred from general patterns in the networks, especially when assessing an entire assemblage. The most important here is the relationship between the quality of the base material and that of the end product, held against the standard of that time (see Kuijpers, 2018a, p. 76). A higher level of skill is for example demonstrated when the affordances of (particularly low-quality) raw material were recognized and acted on in an adequate manner, leading to a high-quality end product (Kuijpers, 2018a, p. 135).

3.2.3 Underappreciating the skilled potter?

Mistakeed assessments of skill have shown to seriously and likely wrongfully skew our image of past societies, most meticulously retraced by Kuijpers for European Bronze Age metalsmiths (2018a). Likewise, pottery studies in archaeology seem to be affected by comparable and at the same time opposite biases. Whereas the skill level of metalsmiths in the European Bronze Age has been systematically overvalued in archaeological narratives, potters' skills seem to have been systematically undervalued in archaeology.

In part, this might be so because of its image as a "minor, everyday craft", "partly because clay is a malleable and soft material, often perceived as requiring less technical skill to shape and use" (Padovani et al., 2025, p. 1; after Rice, 2015a). Aside from differences in appreciation of the techniques involved in the craft, metal objects are considered inherently more valuable than ceramic objects. Furthermore, the archaeologist's underappreciation of the artisanal value in pottery could be explained by the state in which ceramics are usually retrieved from the archaeological record: in sherds, highly fragmented. This created a practical difficulty in sampling and subsequent analysis. Lastly, a vast body of ethnographic research on the craft of pottery manufacture presents household-based, non-specialized craft production systems, even though the link between specialized / industrial production and skill has been disputed for decades (Revello Lami, pers. comm. 8-8-2025; Longacre, 1999; Rice, 2015b).

Thus, both the potter's skill and the study thereof in archaeology might have faced a long tradition of disregard. An old quote from Childe supports these thoughts: "The change in the properties of copper by heat is really very startling; it is distinctively more dramatic than the effect of baking upon potter's clay." (Childe, 1930, p. 4, after Kuijpers, 2018a, p. 3).

In general, guessing the exact actions, thoughts and considerations of people in the past through the objects they leave behind remains a complicating factor in skill research. A potter might have been highly skilled and in the mood for experimenting, or might have been forced to work with low-quality raw materials or tools or under unfavourable conditions, or might have had little skill but was lucky, or multiple potters were involved in the creation of a singular vessel, et cetera. Cases like these are not always apparent in the archaeological record. Therefore, conclusions about skill levels in craftspeople can never be reached rashly, should always be traceable to solid, logical reasoning fitting the research context, and might never be absolute. Before explaining the current research design to lay the foundation for such analysis, I provide a short recapitulation of the first parts of the methodological chapter (Before describing the methodology applied in this research, chapter 3 provides considerations to the archaeological concept of the ceramic chaîne opératoire and discusses a sensory update to the chaîne opératoire concept.

3.1 Introduction to skill in ceramic manufacture3.2 Introduction to quantifying skill: a craftsperson's perspective).

3.3 Recapitulation

A craftsperson's perspective framework is best constructed based on the concept of the chaîne opératoire commonly applied in archaeological research and analysis. Kuijpers has recently proposed an update to this tool; not only the steps, but also the way in which these steps were carried out, can be visualized through the addition of a categorization of perceived sensory input. Based on this categorization, the craftsperson adjusts how they proceed with the production process in order to arrive at the desired final object. Skilful craft production might, then, be retraced in the *how* of these actions, in addition to the *what* of these actions.

Kuijpers' research focused on metallurgical craft in the European Bronze Age, which has a history of systematically overappreciation in archaeological analysis. It seems that the opposite, a systematic underappreciation of the potter's skill and craft, might be, and might have been, happening in archaeological research. Thus, an updated chaîne opératoire is necessary to adequately assess, and appreciate, skill level of potters. In the following, final part of the methodology chapter, the design of this research is explained, which attempts to create such an updated chaîne opératoire for the craft of wheel-thrown pottery manufacture (3.4 Methods for sub-question 1: literature review; 3.5 Methods for sub-questions 2, 3, and 4: interviews, optional demonstrations).

3.4 Methods for sub-question 1: literature review

3.4.1 Literature review and literature relevance

The aim of this literature review is to present an overview of previous archaeological research into skill within the pottery craft realm. The literature to be reviewed has been searched for in the catalogue of the Leiden University Library and on Google Scholar using combinations of the following search key words: skill; pottery; ceramic; archaeology; cognitive archaeology. Other relevant sources

I used for the background chapter may be included as well. Further relevant literature has been derived from the bibliographies and citations of relevant (background) literature.

In this literature review, I reflect on research methodologies that have been applied to study skill in pottery manufacture in the field of archaeology. Literature becomes relevant if it:

- Is written (partially) within the archaeological discourse,
- Focuses on pottery and / or pottery manufacture,
- Studies skill specifically and / or mentions it multiple times in relationship to certain technological attributes and / or research methods.

In this literature review, I seek answers to the following questions:

1) How has skill been researched?
2) Which pottery attributes have been associated with skilful manufacture?
3) Why have these attributes been associated with skilful manufacture?
4) Which research methods have been used to measure, quantify, or otherwise qualify these attributes?

Important to note is that my literature review does not delve into theories of specialization and coinciding standardization, organization of production, or other insights derived from the application of skill assessment methodologies on past societies. The same holds true for (ethnoarchaeological) studies on learning and teaching processes, and communities of practice. Nonetheless, skill research in pottery within archaeology stems from this sort of research, which is why studies following this path may be included in the literature review.

3.5 Methods for sub-questions 2, 3, and 4: interviews, optional demonstrations, and observing

This section details the first attempt at collecting information from potters, done through a too long and too unspecific questionnaire. It then describes what I opted for instead: direct contacting, asking for an interview and a demonstration, and observing at a potter’s workshop. Since the interview questions were limited in number, but vital to the collecting of results, extra attention is given to the reasoning behind each of the questions and how they relate to the sub-questions of this thesis.

3.5.1 Interviewing potters

Aside from diving into previous archaeological literature on skill in pottery manufacture, I planned to work together with actual potters to help me better understand their craft and their experiences therein.

3.5.1.1 First (failed) attempt: questionnaire

Initially, my plan was to collect data using a questionnaire filled out by among both professional- and amateur potters. I knew several potters who were enthusiastic about answering my questions when I told them about it in person, and even some teachers amongst them who were willing to send the questionnaire to their students. However, the questionnaire I had created was too rather too long and extensive to be able to account for as many factors as possible, many of which discussed personal background in terms of previous experience with potter manufacture (see Appendix B.2 First attempt at collecting results: questionnaire).

I reached out to the potters I had talked to using the email addresses they had given me and waited several weeks. After sending a reminder email, I ended up with only two responses that did not quite contain the answers I was looking for. For example, when asking how the potter might recognize skill in the production process, I would only get a few general, fragmentary remarks on skilful pottery manufacture, such as ending up with a symmetrical vessel, the creation of a thin wall, and the ability to throw vessels that were larger in height than at the start of the learning trajectory. Realizing that no other responses were coming either, I concluded that I had to change my approach to face-to-face interviews and demonstrations in order to capture a more complete potter's perspective.

Thus, I reconsidered my approach and settled on the following: directly emailing five pottery studios in Leiden. I asked for the possibility to 1) ask just a few questions to the experienced potter teaching and perhaps some of their students and 2) optionally have them perform a short demonstration with explanations of their actions and considerations. These questions were only six in total and more directly in line with my sub-questions. A one-on-one interview setting allowed for clarifying questions and efficient gathering of necessary background information, without the need to formalize these questions in a questionnaire. Plus, direct observation of the potter's actions with room for discussion was infinitely more insightful than written text only. This approach yielded me a response of one very experienced potter who teaches pottery-throwing and reconstructs archaeological pottery, who gladly welcomed me into her studio during a monthly open studio day.

3.5.1.2 Why have I interviewed?

The qualitative data I was looking for did not exist yet, or at least had not been systematically researched. This data was also highly subjective, shaped by previous experiences and already existing knowledge of the potter. Thus, I needed to have a basic idea of the potter's background and hence, perspective on (their) craft. The potters' responses could be vague or unclear to me at times. I therefore needed to be able to ask for clarification on the potter's considerations, thoughts, and feelings in the very process of obtaining data. I also needed to be able to observe the context in which I would be collecting data – in this case, seeing the potter at work handling the clay in order to better understand their perception of the properties of said clay. Overall, I needed qualitative data, and I found to be the most suitable, workable approach a one-on-one interview with the option to perform a demonstration.

As I have laid out in chapter 2, subjective perception and consequently, interpretations and evaluations, differs for every individual. In my thesis, I therefore had to be mindful of the (lack of) overlapping experiences and comparable states of mind in my test subjects. Yet the challenge of reproducibility in the humanities is a well-known one. I could not control nearly as many research factors as I would like to and only have limited time and resources to build my datasets. The required qualitative nature of my research methods even further hindered reproducibility, let alone differences in the experiences and competence levels of the potters I had interviewed.

3.5.1.3 Who have I interviewed?

I interviewed one professional potter with several decades of learning and teaching experience and a love for reconstructing archaeological pottery, and several of their students. Amongst them was one archaeologist currently pursuing their PhD.

3.5.1.4 Interview steps and questions

After initial greetings and introductions, I gave a small introduction of my research and asked consent for recording the interview and take pictures in the case of a demonstration. I then asked for any previous (teaching) experience in working with clay. I deliberately kept the introduction to my research short, so as to avoid eliciting desirable responses. I followed a semi-structured interview method, asking clarifying questions when necessary while still ensuring that all of my questions were responded to.

The first part of the interviews consisted of me asking the set of questions listed below. Underneath each question, I noted to which thesis sub-question they related and my reasons for asking these questions.

Again the sub-questions of this research:

1) How has skill in pottery manufacture been studied previously in archaeology?
2) How do actual potters view and see skill?
3) At which steps in the pottery manufacturing process can the skill of a potter be well-observed? How does this translate into aspects visible / detectable in the finished product?
4) How can Kuijpers' archaeological craftsperson's perspective be applied to the pottery manufacturing process?

3.5.1.5 Sub-question-related considerations behind the interview questions

A) How do you view (your) skill?

➔ Sub-question 2: I opened a conversation about skill from the perspective of the potter. I hoped to let the potter create their own narrative about skill in pottery manufacture in general and for themself, in case they had not yet done so before.

B) How do you experience manufacturing pottery, broadly speaking? What senses do you use for that?

➔ Sub-question 2: By zooming in on the perception of the pottery manufacturing process, I expected answers mentioning 1) a perceived automatism in performing actions, 2) considerations that still require conscious knowledge and negotiation with the material, and 3) would reflect a ranking of the most important senses used in pottery manufacture.

➔ Sub-question 4: A ranking of the important and less important senses for pottery manufacture would be very useful in choosing relevant aspects for perceptive categories.

C) How do you recognize skill in others? And lack thereof? Consider both their actions and the objects they produce.

- ➔ Sub-question 2: The last question challenged the potter to look at skill from an outsider perspective, potentially changing their view on (their own) skill. Different phrasings or sides to the same story might come up.
- ➔ Sub-question 3 and 4: The potter highlighted the most apparent aspects of skilful actions during, and skill-demonstrating results of, pottery manufacture. Such insights helped in constructing a ceramic craftsperson's perspective.

D) If you teach, which senses do you expect your students to use and in what way(s)?

- ➔ Sub-question 3 and 4: Thoughts about skill, conscious use of the senses, and the application of embodied knowledge come to the fore the most clearly when actively learning a skill. Potters themselves might not always consciously recognize their own sensory input anymore, but they might be able to recognize it better when teaching someone else.

E) What is your relationship to clay like?

- ➔ Sub-question 2: This question allowed me to assess to what degree the potters had become (sensorily) attuned to their material and their craft. It might yield further hints to the amount of embodied knowledge and experience the potter possessed, which helped me to better contextualize their answers.

F) Whenever you pick up clay and start handling it, what pieces of information do you collect about it?

- ➔ Sub-question 4: This question provided the potter with a last chance to highlight any sensory aspects of pottery that did not come up in previous answers, and allowed me to verify any of my own ideas about the relevance of certain sensory aspects.

3.5.2 Optional demonstration

A potter's verbalization of their thought processes and actions alone did not suffice for me to arrive at a more complete understanding of the wheel-throwing pottery production process. Like craft learners, I had to be able to observe the movements and reflections in actions to be able to see the details easily lost in translation to words. Therefore, I asked two potters to perform a demonstration for me, while talking me through their thoughts arising in the process.

In the optional demonstration, I interfered with the production process as little as possible. I asked the potters to verbally comment on their thoughts, considerations, and actions. After asking their consent, I recorded the demonstration audio and took pictures of them while at work. Whenever I saw something that I deemed interesting or unexpected, but had not been commented on by the potter, I asked them about it. Sometimes, these questions concerned their sensory perception at that moment, testing my assumptions on this matter.

3.5.2.1 The ceramic end product of the craftsperson's perspective framework

Unlike Kuijpers' approach, the goal of this thesis was not to create a model around a specific type of archaeological artifact, nor to test it on an existing dataset. Rather, it sought to lay the foundations for a more broadly applicable, basic framework for wheel-thrown pottery manufacture. I encourage further adjustments to the framework by others, for example to better fit a certain type of ceramic artifact, or another material group entirely.

It could be argued that the beginning stages of wheel-thrown pottery manufacture collectively fell into the category of the amateur (Kuijpers, 2018a, p. 231). With increasing ceramic possibilities due to technological developments such as (high temperature) kilns, a wider variety of (skilful) practices could be developed (Sofaer, 2018b, p. 55-56). While it is true that technological advancements created more opportunities to further stretch the possibilities of producing ceramics, such reasoning opens up to the fallacy of equating technological developments with skill. Even with limited technological possibilities, high levels of skill can still be seen in all production steps. This holds true for the production of ancient pottery just as much.

Important for the demonstrations was that the potters would all work towards the same end product, in order for me to compare potentially different approaches leading to similar end results and finding common ground in the potters' considerations. Thus, for the potters agreeing to the demonstration, I needed to have chosen an object that they could take as an example.

3.5.2.2 Choosing a desired end product

Since this research focused on research methodology and analysis rather than archaeological accuracy, I decided to look for pottery examples that were technologically challenging to make while keeping the basics easy to follow for less skilled potters. The more technologically difficult steps were involved, the more explicit and apparent the potter's considerations and skill level would be. There were a few constraints, however. The framework had to be workable in an archaeological context. It needed to be applicable to at least tableware and/or storage containers. Applications and decorations should preferably be mostly functional or minimal in nature to avoid redundancies to the basic chaîne opératoire. In the end, the framework might turn out to be perfectly suitable for all types of wheel-thrown pottery, among which even entirely non-functional ceramic art pieces, but such is not the goal here. Moreover, I also needed to give the option of a very basic shape for when asking for a demonstration from less advanced potters.

I looked for items that would need to withstand similar mechanical challenges in terms of heat and water resistance and overall sturdiness. Most importantly, their manufacturing processes needed to be as similar as possible and needed to be understood relatively easily by more and less experienced potters, regardless of skill level required to carry out these processes.

On an online website selling, amongst others, ceramic home décor items, I found replicas of Frisian candle holders (www.oplage1.nl; see Figure 8). The basic shape might seem easy to make, but the reader will have noted by now that inferential thinking based on theorization alone regarding required skill levels will not suffice in order to arrive at a truthful assessment of necessary skill to create a vessel.

Figure 8: The Frisian candle holders that were used as example piece in the demonstration. (www.oplage1.nl).

I originally offered the option of an easier shape with comparable technical challenges should I find a less experienced potter willing to do a demonstration, but this proved unnecessary in the end.

3.5.3 Observation

When not actively interviewing a potter or watching closely a demonstration, I observed what I could during my time at the workshop. Moreover, I made it my priority to interfere as little as possible with the potters working there. Between me and the potters was a large, wooden table with chairs around it, creating enough distance between us for the potters to work undistracted, while still allowing me to have a perfect overview of everything taking place in the workshop. I limited any conversation with them while they were working, only engaging in conversation with them when they started it with me, potentially asking about my research and / or the interview possibility.

During my time spent at the workshop, I made sure to pay attention to things such as, but not limited to:

- The spatial lay out of the room, including where things were located and the space around, and between, pottery wheels
- Regarding potter's tools: what types of tools were uses, but also how, when, and to what purpose(s) they were used;
- Potter's movements and body language, and what they focused on and for how long, and at what point they seemed to be satisfied with their work;
- The nature of the questions the learning potters asked to the main, teaching potter, and how the teaching potter responded and the content of the response, in relationship to what I had already learned about ceramic manufacture;
- The nature and content of the comments, instructions, and demonstrations of the teaching potter towards the learning potters, and at what stages in the manufacturing process the teaching potter would comment, give instructions, or even step in to save a vessel from further mistakes, while attempting to retrace the reasoning of the teaching potter behind these choices and drawing on my recently attained knowledge of ceramic manufacture;
- Any patterns across the conversations between the teaching potter and the learning potters, and linking these to interview responses and demonstrations I had received from both;
- The nature of the conversations held, their relationship to where the conversating potter was during the manufacturing process, and whether a specific emotion was communicated;
- A potter's silence and any changes in body language when deep in concentration;
- The concentration dynamics over the timespan of the few hours that one half of the open throwing day would last;
- The time it took for specific potters to complete specific manufacturing steps;

- The large amount of reference material present in the studio, ranging from vastly different vessel shapes and figurative work, to cross-sections of vessels used for teaching purposes, overview sheets for suitable clay amounts for common vessel shapes, and imagery used in teaching as a visual explanation to forming (including regular A4 pages, but also hung above the wheels for real-time comparison);
- The content of the potters' evaluations of, and comments on their own work when placing it to dry on the large table I was sitting on, any corresponding emotions or valorisations of the potter, and the content and nature of any of the potter's comments potentially comparing their work to that of others.

As one can imagine, this list is rather extensive and was written down only after the observations had taken place. While I expected some of these topics to be important prior to my visit to the workshop, the exact decision on what to pay attention to was made in real-time during observation.

What follows are the results I obtained using the methodology of interviews, optional demonstrations, and observation.

4 Results

The result chapter has been divided into four parts, each corresponding to one of the sub-questions. Each part begins with a short discussion of the collection of data required to answer that specific sub-question. Furthermore, recapitulations are provided at the end of the first (literature review) sub-question and at the end of the chapter.

4.1 Results for sub-question 1: How has skill in pottery manufacture been studied previously in archaeology?

4.1.1 Introduction to the results for sub-question 1

4.1.1.1 Aim and scope of the literature review

After a short introduction to the literature collection process for this review, I will present answers to the following questions:

- How has skill in pottery manufacture been studied previously in archaeology?
- Which research methods have been used to measure, quantify, or otherwise qualify attributes of skilful pottery manufacture?
- Which pottery attributes have been associated with skilful pottery manufacture?
- Why have these attributes been associated with skilful pottery manufacture?

This means that I will *not* dive into the theories around, and academic uses of, the insights that these research methods have brought about. Examples of these are debates on the organization of production, standardization and specialization, and cultural transmission.

4.1.1.2 On the collecting of literature[12]

Firstly, I went through my notes from previous exploratory reading and the literature list I compiled while writing this thesis. I selected references I thought to be about archaeology, pottery, and skill. I then searched in the online database of the Leiden University Library and Google Scholar using the following key words: skill; pottery; ceramic; archaeology; cognitive archaeology. I selected sources

[12] During the final stages of my thesis process, I came across several additional relevant studies predominantly published in the most recent few years. Hence, the literature review presented here should not be seen as complete. However, it does provide a well-defined glimpse into the rapidly evolving and expanding field of skill in pottery manufacture research. For a list of further relevant literature, see Appendix A.1.4 Quantification of researchers collaborating in Gandon's research group.

from the first ten pages for each search and repeated this several times for different word combinations until I found no more new promising references. Both methods combined, I collected nearly 120 references. My initial sorting based on title and at times the abstract was rather broad here. In line with the limited scope of my review, I decided to narrow it down to sources strictly on pottery, archaeology, and likely covering skill. I then read all abstracts and filtered out even more references. Some sources strongly focusing on skill or craftspersonship in a related field were sometimes kept, but most of them did not reach the final selection. A few interesting sources I could not find online, nor in physical form in the library, so I excluded them as well.

I wish to note here that the word 'skill' might appear synonymous with 'expertise', but it is not. However, I found that 'expertise' was used rarely in the literature. Sometimes, it was used interchangeably with 'skill', even though expertise usually referred to *a high level of* skill instead of any level of skill, and 'skill' might also refer to a specific ability. I was more interested in any evaluations and quantifications of any potter's skill level, and therefore decided to make the presence of the word 'skill' a minimum requirement for including sources in the final selection.

This approach shrunk the list to 43 references spanning 40 years of research (see Appendix A.1.1 Extended quantification tables of research perspective results; see Figure 9 for the temporal spread of references). I read these in more detail. For each reference, I noted down answers in an Excel sheet to the following questions (if applicable):

- Is the main research focus skill [in pottery manufacture in archaeology]?
- Within which academic subfield can it be placed?
- What is the main research focus?
- What questions are asked regarding skill [in pottery manufacture in archaeology]?
- What research methods are used?
- What aspects of skill are researched? Which perspectives are explored?
- What methods are applied to study skill specifically, if different from the previously mentioned methods?
- Which pottery attributes have been associated with skilful manufacture?
- Why have these attributes been associated with skilful manufacture?

Figure 9: Number of references used for the literature review published per year (final selection).

4.1.2 How has skill in pottery manufacture been researched in archaeology previously?

I have identified a number of different research perspectives through which researchers in archaeology and related fields have studied skill in pottery manufacture. Overall, it became clear that this research niche has been dominated by mainly French, some British, and some Dutch researchers. I put them into an Excel spreadsheet and sorted them chronologically (see Appendix A.1.1 Extended quantification tables of research perspective results). Table 3 shows the number of references within the research perspective categories. Their order in the table reflects the sequential order in which they were first applied.

Table 3: The number of references within each research perspective identified in the literature review.

5	Ceramic ethnoarchaeology
20	Standardization and specialization
1	Overview
5	Social dynamics
1	Theorization / context
3	Reconstructing forming techniques
5	Artisanal knowledge
2	Real-time processes
1	Neuroscience

4.1.2.1 Ceramic ethnoarchaeology

Within archaeology, ceramic ethnoarchaeologists created a research tradition focused on craft production, specialization, and standardization in ceramics. This does not come as a surprise, since ethnoarchaeology strives to provide archaeological materials and models with ethnographic data and contexts (Costin, 2000, p. 37). Archaeologists therefore incorporated assessments of potter's skill levels to understand past societies better (see Hagstrum, 1989; Costin, 1991, 2000; Kamp, 2001). Yet in doing so, "skill is often cited as an indicator of specialization, [but] has remained a primarily subjective criterion mentioned in passing, without active research" (Costin, 1991, p. 40).

4.1.2.2 Standardization, specialization, and social dynamics: to apply, or not to apply

Up until about 2010, studies were aimed at understanding craft specialization and inherent standardization within a past society, actively incorporating skill assessments (Costin, 1991; Crown, 2001; 2007). I combined the perspective of standardization and specialization in my tables, since these topics are traditionally heavily related to one another.

A similar line of research continued to follow in the footsteps of ethnoarchaeological tradition and to focus on social dynamics (Michelaki, 2008; Budden & Sofaer, 2009). The perhaps surprising, common denominator of these studies is that they are done on hand-formed pottery, contrary to nearly all other references collected[13]. The expansion of perspectives of craft research led to an article reflecting on opportunities for future directions in craft technology research in archaeology (Dobres, 2010).

This article gave way to a notable separation movement from 2011 onwards. Skill increasingly became a research topic of its own. A slightly variable, but rather constant research group[14] led by the French Enora Gandon published repetitively on skill in ceramic manufacture. They were quite productive and stead-fast – this literature search yielded nine[15] publications in fifteen years (Gandon et al., 2011, Gandon et al., 2013; Gandon et al., 2014a; Gandon et al., 2014b; Gandon et al., 2018; Gandon et al., 2020; Gandon et al., 2021a; Gandon et al., 2021b Nonoka et al., 2024). Their experimental studies focused on ceramic standardization in production only, without applying their insights to models of craft specialization and organization. Instead, they looked at interindividual

[13] Kamp (2001) and Duistermaat (2016), both on wheel-throwing, have been placed under the same research perspectives, however. Yet the former discusses both production processes in a broad view of children getting familiar with ceramics, and the latter focusses so heavily on research methodology that the difference becomes irrelevant.

[14] A quantifying table of these researchers and their contribution to each of these studies can be found in Appendix A.1.4 Quantification of researchers collaborating in Gandon's research group.

[15] As can be seen in Appendix A.1.4 Quantification of researchers collaborating in Gandon's research group , I have unintentionally excluded one other study of this research group (Gandon & Roux., 2019). This would result in a total of ten studies in a fifteen-year period. Without going into too much detail, I will note here that this list contains publications by researchers that contributed to Gandon-led research, and who simultaneously published own work on the same and / or related topics (specifically Harush et al., 2020; Nonoka, 2024; Roux et al., 2024).

variability and standardization in skilful manufacture taking place in reproductive and (un-)familiar settings, highlighting different facets of skill and enacted technology itself. Lastly, Gandon's research group introduced an experimental approach to skill research rather than applying a methodology on an archaeological assemblage (see Appendix
A.1.2 Extended quantification tables of methodologies results).

Research applying insights on skill to understand past societies using a non-experimental approach did see a small revival later on (for wheel-throwing: Forte, 2019; Miloglav & Vuković, 2019; Roux & Karasik, 2019. For hand-forming: Santacreu*.* 2017 For both: Duistermaat, 2016).

4.1.2.3 Other perspectives: reconstructing technology, experiential knowledge, and neuroscience

On one hand, Budden & Sofaer's 2009 article and Dobres' 2010 article marked the emergence of a solid array of Gandon-led research with a systematic, experimental methodology, to which I will turn soon (4.1.4.1 Empirical data, experiments, and methodological solidification). On the other hand, researchers seeking to reconstruct ceramic forming techniques sometimes made mention of skilfully executed techniques (Thér & Toms, 2016) or actively looked for traces of particularly (un-)skilled craftspersonship in assemblages (Berg, 2022) or even a single pot (Solnay et al., 2023).

An entirely different view was presented in the dissertation articles by ceramic-practitioner-researcher Botwid (2013; 2016a; 2016b; 2022). Recognizing that archaeologists missed crucial experiential knowledge on the ceramic production process, she posed that craftspeople be consulted during archaeological object analysis. Another approach, also in the shape of a dissertation, extensively studied a highly extensive set of biophysical and mental processes occurring in potters while actively throwing a pot (Palmer, 2020).

The latest advancements in ceramic skill research in archaeology see the use of neuroscientific methods to better understand meta-cognition through gaze movement in wheel-throwing (Nakamura et al., 2021) and early skill acquisition in hand-forming (Forte et al., 2025).

Overall, the studies that have contributed the most to our understanding of skill in pottery manufacture in recent decades have employed an experimental approach as opposed to a non-experimental approach, starting with Gandon-led research.

4.1.4 Which research methods have been used to measure, quantify, or otherwise qualify attributes of skilful pottery manufacture?

What I refer to as 'attributes' are any and all physical features of a vessel. In the context of this thesis and in the archaeological literature studied, this exclusively refers to features in the final ceramic object. Since this research focusses on skill recognition in craft, the attributes of interest here are those that have been linked by archaeologists to skilful pottery manufacture. Examples of these include even wall thickness, overall symmetry in vessel shape, and a smoothened exterior surface.

Table 4 lists the categories of methodologies that have been applied to measure, quantify, or otherwise qualify skilful pottery manufacture. Their order in the table reflects the sequential order in which they were first applied. A more complete overview incorporating the methodologies for all references can be found in Appendix
A.1.2 Extended quantification tables of methodologies results). I devised these categories myself, as I did for the research perspectives in section
4.1.2 How has skill in pottery manufacture been researched in archaeology previously?).

Table 4: The number of times a type of method was applied in the references of the literature review. Some references applied multiple methods in the same study.

33	Visual observation
6	Physical measuring
6	Coefficient of Variation
2	Analysis of Variance
1	Von Mises mechanical stress index
1	Global Shape Variability
1	Cluster tree of variation
3	Videorecording
4	Video image capture + 2D image of one half, pixels to coordinates, mirrored + elliptical Fourier analysis + Principal Component analysis + Permutation test
2	Petrography / magnified images of plane sections of inclusions and voids in pottery, extracted and separated using software
1	X-ray fluorescence + X-ray diffreaction + petrology + textural characterisation via image analysis + scanning electron microscope + macro trace analysis
1	Gaze tracking

1	Shape analysis and TMS-EEG co-registration
1	Verbal protocol + biophysical measurements + digital visual observation + self-reporting review
4	Personal experience and reflection
5	Literature review

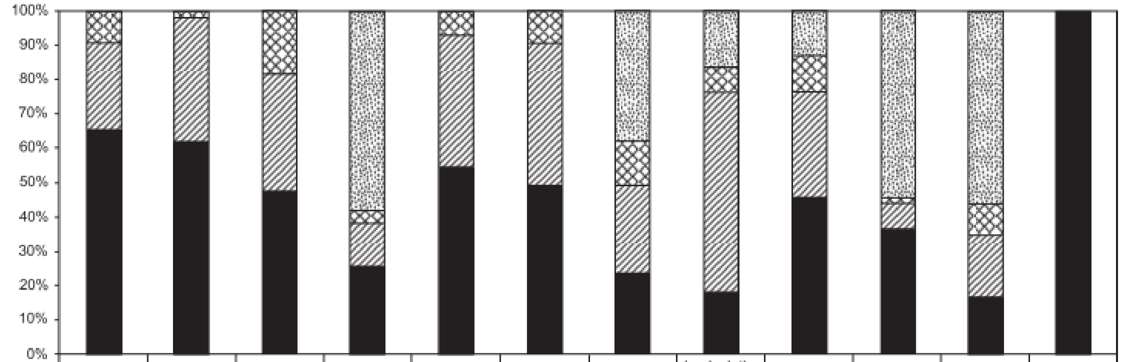
For 41 references, 17 different types of methods were employed to study skill specifically in some way. Some studies employed multiple methods, but the vast majority employed only one. The overarching goal was more or less the same for each of the methods: systematically assessing and / or quantifying ceramic variability. Some did this through experimentation, while others applied the methodologies on past assemblages directly.

The most accessible and probably because of this, the most popular method, was visual observation, sometimes accompanied by physical measurements. Whether visual observation counts as an actual research method, and whether it is supposedly entirely absent in some studies according to Table 4, can be disputed in some cases, however. When noted as the only method employed, it means one or both of the following: 1) that the research drew conclusions on potter's skill (partially) based on visual observation alone and 2) that any physical attributes or features of the vessel associated with skilful manufacture were recognized through visual observation. For research employing other methods simultaneously, different things could be the case: 1) researchers drew conclusions on potter's skill (partially) based on visual observation, 2) direct visual observation, or existing insights on skilful pottery manufacture gained through visual observation, helped decide what to study, or 3) skilled potters themselves were asked to draw conclusions on skill and variability based on visual observation.

4.1.4.1 Empirical data, experiments, and methodological solidification

Over time increasing experimentation with natural scientific research methods focused on measuring and calculations (see Richards & Britton, 2020), aimed at quantifying variability (concerning the categories of Physical measuring, Coefficient of Variation, Analysis of Variance, Von Mises mechanical stress index, Global Shape Variability, and Cluster tree of variation). This trend is noticeable between around the turn of the millennium and between 2011 – 2014. Switching millennia proves a moment of more intense reflection and determining directions of future research, at least in potter's skill research (Costin, 2000; Costin, 2001; Stark, 2003). Academic thought on the interpretation of extensive ceramic measurements led to actual quantification of skill levels in ceramic manufacture –

very much in line with the research aims of this thesis (see Budden & Sofaer, 2009, p.212; see Figure 10). This study was done on hand-formed pottery.



	clay preparation	manufacture	wall thickness	additions	int. surface treatment	ext. surface treatment	decoration	rim deviation on the horizontal plane	rim symmetry	handle symmetry	profile symmetry	firing
not present	0	0	0	32	0	0	21	9	7	30	31	0
poor	5	1	10	2	4	5	7	4	6	1	5	0
moderate	14	20	19	7	21	23	14	32	17	4	10	0
good	36	34	26	14	30	27	13	10	25	20	9	55

Figure 10: Skill variability in the production of domestic vessels at Száhalombatta for twelve technological variables. Based on ceramic measurements and deviation rates, skill levels of the potter have been inferred. (Budden & Sofaer, 2009, p. 212).

From 2011 onwards, the Gandon-led research group not only offers a new impetus to ceramic skill research, but they also introduce experimental approaches to skill research and devise new methods to quantify ceramic variability (Gandon et al., 2011; Gandon et al., 2013; Gandon et al. 2014a, see two most right columns of Appendix
A.1.2 Extended quantification tables of methodologies results). First applied in 2018, they have used roughly the same multi-step method in four out of five of their following studies (Gandon et al., 2018; Gandon et al., 2020; Gandon et al., 2021a; Gandon et al. 2024). They make use of video imagery, capturing the profile of one half of the pot directly after forming (and half-way during the forming process, too, in the case of Gandon et al. (2020). The pixelated image gets translated into coordinates, which are mirrored to theoretically complete the full profile. Degrees of standardization are then calculated using multiple types of analysis and tests.

4.1.4.2 Experiential knowledge and the act of throwing

While Gandon et al. developed new empirical measuring methods, Botwid proposed and argued for a 'soft' approach. In several case studies, she demonstrated that conventional object descriptions in archaeology could be extended upon greatly through inviting a craftsperson – who she referred to as 'artisan' – to assess the object's manufacturing process using their experiential knowledge (2013;

2016a; 2016b; 2022). Similar to Budden & Sofaer, she identifies and applies levels of skill in potters (Botwid, 2013, p. 34). Palmer's research into cognitive and physical processes during the throwing of a pot goes even further in centring the human experience, which she studies through verbal protocol, biophysical measurements, digital visual observation, and self-reporting reviews.

4.1.4.3 Archaeological science, neuroscience and experimental approaches

Even more pronounced than around the turn of the millennium, the subfield of archaeological science has increasingly applied hard science research methods on ceramic skill research in recent years. Examples include petrography (Thér & Toms, 2016; Solnay et al., 2023) and a collection of methods involving X-ray diffraction, scanning electron microscopy and macro trace analysis (Santacreu et al., 2019). In attempts to capture skill through brain activity, neuroscientists and archaeologists have applied neuroscientific methods to ceramic skill possession (Nakamura et al., 2021) and -acquisition (Forte et al., 2025). Approaches stemming from archaeological science favour an experiment-based approach, in contrast to 'traditional', humanities-focused archaeology (see two most right columns of Appendix
A.1.2 Extended quantification tables of methodologies results).

4.1.5 Which pottery attributes have been associated with skilful pottery manufacture?

I went through the collected references to look for any and all technological pottery attributes that were mentioned (more and less) explicitly to reflect skill, expertise, increased specialization and / or standardisation and / or were studied in order to later draw conclusions regarding these topics. In that last case, I assumed that researchers that were interested in ceramic variability and whose research ended up in my selection, would select attributes to study due to them likely reflecting skill-related ceramic variability.

I put the attributes in an Excel sheet in chronological order of publication year. I furthermore grouped them into overarching attribute categories in order of appearance during manufacture as much as possible (see Appendix

A.1.3 Extended quantification tables of attribute results). These categories I devised myself. I grouped attributes based on their main focus, which could be a part of the vessel (e.g., the wall, and the surface), a specific part of the chaîne opératoire (e.g., preparing the clay, and forming), or other shared foci not related to a specific vessel part of production step (e.g., weight, and standardization). At times, some liberty had to be taken for analytical clarity in the categorization, although I attempted to limit this as much as possible.

I combined a total of 163 mentions of specific attributes into 75 groups of content-wise similar attributes[16], which I further categorized into 22 overarching attribute categories. The attributes and their corresponding overarching categories are presented in Table 5.

Table 5: The attributes mentioned in the literature and their corresponding overarching categories in bold and underlined, sorted in order of appearance during manufacture as much as possible. The regular numbers represent the number of mentions of the attribute, while the number in bold an underlined represent the total number of mentions within that category. Within each category, the attributes have been listed from most to least mentioned.

6	**Preparing clay**
1	Inclusion sorting (better)
1	Temper (lack thereof; context-dependent)
3	Homogeneity in kneading / wedging (more homogenous, no air bubbles)
1	Clay preparation (more appropriate for manufacturing process and final vessel use)
1	**Prebuilding**
1	During kneading and centring the clay on the wheel (axis of kneading in line with turning direction of the wheel)
2	**Weight**
2	Clay amount (more)
18	**Forming**
6	Relative regulation of forming speed (appropriate wheel turning speed in relation to pulling up the clay)

[16] It is these content-wise similar attributes that I refer to when referring to '[an] attribute'. When I refer to '[an] attribute mention', I mean the mention of a certain attribute within a singular study.

4	Form / shape
4	Form complexity (more complex)
3	Technique (more complex)
1	Quality (higher quality, context-dependent)
17	**Surface**
6	Exterior finish / surface treatment (presence thereof)
2	Successive coil bonding (less traces, no crevices; in handforming)
2	Refining ability and accuracy (more refined and more accurate)
2	Interior finish / surface treatment (presence thereof)
1	Scraping marks (lack thereof; in hand-forming)
1	Patched areas (lack thereof; in hand-forming)
1	Spalled surfaces (lack thereof; in hand-forming)
1	Smudged interior (smoother)
1	Presence of prefiring surface treatment techniques called preforming, such as shaving, scraping, beating, or comparable techniques (in hand-forming)
10	**Standardization**
5	Standardization in profile reproduction (complete profile; closer to original)
2	High-rate production standardization (more in base, height, apterture, and for closed shapes maximum diameter and height thereof)
2	Profile standardisation in working with unfamiliar shapes and / or tools
1	Standardized paste composition (more standardized)
15	**Absolute dimensions**
7	Size (larger)
4	Maximum height (higher)
3	Maximum diameter (wider)
1	Neck length (longer; for jars)
7	**Relative dimensions**
4	Maximum orifice diameter in relation to the vessel (larger)
1	Maximum diameter located close to the mid-height of the vessel (smaller diameter)
1	Wall thickness in relation to profile length increase (thinner)

1	Height and maximal diameter in relation to clay mass (larger)
9	**Symmetry**
7 1 1	General symmetry, visually observed or measured symmetry (less lopsidedness) Handle symmetry Profile symmetry
1	**Mechanical stress division**
1	Mechanical strain (less local, more evenly divided, in more complex shapes)
1	**Base**
1	Roundness (rounder)
22	**Wall**
10 4 2 2 1 1 1 1	Thickness (thinner) Evenness (more even / regular) Thickness, especially at the base (thicker) Curvature regularity (more regular) Evenness, especially at the base (more even) Basis collapse (lack thereof) Thickness (thicker; in hand-forming) Maximum thickness (lower)
7	**Rim**
2 2 1 1 1	Angle to wall (more acute) Thickness (slightly thicker than wall) Deviation on horizontal plane (less) Evenness (more even) Rim symmetry (more)
1	**Orifice / aperture / top opening**
1	Minimum diameter (smaller)

6	**Drying**
2	Thorough before firing (dry)
2	Drying cracks (lack thereof)
2	Thorough before firing, avoiding warping of the pot (dry)
1	**Additions (context-dependent)**
1	Presence thereof
11	**Firing**
4	Fire clouds (lack thereof) / equal temperatures along the vessel
3	Colour extending through firing core through consistent atmosphere (reduction / oxidation; extending more thoroughly)
2	Fire cracks and star-shaped cracks (lack thereof)
1	High temperature (higher)
1	High temperature but avoiding calcite decomposition
13	**Post-firing treatment (context-dependent)**
4	Exterior finish / surface treatment (presence thereof)
2	Shiny surface (successful burnishing)
2	Finishing quality (higher quality)
1	Presence thereof (more aesthetic and more even final result)
1	Technique (more complex)
1	Interior finish / surface treatment (presence thereof)
1	Refining ability and accuracy (more refined and more accurate)
1	Surface roughness (less)
10	**Aesthetic features**
4	“Fineness”
4	Decoration (presence thereof)
1	“Luxury” (aesthetical pleasantness? Subjective? Combination of many different attributes and strongly context-dependent)
1	Lack thereof due to focus on output and speed
1	**Fitting to customs (context-dependent)**

1	Adherence to appropriate customs (strongly culturally embedded)
2	**Labor intensity / investment**
2	Labor intensity / investement (more; larger task size)
1	**Integrity (unclear: structural, functional, aesthetic or material?)**
1	Integer (more)

4.1.5.1 Attribute numbers in general and per research perspective

At a first glance, the attributes seem to be mentioned rather randomly in the literature in terms of overarching categories and appearance in the literature over time. Nonetheless, certain patterns could be traced.

Attributes reflective of skill were mentioned in 30 out of the 43 references. The largest variety and largest number of mentions of attributes occurred between 2000 and 2020, in particular between 2007-2010 (35 mentions) and 2016-2020 (45 mentions). The authors mentioning the highest number of different attributes were Crown (2001, 13 attr.), Budden & Sofaer (2009, 16 attr., hand-forming), and Santacreu (2017, 13 attr.). The research group led by Gandon was predominantly interested in profile reproduction variability, which I placed in the category of standardization. They mentioned little other pottery attributes of skill.

The references that did *not* mention attributes in relation to skilful manufacture I had previously sorted through the research perspectives of craft production systems, theorization / context, and real-time processes (as the focus here was not on the remaining features of skilful crafting, nor on discerning more skilled from less skilled crafting behaviour). The research perspective of the artisanal perspective only yielded one reference mentioning particular attributes of skilful manufacture.

4.1.5.2 The attributes, their overarching categories, and their occurrence in the literature

The most important attribute categories in the literature, as measured by the number of mentions in literature of the attributes within that category, are the following

- Wall attributes (22x total):
    - Thickness (14x), evenness (5x), curvature (2x), and lack of basis collapse (1x)
- Forming attributes (18x total):

- ○ Form / shape (complexity) (8x), regulation of wheel turning speed in relation to pulling up the clay (6x), technique complexity (3x), quality (1x)
- Surface attributes (17x total):
    - ○ Exterior finish / surface treatment (7x), refining and accuracy (2x), interior finish (2x), smudged interior finish (1x), the following all in hand-forming: coil bonding succession (2x), lack of scraping marks (1x), lack of patched areas (1x), lack of spalled surfaces (1x)
- Absolute dimensions attributes (15x total):
    - ○ Size (7x), maximum height (4x), maximum diameter (4x), neck length for jars (1x)

Some overarching attribute categories were more diverse than others. Figure 11 visualises the number of times that attributes in specific categories were mentioned. Since some categories consisted of more diverse attributes of skilful manufacture than others, this graph shows the number of different technological attributes of skilful pottery manufacture per overarching category as well.

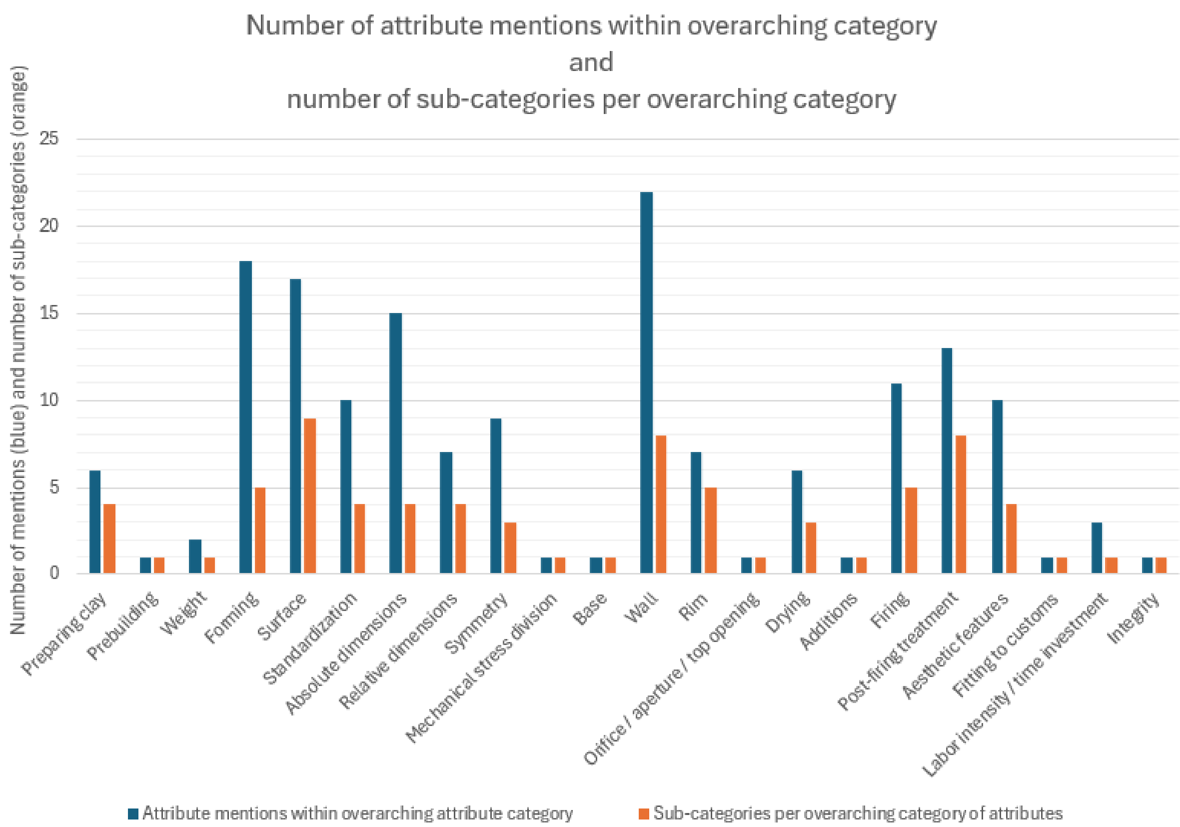


Figure 11: Number of attribute mentions within overarching attribute category and number of sub-categories per overarching attribute.

The graph in Figure 11 clearly shows that some overarching attribute categories are more diverse than others. The most homogenous categories are those of forming, absolute dimensions, and wall. As mentioned previously, some liberty had to be taken in grouping attributes for analytical workability.

Conversely, several attributes categories were only mentioned once; these were prebuilding, mechanical stress division, base, orifice / aperture / top opening size[17], additions, fitting to customs, and integrity.

Some attributes only appeared in studies on hand-formed pottery:

1. clay preparation[18]
2. successive coil bonding
3. (lack of) scraping marks
4. (lack of) patched areas
5. (lack of) spalled surface
6. handle- and profile symmetry
7. (lack of) basis collapse
8. thickness (thicker)
9. deviation of horizontal plane
10. rim symmetry
11. (presence of) additions
12. (presence of) interior finish / surface treatment

However, all of the above, probably except for 2, 3, 4, and 5, are likely applicable to wheel-thrown pottery as well.

4.1.6 Why have these attributes been associated with skilful pottery manufacture?

For each reference in which attributes were mentioned that were associated with skilful manufacture (30 in total), I tried to trace back how the researchers arrived at the attributes they

[17] Although mentioned only once as a topic in itself, it is mentioned four times as part of the category of relative dimensions as “maximum orifice diameter in relation to the vessel (larger)”. This does not apply to (roundness of the) base, which truly is only mentioned once.
[18] Although if specified further, this could have been put under other (wheel-throwing) attributes of the ‘Preparing clay’ category.

presented as reflecting skilful pottery manufacture (see Figure 12). Note that the results described in this section (4.1.6 Why have these attributes been associated with skilful pottery manufacture? do *not* reflect the entire research approach applied in a study, but only, strictly, the approaches leading towards the recognition of attributes as signifying skilful manufacture.

If literature references were lacking, I assumed that the links between the attribute to skilful pottery manufacture were thought to be self-evident, based on reasoning of the researcher, and / or a generally accepted assumption. In some cases, researchers referred to observations of their own and would make inferences based on that. In the case of pottery likely made by children, differences in skilful and non-skilful manufacture were potentially very easily identifiable. Some researchers arrived at the attributes in multiple different ways within the same study.

Up until 2010, nearly all researchers relied on their own reasoning, inferences, generally accepted assumptions, and observations in identifying attributes of signifying skilful manufacture. Studies regularly relied on multiple approaches, and about half of them relied on literature additionally to inferences and reasoning. A clear switch is noticeable after 2010. Attributes in the literature from 2011 onwards were mostly identified based on literature only. Gandon et al. strongly led this development, as all of their attribute identifications were based on literature[19].

Furthermore, Botwid (2013) relied on her experiential knowledge, while Forte et al. (2019) and Santacreu (2017) incorporated their own reasoning next to literature research. Solnay et al. (2023) and Forte et al. (2025) used very clearly visible markers for non-skilful and skilful manufacture in addition to literature research. For Duistermaat (2016), I was not able to retrace the identification of the (singular) attribute.

[19] It must be noted here that Gandon et al. identified a relatively small number of attributes in each of their studies; five at most. From their third study onwards (except for 2021b, where they identified five attributes), they exclusively identified one and the same attribute, which was a higher degree of standardization.

REFERENCES SORTED IN CHRONOLOGICAL ORDER	Publication year	Self-evident, reasoning, generally accepted assumption	Own observations and inferences	Very clearly observable differences in skill (e.g., young children's work)	A potter told the researcher + researcher inferred what to measure	Supported by literature	Experiential knowledge
Kramer	1985					1	
Hagstrum	1989	1		1			
Longacre	1991		1				
Crown	1999	1				1	
Crown	2001		1	1			
Kamp	2001			1		1	
Roux	2003				1		
Crown	2007		1	1		1	
Michelaki	2008	1	1				
Budden & Sofaer	2009	1				1	
Sofaer	2010	1	1				
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011					1	
Gandon, Bootsma, Endler, & Grosman	2013					1	
Botwid	2013						1
Gandon, Coyle, & Bootsma	2014a					1	
Gandon, Roux & Coyle	2014b					1	
Duistermaat	2016	1					
Thér & Toms	2016					1	
Gandon, Coyle, Bootsma, Roux & Endler	2018					1	
Forte	2019	1				1	
Miloglav & Vuković	2019					1	
Santacreu	2017	1				1	
Palmer	2020					1	
Gandon, Nonaka, Endler, Coyle & Bootsma	2020					1	
Gandon, Nonaka, Coyle, Sonabend, Ogbonnaya, Endler, & Roux	2021a					1	
Gandon, Coyle, Pous, Buloup & Bootsma	2021b					1	
Berg	2022					1	
Solnay, Kreiter & Szilágyi	2023			1		1	
Nonaka, Gandon, Endler, Coyle & Bootsma	2024					1	
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025			1		1	
Total		8	5	6	1	22	1

Figure 12: Approaches used in the references on the literature review to arrive at the recognition of attributes as signifying skilful manufacture. The studies by Gandon et al. have been marked light yellow.

4.1.7 Recapitulation

The literature review encompassed a total of 43 publications and yielded results on four different topics regarding previous archaeological research on skill in ceramic manufacture:

1 Research perspectives adhered to

2 Methodologies applied

3 Attributes identified and recognized as signifying skilful manufacture
4 Approaches used in the identification and recognition of these attributes

Rooted in ceramic ethnoarchaeology in the last decades of the 20th century, skill research in ceramic manufacture mostly developed in the direction of standardization and specialization, and social dynamics. Another important division can be made between the application of archaeological theory incorporating theory on skill on an archaeological assemblage, as opposed to experimental research not seeking to apply its insights on past societies. This latter, more recent line of research has been dominated by a most productive research group led by Gandon. Even more recently, methods from the natural sciences have been applied by archaeological scientists. In some instances, archaeologists have been closely collaborating with these natural scientists, mainly neuroscientists.

A wide variety of research methods has been applied in order to measure, quantify, or otherwise qualify physical vessel attributes that have been identified by researchers as signifying skilful manufacture. The methodology of visual observation has been applied in nearly all studies, oftentimes supplementary to other methods. While researchers applying insights to past societies attempted to quantify skill in assemblages (e.g., Budden & Sofaer), the experimental studies focused on extensive quantification of vessel attributes, and, in the case of Gandon et al., methodological solidification. More recent years saw the use of, and collaboration with, natural scientists (e.g., neuroscientists).

Around 75% of all studies reviewed mentioned one or more attributes in relationship to skilful manufacture, of which Crown, Budden & Sofaer, and Santacreu mentioned the most in a singular study (13, 16, and 13, resp.). A total of 163 attribute mentions, combined into 75 content-wise similar attributes groups (referred to as '[an] attribute') and 22 overarching attribute categories, demonstrated an impressive diversity in both attributes, as well as attribute descriptions in the literature. The attributes most often mentioned were wall thickness (thinner), form / shape (more complex), exterior finish / surface treatment (presence thereof), and size (larger). 12 attributes were only mentioned in the context of hand-formed pottery, of which 8 I assumed to be applicable to wheel-thrown pottery, too.

The approaches applied in arriving at the identification of attributes as signifying skilful manufacture mostly relied on personal reasoning and inferences of researchers, supplemented by literature in half of the cases. This changes drastically from 2011 onwards; virtually all studies thereafter identified attributes based on literature. Gandon et al. led therein in all nine of their studies, even though they usually only identified one attribute (standardization).

Overall, potter's skill research is marked by a clear change at the end of the first decade of the 21st century. In nine (/ ten[20]) publications in a fifteen-year period from 2011 - 2024, the most productive Gandon-led research group 1) steered away from applying insights on skill onto past societies, and towards researching skill through standardization on its own as seen in pottery manufacture, 2) opted for an experiment-based approach, in contrast to previous studies, and 3) developed a methodological standard of studying skill, focused on capturing standardization through profile variability and hardly any other attributes.

On this note, the presentation of the results of the literature review is concluded. I will continue with a presentation of the results obtained in the interviews with, and demonstrations and my observations of, the potters.

4.2 Results for sub-question 2: How do actual potters view skill?

Firstly, I wanted to understand the view of actual potters on skill in their craft, and find out the dominant themes in their (conscious, verbalized) experience thereof. I did not go into these topics all too deep, since I covered them extensively already in chapter 2. I mostly wanted to check to what degree the potters' experiences were similar to descriptions of these in literature.

4.2.1 Introduction to the results for sub-question 2

4.2.1.1 Finding potters

In section 4.1 Results for sub-question 1: How has skill in pottery manufacture been studied previously in archaeology?I have presented the data attained through the literature review. In sections 4.2, 4.3, and 4.4, the attention shifts to the data obtained through the interviews with potters and their demonstrations.

As the data for the remainder of chapter 4 is derived from the interviews, demonstrations and my personal observations, I refer to these often. The transcripts of the interviews and the potters' comments, including descriptions of corresponding actions, have been taken up in Appendix C.2

[20] See Appendix A.1.4 Quantification of researchers collaborating in Gandon's research group.

Interview and demonstration transcripts. However, these sources of data only incorporate consciously perceived, verbalized information, while the inferences I was forced to construct in order to combine the results into one coherent description drew on a much larger body of contextual knowledge that I had gained during my data collecting. More often than not, insights would be retraceable to a variety of data, of which a significant part had not been written down. In accordance with my supervisor, I have therefore opted not to refer to specific transcript passages when referring to the potter's insights. Instead, I present here an overview of the Appendix headings that correspond to interview- and demonstration transcripts of specific potters (see Table 6). When referring to a piece of knowledge gained from a potter, I will simply refer to 'P[number]', instead of the specific interview in which this piece of knowledge might (also) be inferred from.

Table 6: Overview of Appendix headings corresponding to the interview- and demonstration transcripts of specific potters.

P1	C.2.1.1 Transcript of interview with P1 (original in Dutch) C.2.2.1 Transcript of interview with P1 (translated into English)
P2[21]	C.2.1.2.1 Notes of first interview with P2 (original in Dutch) C.2.1.2.2 Notes of second interview and demonstration with P2 (original in Dutch) C.2.2.1.1 Notes of first interview with P2 (translated into English) C.2.2.1.2 Notes of second interview and demonstration with P2 (translated into English)
P3	C.2.1.3 Transcript of interview with P3 and P4 (original in Dutch) C.2.2.3 Transcript of interview with P3 and P4 (translated into English)
P4	C.2.1.3 Transcript of interview with P3 and P4 (original in Dutch) C.2.2.3 Transcript of interview with P3 and P4 (translated into English)
P5	C.2.1.4.1 Transcript of first interview and demonstration with P5 (original in Dutch) C.2.1.4.2 Transcript of second interview with P5 (original in Dutch) C.2.1.4.3 Transcript of third interview with P5 (original in Dutch) C.2.2.4.1 Transcript of first interview and demonstration with P5 (translated into English) C.2.2.4.2 Transcript of second interview with P5 (translated into English) C.2.2.4.3 Transcript of third interview with P5 (translated into English)

[21] P2 was the first potter I interviewed, which I did through without recording the interview. Hence the word 'notes', which I worked out into a flowing text directly afterwards, instead of 'transcript'. For the other interviews and demonstrations, I did record and later transcribe them.

As mentioned previously, after a failed first attempt to obtain results using a questionnaire, I redesigned and simplified the questionnaire to be more open, and contacted a very experienced potter (who I will refer to as 'P5') running their own pottery workshop and teaching pottery wheel-throwing in Leiden. They kindly agreed to answering my questions, doing a demonstration, and welcoming me in their studio on an open studio day (12-4-2025). The monthly held open studio day entailed a full day on which potters could come and work autonomously and optionally ask questions. These days are accessible for anyone who has at least finished a beginner course in pottery throwing. Here, I conducted an interview with them and they performed a demonstration with explanations. I further interviewed three of their students (P2, P3 and P4). I interviewed P3 and P4 simultaneously, as they approached me at the same moment. After these interviews and more observation, I returned to P5 for another deepening interview. To address sub-question 3 regarding where potters see skill in pottery manufacture and in the final object potters (see section 4.1 Results for sub-question 1: How has skill in pottery manufacture been studied previously in archaeology?), I returned to another open studio day at the workshop of P5. I did this to check together with P5 my reasoning and assumptions regarding the process of skilful pottery manufacture.

On the first open workshop day, I was introduced to the students at the beginning of the day. The next several hours I spent observing from a distance a total of nine potters while at work, while listening to the mostly pottery-oriented conversations they had with the teacher and each other. The observed activities included preparing clay, throwing pots (using both regular industrial clay and porcelain clay) and taking them off the wheel again, performing alterations on leather-hard pots, and glazing. I invited them to come up to me after their throwing sessions if they would be interested in answering some questions for academic purposes about their experiences with throwing pottery and potter's skill. I further mentioned that all of them were welcome, regardless of the skill level they currently possessed.

4.2.1.2 Background information of potters

The levels and types of pottery skill and experience differed greatly between each of the potters, so I will briefly introduce them and their pottery background. For reader convenience, I sorted and named them in order of self-perceived increasing skill level in wheel-thrown pottery manufacture[22].

[22] Since (most of) these potters did not focus on routinized production in their craft, the skill levels as defined by Kuijpers did not align neatly with the practice of the potters I interviewed (see 2.3.2.1 Levels of mastery). Botwid used the ten-grade Visual Analogue Scale (VAS) for this (2016a, p.72). However, the Dutch educational grading system is built around grades 1 – 10. This would not be a problem in and of itself, but whereas the VAS represents a more linear scale, the Dutch grading system represents a more exponential scale. Moreover, Dutch students have commonly developed a deep-rooted, negative evaluation of anything below a 5.5 mark

P1 (31 years)

Pottery education: One five-lesson basic course in throwing and half a year of weekly throwing evenings at this workshop

Duration of pottery experience: One year

Intensity of pottery manufacture: Hobby

Skill level: Beginner / intermediate

P2 (39 years)

Pottery education: One five-lesson basic course in throwing, then weekly throwing evening at this workshop

Duration of pottery experience: Five years

Intensity of pottery manufacture: Hobby. Taught a few one-off workshops. Is currently a PhD candidate at Leiden University working on Roman pottery. Therefore had a lot of practical experience in handling pottery prior to starting wheel-throwing lessons, resulting in a steep learning curve during and after these lessons. Currently regularly recreates Roman pottery

Skill level: Intermediate

P3 (64 years)

Pottery education: Half-year course of figurative hand-forming ceramics. One six-lesson basics course in throwing and three years of weekly throwing evenings at this workshop. One sabbatical month of throwing, diverse multi-day workshops focused on glazes and porcelain, and in an online format

Duration of pottery experience: Three years (in throwing)

Intensity of pottery manufacture: Serious hobby

Skill level: Intermediate

P4 (57 years)

Pottery education: Six times week-long courses in throwing, several years of regular to advanced monthly throwing lessons at this workshop, half-year course at the Klei Academie in Amsterdam

Duration of pottery experience: Seven years

(the benchmark for a 'sufficient' grade), which can result in a feeling of discouragement when being marked below that. In an attempt to steer away from attaching a number to one's ability that could be emotionally loaded to Dutch potters, especially since I relied on self-evaluation, I opted for asking the potters to rank their skill level using the following categories: beginner, intermediate, advanced, and very advanced.

***Intensity of pottery manufacture**:* Professional, teaching hand-forming and occasionally basics of throwing

Skill level: Advanced

P5 (50 years)

Pottery education: Several years of hobby lessons focused on throwing, followed by the three year ceramics education in Gouda ('Nederlandse Keramiekopleiding', 'Dutch Ceramics Education'), and two extra study years focused on throwing large ceramics and glazes. Several one-day or three-time courses on specific techniques

Duration of pottery experience: About 25 years, of which fifteen years professionally, amounting to about four years of thirty hours of throwing per week

***Intensity of pottery manufacture**:* Professional, teaching wheel-throwing and producing commissions, such as archaeological reproductions

Skill level: Very advanced

4.2.2 Interview results for sub-question 2: How do you view / experience (your) skill?

For the following results for sub-questions 2, 3, and 4, I noted down the relevant information from the interviews and combined them under overarching topics. The full transcripts in Dutch (original language) and English (translation) can be found in Appendix C.2 Interview and demonstration transcripts.

Automatism

In general, the lived experiences of crafting of the interviewed potters were very similar to one another. An important component of the throwing experience mentioned by all was an automatism in their movements, both in a mental and physical sense. They saw their knowledge on how to move as "coming from the body" (P1), "becoming part of your fingers" (P2), "an absolute extension of myself" (P3), "not thinking about it" (P4) and "muscle memory" (P5). A feeling of (increasing) automatism was perceived regardless of skill level, although intensifying with progressing skills.

Mental flow

In more or less words, all potters told of a (relaxing) flow-like state while throwing marked by full concentration on the pot (P2; P4; P5). P3 described their mental state as ranging from "complete extasy to complete frustration", reminiscent of P4 and P5 mentioning a process of life-long, continuous learning by doing.

Physical flow

P1 described how their attention shifted as she progressed in the craft, from focused on the current action to thinking ahead of the final shape and adjusting her actions accordingly. They recognized skill in understanding and performing the basics well; steps that P5 describes as having been merged into one another or even omitted completely in her own production sequence. P3 and P4 told me about how their body moves in a massaging-like, smooth motion when things are going well. Both would stiffen up if things went wrong or when deep in concentration, to the point of getting off their stool again in a stiff "potter's walk" and even falling off their stool in the case of P4.

Sensory attunement

The most experienced potter (P5) noted that their long-time experience practicing the craft had led to them having very sensitive fingertips. They further told me about a skill that takes quite a while to master, which is part of their teachings from the beginning. It consists of hearing, and to a lesser degree feeling, the thickness of a clay wall and moisture content. This is done by lightly tapping the wall of the pot with a fingertip. As this sound is very dull, it quite literally takes a tuned-in ear to differentiate between differences in sound corresponding to wall thickness and moisture content.

Relationship to clay

The responses to this question demonstrated an increase in intensity of the potter's relationship with clay in line with increasing skill levels. In working with clay, P1 found "complete relaxation and peace". P2 called it his "second nature", born from the initially scientifically inclined wish to make pottery himself after having studied pottery for a decade. Both P3 and P4 agreed on a feeling of not being able to live without clay. P5 told me about how they are very much drawn to throwing clay and especially likes the aspect of its permanent transformation to baked ceramics. P5 finds it a very grounding, beautiful and lasting material. At the same time, P5 compares it to children due to it having all sorts of needs and demands.

From potters' verbal descriptions of experiences of practicing the craft of wheel-thrown pottery manufacture, I now turn to the potters' verbal descriptions and non-verbally communicated information regarding what occurs during a wheel-thrown pottery production process.

4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?

This section contains the most important and most extensive part of the results I obtained in the interviews with, and demonstrations by potters, and my personal observations. I have combined as much data collected from these approaches into one, coherent description of the wheel-thrown pottery production process, as experienced by the potter. Notably, it covers potter's insights on what makes a skilfully executed pottery manufacturing process. I discuss their explanations for why specific actions (the *what*), and the way they might best be executed (the *how*), are as important as they are for the steps in the production process thereafter and the final result.

4.3.1 Introduction to the results for sub-question 3

For each topic in this description, I listed material outcomes for unfavourable actions or 'mistakes of the potter. I tried to present them in a logical, sequential order. However, calling a certain action a mistake implies that there are more favourable actions, 'correct' ones, and less favourable actions, 'mistakes'. While I realise that variations in actions *can* be deliberate *and* still compromise the structural and / or aesthetic integrity of a vessel, my outlook for the updated pottery chaîne opératoire is that of a functional object, rather than a piece of art where a creative artist explores the very limits of the material – and beyond. Arguably, the line between the two may be thin at times. Presenting a potter's choice as a mistake further implies that it is sufficiently deviant from a(n unknown) standard (e.g., the standard of the time, see Kuijpers, 2018a, p. 76), while I have not indicated such a standard to be present in my work until this moment.

I will therefore illustrate this standard now: a functional vessel, suitable to its desired use in shape, rim finish, weight, and weight distribution, while also structurally sturdy and aesthetically coherent. This description is in line with my research aim to create a universally applicable updated chaîne opératoire for vessels for which the potter's considerations can reasonably be known. Still, exact measurements entirely depend on context and the 'recipe' for a certain vessel. As such, 'mistakes' are relative, softened by apostrophes, but called mistakes nonetheless, since they could lead to serious failure to arrive at a functional finished object if extrapolated too much. The key here is the word "too"[much or little of something], leaving room for own interpretations fitting a certain production process. Importantly, the range in which a finished object is still close *enough* by standard of the potter and / or the potter's teacher shrinks, in fact, as the potter's skill increases (P4; P5).

On another note, I need to disclaim from the onset that this section[23] and the next[24] reveal some of my personal reasoning and potential biases therein in order to connect loose potter's comments and my observations during the demonstrations into one, coherent story. My personal reasoning is most prevalent in the listed material outcomes of mistakes. While working on the results and setting up an outline for my updated version of the ceramic chaîne opératoire, I found that I made several assumptions about the potters' considerations and material outcomes. Fortunately, I was able to schedule another meeting with P5 who very kindly went through the updated chaîne opératoire with me and correct any inconsistencies. This has resulted in sections 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?and 4.4 Results for sub-question 4: How can Kuijpers' craftsperson's perspective be applied to the pottery manufacturing process?largely relying on insights coming from P5. I further heavily edited the material outcome lists after this conversation, but they are still reconstructed based on (my own inferences from) the interviews and demonstrations. Therefore, they may not always reflect varying degrees in the gravitas of potter's mistakes, nor contain the completely correct order of clay responses, if not simultaneous. Any mishaps or inconsistencies in interpretation and consolidation of the potter's insights into one story are my faults alone.

What follows are a few considerations regarding what is covered in this section (4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?, and how it has been written down. Firstly, the descriptions are divided by topics, steps, and sub-steps in the production process that naturally followed from the interviews. They do not necessarily represent the final set of production steps I will choose to present in the pottery chaîne opératoire for the results for sub-question 4. Secondly, comments made under one heading oftentimes refer to topics under another heading. I tried to limit repetition as much as possible, yet I consider some repetition to benefit reader's understanding of the process. Thirdly, (crafts-)people never produce absolutely, completely perfect pieces. I therefore decided to focus on 'mistakes', even

[23] 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?
[24] 4.4 Results for sub-question 4: How can Kuijpers' craftsperson's perspective be applied to the pottery manufacturing process?

though the resulting pieces look (nearly) perfect to the skilled observer. I deliberately chose to extrapolate negative outcomes of various production choices to ensure that researchers with no or little practical experience in wheel-throwing pottery could follow the potter's considerations on what to avoid, and thus what to balance and strive for. Moreover, knowing the more extreme results of mistakes might help to understand and recognize throwing mistakes in their early stages in fired pottery. Indeed, only the pots with no or minimal mistakes survive the entire production process.

Furthermore, some steps get significantly more attention than others. This has several reasons. Firstly, the potters I interviewed all worked with industrial clay and did not add any inclusions or temper to it aside from reclaimed, unfired clay. Therefore, I will not cover considerations on collecting, purifying, or preparing clay, nor on collecting, preparing, or mixing in temper. Secondly, my research focus is on a universal vessel manufacturing process in which any decoration, glazing, and additions are optional. While I welcomed all comments regarding these topics and did not mention specifically that I was less interested in them, the potters spent little time on it in the interviews, if any. Thirdly, firing processes within past and present societies are hardly standardized in any way, so I deliberately kept it short there. On another note, firing industrial clay in modern-day kilns requires significantly less skill than firing self-collected and self-prepared clay in a dug-out fire pit, for instance.

4.3.2 Points of attention for potters in pottery manufacture

Following the steps of the ceramic chaîne opératoire would seem like a logical option when describing a pottery production process. However, while consolidating the potters' data, I quickly realized that I needed to adjust my framing of steps discussed to what I had learned from the potters, instead of trying to make them fit a pre-existing chaîne opératoire. Moreover, not all topics discussed related to specific steps, or they played a role throughout the process. I therefore opted for a description of the production process centred around 'points of attention', as I have come to refer to it. This framing is rooted in the idea that a verbalized experience of a (sub-)consciously perceived production process is best understood as a collection of attention foci as per the perspective of the potter, intricately interwoven in terms of material outcomes, time, and their (alternating) sequencing. For the reader's convenience, the order in which I discuss them here is (loosely) based on the order in which they become most directly relevant during the manufacturing process.

4.3.2.1 Clay type

Different clay types have different affordances, which makes them suitable for different forming techniques and final shapes. The important aspect in this step is the firmness of the clay. Very firm clay requires more strength to work with and is difficult to centre on the wheel. It tears easily during forming, even when more water is added. Clay too firm for throwing is suitable for hand-forming, though. Clay that is on the firm side, yet suitable for throwing, will lead to more robust shapes, demanding (more) trimming of supporting clay in the leather-hard drying stage to get to the desired shape. More necessary trimming is true for very soft clay; while capable of being formed into thin-walled shapes, it lacks stability and needs a lot of supporting clay. A softer clay furthermore requires less strength to work with and is easily centred, yet slips away from the centre just as easily. Too soft clay sticks to the hands, causing spiral formation and instability in the wall (P5).

Firmness depends on the size of the clay plates. Particularly firm, secondary clays, potentially mixed with quite some grog[25] will consist of smaller clay plates or smaller particles, while softer, primary clays like porcelain are made up of larger clay plates. Firm clays may be referred to as 'short' clays, and soft clays may be called 'long' clays. As such, firmness is inherent to the clay type and does *not* depend on water content (P5).

A skilled potter chooses a suitable clay with the correct firmness, fitting the planned forming techniques and final shape. For the material outcomes of 'mistakes' in choosing clay type, see Table 7.

Table 7: Material outcomes of 'mistakes' in choosing clay type.

Material outcomes of 'mistakes' in choosing clay type

- Choosing too firm a clay can lead to:
  o Difficulty centring
  o Easy tearing
  o Difficulty forming
  o Robust shapes with more supporting clay, requiring more trimming later

- Choosing too soft a clay can lead to:
  o Easy de-centring
  o Reduced stability needing a lot of supporting clay, requiring a lot of trimming later

[25] Grog is a type of temper. It refers to baked ceramics that did not withstand the firing process, have been ground up, and added to next clay batches to make the clay firmer.

4.3.2.2 Clay amount

The amount of clay chosen for a piece is essential to the following steps, since compensating it is difficult and it entails a number of other choices (P5).

Firstly, more skilled potters throw thinner, needing less clay than beginner potters (P5), as skilled potters have more control over the clay thickness, are susceptible to mistakes in their beginning stages, and are better able to correct them before becoming too severe to repair.

Secondly, clay amount should correspond with the shape of the final vessel (P5). Using too much clay in relation to the desired shape will lead to unbalanced weights and shapes. For some shapes, this matters less than others; it does matter for vessels meant to be lifted by its user, such as cups (P1). Using too little clay results in difficulty reaching the desired wall height, since there is no more clay left to lift. Lifting up the clay nonetheless results in a very thin, fragile wall, easily causing warping and subsequent wall collapse (P5).

The type of clay is important; a soft clay needs more supporting clay than a firm clay for the same shape. Moreover, extra supporting clay is needed for high-moisture (more plastic), therefore low-stability clay. Low-moisture (drier) clay is difficult to form, naturally leading to a blunter shape with more supporting clay. More supporting clay is required for broader shapes, too. On the other hand, needing less clay overall reduces the amount of necessary supporting clay. Lastly, due to personal preferences to firmness and plasticity, aesthetic considerations, and most importantly, skill level of the potter, the ideal clay weight is never absolutely fixed (P5).

Initially using too much clay can be compensated during forming by inserting an iron trimming needle into the wall and removing the resulting loose circle of clay. Supporting clay can be trimmed in the leather-hard stage, when the piece has been hardened a bit already. Iron trimming tools, potentially wooden tools, and a scraper[26] may be used for this (see Figure 13). Any clay lost in the process must be factored in when choosing the clay amount at the start. Suitable supporting clay amounts vary not just for different clay types, but also for different shapes. A plate, requiring a lot of supporting clay,

[26] Regardless of the various shapes a scraper might have, they always have relatively sharp edges, especially the metal ones. They are usually placed perpendicular or at a certain angle to the turning vessel on one side, and guided by a hand placed on the other side of the vessel. This happens in a controlled, upward motion, just like in lifting the clay wall with the hands in primary forming. scrapers are mostly used to shape the vessel in secondary forming to shape the wall into its final shape, smoothen out traces on the wall, and remove excess slip off the wall. They are usually made out of wood, plastic, or metal.

loses about thirty per cent of its starting weight, for example. Lastly, clay can be gained during throwing as well when making multiple pots at once and some clay sticks to the potter's hands in between pots.

Figure 13: An example of a basic potter's toolkit. From left to right: an iron trimming tool, an iron potter's needle, a larger iron trimming tool, a wooden scraper, a soft-edged sponge, a wooden potter's spatula, a wire cutter, and a metal scraper. Trimming tools, spatulas and scrapers exist in many different shapes and sizes; the choice of which one to use when often depends on personal preference of the potter. (Public product marketing picture found on www.cavalierart.com).

A skilled potter chooses the correct clay amount right at the beginning – through visual estimation and / or weighing to be sure, considering own preference and ability to throw thinly, desired final shape, clay type in relationship to forming technique and necessary supporting clay lost again in trimming during forming and in the leather-hard drying stage (P5). For material outcomes of 'mistakes' in choosing clay amount, see Table 8.

Table 8: Material outcomes of 'mistakes' in choosing clay amount.

Material outcomes of 'mistakes' in choosing clay amount
- Using too much clay can lead to: o Thick base compared to the wall, requiring more trimming later o Heavy, robust piece overall, requiring more trimming later o Higher and / or thicker wall than planned, lacking the necessary supporting clay, causing wall collapse

- Not using enough clay can lead to:
    - Not having enough supporting clay, causing sagging
    - Not reaching desired wall height, resulting in an unplanned shape
    - Fragile, thinned-out wall, causing warping and subsequent wall collapse

4.3.2.3 Wedging

Wedging clay involves kneading clay and slicing off pieces to add water or temper, and kneading again, repeatedly if necessary. This serves two purposes: getting rid of any air bubbles (P1, P2) and homogenizing (added) moisture, different clays, and / or any inclusions present in the clay. Wedging clay should be done slightly forcefully to push out the air. If done correctly, the clay will be rolled into one large spiral, as if a very long, narrow strip of clay has been rolled up. (Large) air bubbles remaining in the clay can hinder centring the clay. They may be popped at any time while working the clay on the wheel or even in leather-hard clay, although it is highly preferred to do this as early on in the process as possible to limit further disturbance from them during forming. If left untouched until firing, they can cause the piece to break in the kiln due to air expansion in combination with clay shrinkage (P5).

Adding moisture to the clay (see Figure 14) increases its plasticity and makes it easier to form. This makes it easier to form wider shapes, but more plastic clay lacks stability for higher shapes. Choosing a firmer clay and adding more water hardly solves this problem, as firmer clay does not take up water as easily as softer clay. Therefore, firmness of the clay dependent on clay plate size and plasticity of the clay dependent on moisture level of the clay need to be chosen carefully in line with the necessary forming technique to reach the desired final shape (P5).

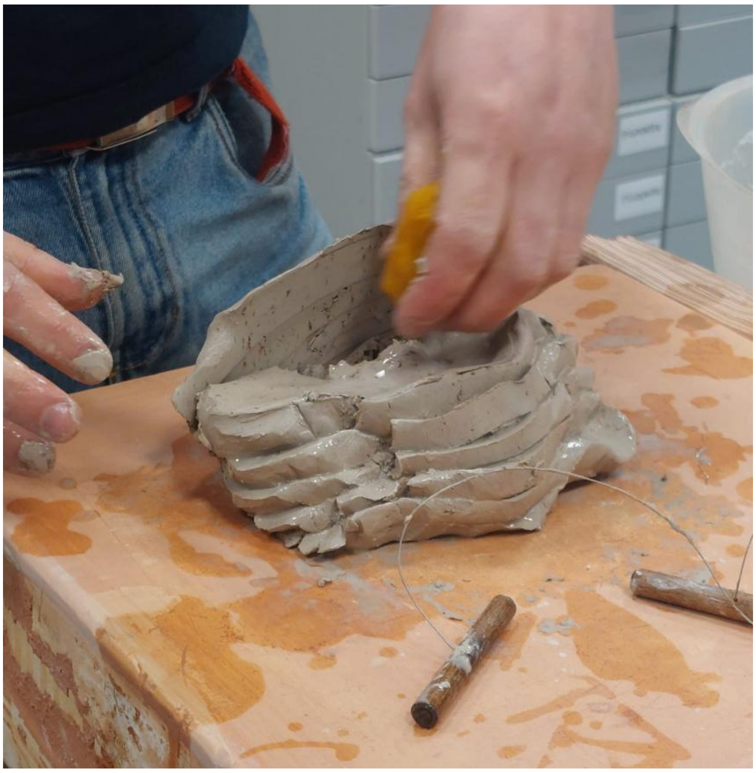


Figure 14: P2 adds water to the clay while in the process of wedging. The clay hump is alternatively wedged, cut into slices using a wire cutter to add water, and wedged again, until the desired plasticity has been reached.

A skilled potter perfectly homogenizes the clay and leaves no air bubbles in it (P4), while adjusting moisture level to fit the inherent firmness of the clay, planned forming technique, and final shape (P5). For material outcomes of 'mistakes' in wedging, see Table 9.

Table 9: Material outcomes of 'mistakes' in wedging.

Material outcomes of 'mistakes' in wedging
- Bad or incomplete wedging can lead to: ○ Difficulty centring due to air bubbles, causing asymmetry in shape and thickness ○ Uneven moisture distribution, causing uneven thickness and fragile base and wall ○ Uneven distribution of temper, if applicable ○ Air bubbles still present in piece during firing, leading to cracking or even bursting during firing
- Too little plasticity can lead to: ○ Difficulty centring and forming ○ Robust, low-walled piece and / or thick base compared to the wall, requiring more trimming later

- Too much plasticity can lead to:
    - Slipping away from the centre of the wheel
    - Sagging
    - Stickiness to the hands, compromising stability and dragging of the clay into spiral
    - Reduced stability needing more supporting clay, requiring more trimming later

4.3.2.4 Centring

A properly wedged piece of clay can be transferred to the throwing wheel. Any air pockets underneath the clay creates the risk of water slipping underneath it, creating a slippery film, and causing the piece of clay to slip away uncontrollably from the centre of the wheel. 'Sealing' the lump of clay onto the wheel by running a finger along the edge limits the chance of water slipping underneath (see Figure 15).

Figure 15: P2 seals the lump of clay to the wheel to avoid the creation of a slippery film underneath the lump, which could cause the lump to wander from the centre of the wheel.

Through firm pressure of the palm(s) or side(s) of the hand(s) and adding enough water, the clay is pushed into a centred shape. Elbows may be locked into the thighs for extra stability. The clay is then homogenized even further by, for example, coning. This refers to pushing the clay upwards into a cone and downwards again several times (P5; see Figure 16). Only after all irregularities have been spread evenly throughout the clay, the precise centring becomes priority.

Figure 16: P2 performs a coning movement, pictured pressing downward a cone, to further homogenize the clay. Note that P2 is leaning one elbow against the leg for extra support.

Starting from this stage, the potter will always make sure that both hands are making (in-)direct contact with each other in some way to help estimate the distance between hands and fingers. Likewise, adequate water content in the clay must be maintained throughout the entire process (P5).

Any remaining air bubbles in the clay at this point might hinder perfect centring. Continuing with an imperfectly centred shape will lead to uneven amounts of clay moved outwards and into the wall, creating an irregular shape and potentially even uncontrollable warping due to irregular centrifugal force (P5).

A skilled potter will only move forward when the clay has been thoroughly homogenized and perfectly, symmetrically centred on the wheel (P1; P4; P5). For material outcomes of 'mistakes' in centring, see Table 10.

Table 10: Material outcomes of 'mistakes' in centring.

Material outcomes of 'mistakes' in centring
- Improper final homogenizing can lead to: o Irregularities in forming, causing uneven thickness and / or warped, asymmetrical shape

- Presence of air bubbles can lead to: o Difficulty centring, leading to asymmetry
- Imperfect centring can lead to: o Uneven thickness o Warped, asymmetrical shape

4.3.2.5 Prebuilding / Making basic shape

Preforming refers to creating a compact, unopened shape that later enables opening the shape in such a way that it mitigates centrifugal force in a way that supports the creation of a certain final shape. The correct basic shape for pulling up has straight, diagonal sides for extra stability regarding centrifugal force, never fully vertical sides (P5).

In the preforming step, the foundations are laid for three different forming trajectories that can be made into to all kinds of final shapes. The basic shape of a final cylinder shape resembles a small beehive (P1, P5). For a final bowl shape, the basic shape is like a flattened pot upside down (see Figure 17 and Figure 18). A plate starts out as a thick disc. Sharp edges are to be avoided, since hands will easily drag clay along from them and clay gets lost (P5).

Figure 17: P2 works towards a prebuilding shape resembling a flattened pot upside down, with smooth edges, since I asked P2 to recreate the shape of the Frisian candle holder – in its essence, a bowl shape.

Figure 18: *Just like P2, P5 creates a prebuilding shape resembling a flattened pot upside down in preparation for the basic bowl shape of the Frisian candle holder.*

Unsuitable preforming shapes will lead to difficulty mitigating the result of increasing centrifugal force when opening the shape and trying to pull up walls, even when lowering turning speed. Choosing a certain preforming option determines the forms that can be made afterwards, meaning that it is extremely challenging, if not impossible, to successfully create a final shape form an unsuitable preforming shape (P5). The basic shapes must be seen as guidelines on a spectrum where the support and the angle of the wall relative to the wheel are the main variable material outcomes. These factors are determined through division of clay on the wheel in the preforming stage; the further away from the centre of the wheel, the more grip the centrifugal force has on the clay.

To illustrate the different forming trajectories, I took pictures of the demonstration material P5 keeps in her studio to help explain the different forming trajectories (see Figure 19 and Figure 20). A more in-dept description of the steps pictured will follow in the majority of the following topics, in which I will refer to these images repeatedly.

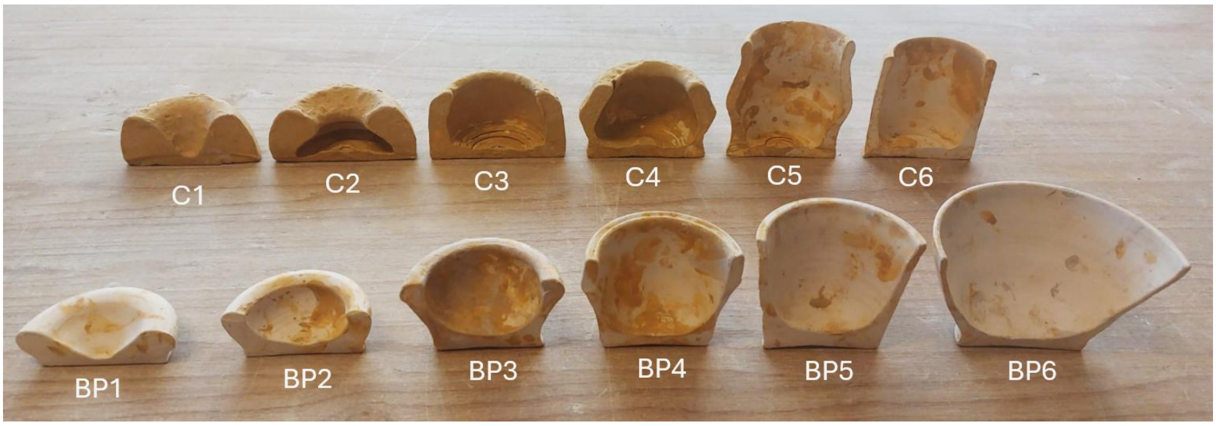


Figure 19: Demonstration material in P5's workshop to help explain different forming trajectories of different vessel shapes. C stands for cylinder shape featuring a flat base and a 90-degree outside angle. BP stands for bowl / plate combination, featuring the flat base characteristic of plates, and the tensions arch and upward wall of a bowl. Bowl and plate have probably been combined for ease of storage and to demonstrate that bowls and plates share similar forming trajectories.

Figure 20: Demonstration material in P5's workshop to help explain different forming trajectories of different vessel shapes. B stands for bowl, of which B-a and B-b demonstrate different versions. Both feature a connected tension arch, creating a downward parabola shape. B-b showcases how choices in forming trajectories of a bowl and a plate can be placed on a spectrum.

A skilled potter will determine the correct proportions within the preforming phase to fit the final shape the best (P3; P5). For material outcomes of 'mistakes' in prebuilding, see Table 11.

Table 11: Material outcomes of 'mistakes' in prebuilding.

Material outcomes of 'mistakes' in prebuilding
- Final shape: cylinder
o Choosing bowl basic shape (flattened bowl upside down) can lead to:

▪ Some difficulty with creating a 90-degree outside angle characteristic of a cylinder ▪ Great difficulty keeping the wall leaning inward, leading to warping
○ Choosing plate basic shape (thick disc) can lead to: ▪ Extreme difficulty creating a 90-degree outside angle characteristic of a cylinder ▪ Extreme difficulty raising vertical walls ▪ Extreme difficulty keeping the wall leaning inward, leading to warping and wall collapse
- Final shape: bowl
○ Choosing plate basic shape (thick disc) can lead to: ▪ Extreme difficulty raising wall upward, leading to low, unstable walls and a very wide aperture / top opening ▪ Very wide lower part of the shape
○ Choosing cylinder basic shape (beehive) can lead to: ▪ Lack of supporting clay, leading to unsupported walls and wall collapse ▪ Higher and more upright walls than planned ▪ Very thin, fragile upper part of the wall, causing warping and wall collapse
- Final shape: plate
○ Choosing cylinder basic shape (beehive) can lead to: ▪ Extreme lack of supporting clay, causing the shape to collapse ▪ Extremely thin, fragile wall, leading to immediate wall collapse
○ Choosing bowl basic shape (flattened bowl upside down) can lead to: ▪ Lack of supporting clay, causing the shape to collapse ▪ Very thin, fragile wall, leading to wall collapse

4.3.2.6 Forming the base and the lower part of the wall

The preforming shape is opened through pushing one or more fingers or the side of a hand / fist into the centre until reaching almost the wheel (see Figure 19 for C1 and BP1; Figure 20; Figure 21; Figure 22).

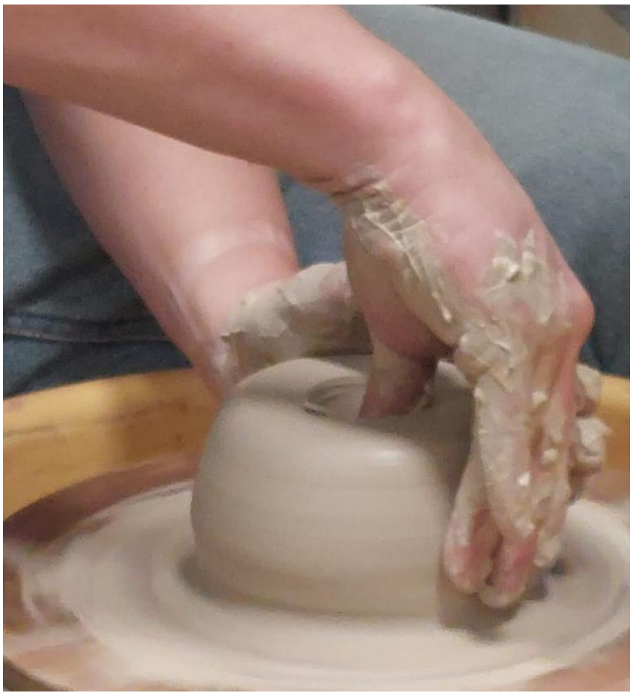


Figure 21: P2 opens the prebuilding shape using one thumb on the inside, while staying connected to the clay lump using the remaining fingers and the other hand, touching each other.

Figure 22: P5 opens the prebuilding shape using one thumb, which is guided in a controlled manner by two fingers of the other hand.

Simultaneously, an inner hand pushes outwards, creating a flat base surface in the middle of the shape, and the outer wall is guided outwards by the other hand (see Figure 23 for C2, BP2 and BP3). The base is laid in one, smooth motion, turning into lifting the wall at the right moment. The near-final width of the base is created here, so this must be kept in mind when laying the base. The amount of clay pushed outside here largely determines the division between base clay and wall clay, although a clay overshoot pushed outside here can be compensated later on when pulling up the wall (P5).

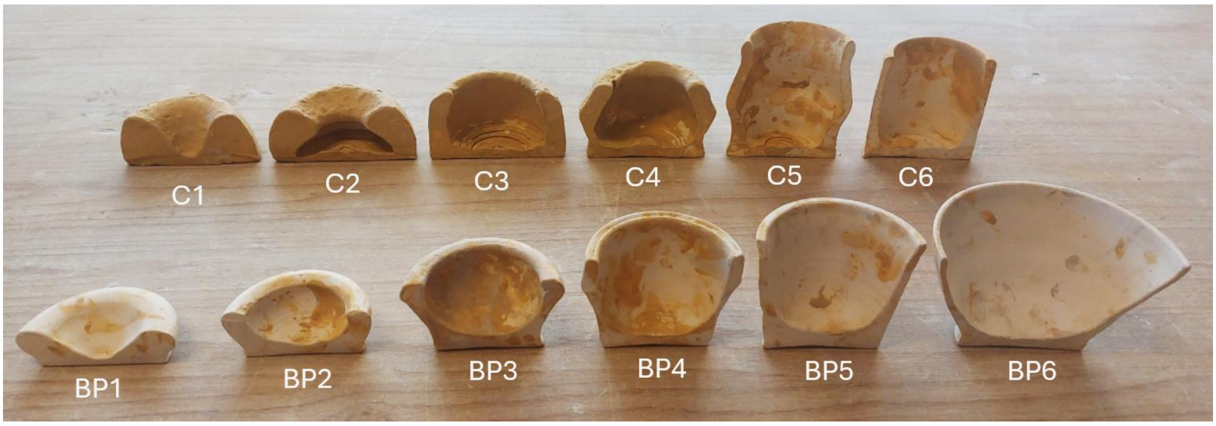


Figure 23: Figure 19, repeated first time.

For a cylinder, a 90-degree outside angle between base and wall is created (see Figure 23 for C3; Figure 25). A proper balance must be established between the thickness of the lower wall part and the clay ring on top meant for the rest of the wall. Too thin of a lower part will risk collapse due to the heavy weight on top, while a too thick lower part risks not enough clay being present in the ring on top to reach the desired height and it requires extra trimming later on. Between the two, a good ratio exists based on gut feeling[27]. A raised point in the middle of the base stores clay that can later fill up the inside angle into a small “tension arch” (P5, see next paragraph) without compromising base thickness (P5; see Figure 23 for C2 and C3; Figure 24).

[27] I wish I could attach a more objective ratio to this, but this was the answer I received.

Figure 24: At the end of the demonstration, P5 shows the connected tension arch on the inside of the vessel benefitting the overall stability and integrity of a bowl shape, in this case in the vessel that P5 threw.

Figure 25: P5 opts for extra stabilization in the mitigation of centrifugal force at the beginning of the wet forming. Even though the creation of a 90-degree angle is more strictly necessary for a cylinder shape, it creates extra control over the shape and can thus benefit in the creation of a final shape in which the diameter of the aperture / top opening is not too large in comparison to the diameter of the base.

For a bowl, the priority lays with creating in one smooth motion (P4) a “tension arch” or hyperbole shape (P5). It evens out the tension of gravity and mechanical stress of the final shape, adding to the structural stability when throwing thin-walled and with little supporting clay. The arch is mainly visible on the inside of the vessel; the outside angle between base and wall will be more acute, containing supporting clay. This part may be trimmed later. The base has no raised point in the middle nor is there a spiral / “finger flow trace” outward (P1; see Figure 23 for BP2 and BP3); a challenge in case of uneven centring (P5).

For a plate, the disc is flattened until a thinness suitable for a base has almost been reached. A ‘disconnected’ (small) tension arch may be present on both ends of the plate (see Figure 23 for the bases of BP4, BP5, and BP6), depending on the final shape of the plate (P5).

Proper posture aids in ensuring the correct direction of pressure in the forming motions, particularly in forming the base and lifting up the wall. Skilled potters use their whole body to throw (P1), almost as if massaging the clay while avoiding being stiffened up (P3; P4). They specifically do not lean on their elbows and relax their arms after the centring stage. Tense arms and leaning on elbows will likely result in a thin base and a pressed-inward wall (P5).

A skilled potter, regardless of desired final shape, sets in one fluid motion a base of adequate, suitable width. For a cylinder, the potter makes a point in the middle, sets a 90-degree outside angle, and moves on to balancing – based on gut feeling – the thickness of the lower part of the wall in relationship to the ring of clay storing clay for the wall. For a bowl, the potter makes a connected tension arch throughout the shape and keeps enough supporting clay. For a plate, the potter first creates a flat base, after which a disconnected tension arch is created. The diameter of the flat base, if it exists at all, may vary greatly depending on the desired final shape. Proper posture is maintained throughout for all shapes (P1; P2; P3; P4; P5). For material outcomes of ‘mistakes’ in forming the base and the lower part of the wall, see Table 12.

Table 12: Material outcomes of ‘mistakes’ in forming the base and the lower part of the wall.

Material outcomes of ‘mistakes’ in forming the base and the lower part of the wall.
- Final shape: cylinder
o Not setting a 90-degree angle can lead to: ▪ Difficulty in keeping the walls leaning inward, leading to a wider aperture / top opening ▪ Creating a tension arch, leading to a bowl shape
o Not keeping a raised point in the middle of the base can lead to: ▪ A thinner, more fragile base and / or lack of supporting clay on the inside angle between base and wall, leading to wall collapse

  - Too thin a lower part of the wall compared to the thicker clay ring on top can lead to:
    - Little support for the heavier ring on top, causing wall collapse
    - Thin, fragile wall, leading to warping and wall collapse
  - Too thick a lower part of the wall compared to the thicker clay ring on top can lead to:
    - Difficulty in reaching the desired height
    - Thin, fragile wall, leading to warping and wall collapse
    - A lot of supporting clay, requiring extra trimming later
- Final shape: bowl
  - Having a disconnected tension arch can lead to:
    - Potential reduced support for the shape, although this does not have to be an issue and can be a stylistic choice, *if* compensated with enough supporting clay (like in a cylinder)
  - Too little supporting clay can lead to:
    - Lower part of the wall collapses under the weight of the wall
  - Too much supporting clay can lead to:
    - Thick wall, requiring more trimming afterwards
    - Difficulty in reaching desired height, leading to a low wall
    - Thin, fragile wall, leading to wall collapse
- Final shape: plate
  - Too little supporting clay can lead to (only applicable in case of no or little flat base part):
    - Sagging
  - Too much supporting clay can lead to (only applicable in case of no or little flat base part):
    - Thick wall, requiring more trimming afterwards

4.3.2.7 Forming the wall

Even, controlled lifting of the clay using fingers pressed against each other from the inside and outside keeps the tension arch or 90-degree angle intact. The right amount of supporting clay is left behind for the intended shape, reducing the risk of wall collapse. The lower inside fingers press the shape inwards, while the upper outside fingers press the clay outwards, so as to lift clay simultaneously counteract centrifugal force. This creates a very slight S-curve in the wall when lifting bowl walls (see Figure 26 for BP3 and BP4; Figure 27). P5 teaches the knuckle technique to do this, where the side of the bent pointing finger is used to press the clay upward (see Figure 28). A more pronounced S-curve is formed in the wall when lifting cylinder walls, strongly compensating for centrifugal force by pushing inwards with the lower-placed fingers during lifting (see Figure 26 for C4 and C5). For plates with a classical lifted rim, the clay is strongly compressed and worked outwards (P5).

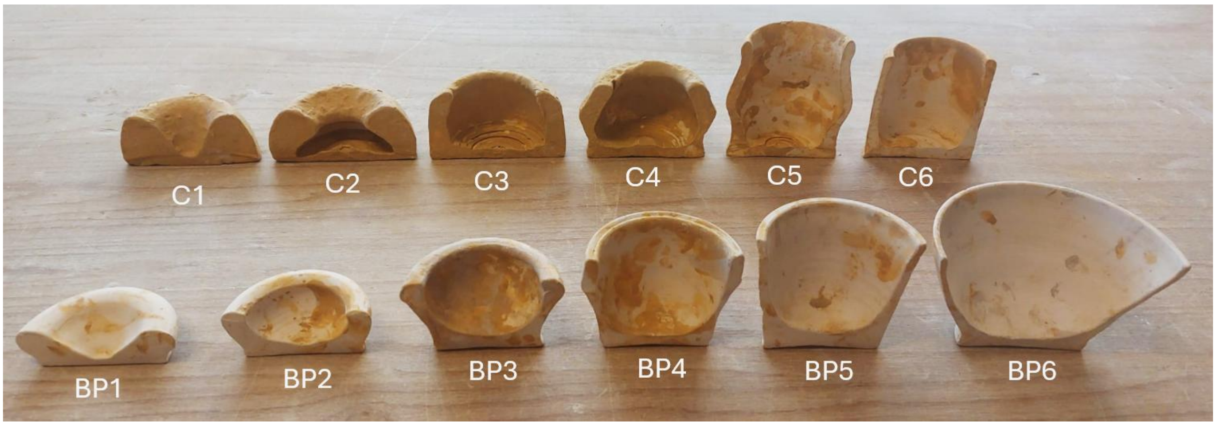


Figure 26: Figure 19, repeated second time.

Figure 27: P5 lifts the wall through creating a small S-curve using fingers from one hand to apply force from the inside, and fingers from the other hand just underneath to stabilize the wall again in the upward pulling motion.

Figure 28: P5 lifts up the wall using the knuckle technique, where the clay is pushed upward using the side of the bent pointing finger.

Lifting the vast majority of the clay is done in preferably two, maybe three lifting motions, lifting at once as much clay as possible (P2; P5). This can be recognized by a base that is not too thick (P1). A balance must be found here between the amount of supporting clay left at the bottom in relationship to the final shape, and the amount of clay that will form the walls (see Figure 29; Figure 30). For bowls and even more so for plates with a classical lifted rim, the degree to which the wall faces outwards weighs heavily in this, as a particularly outward-facing wall will require more supporting clay, which is then lost for the wall clay amount (P5).

Figure 29: P2 lifts up the wall as controlled and calm as possible, creating a wall thickness as even as possible on a wheel on which it turned out to be more difficult to regulate turning speed (see 4.3.2.9 Centrifugal force). A significant amount of supporting clay has been left in the lower part of the vessel.

Figure 30: P5 lifts up the wall in a calm, controlled manner, creating a wall as even as possible, ensuring the hands are touching at all times to estimate the distance between the fingertips.

More than three main lifting motions will “tire out” the clay too much (P5). Several secondary shaping lifts may occur afterwards to achieve the desired shape, again avoiding tiring out the clay too much Lifting motions are performed in an upwards motion. They generally start at the very bottom and end and the rim. A scraper is used to finally smoothen the shaped surface and to remove the built-up slip layer. Secondary, less invasive shaping is less strictly limited than primary shaping, but can tire out the clay wall just as well. The limitation in main and secondary shaping motions lies in that clay strength comes from the rooftile orientation of the clay plates. In clay that has been through too much, this orientation loosens up, causing the clay plates to “flop” over each other and leading to wall collapse (P1; P5). Tired, thinned-out clay responds more extremely to centrifugal force and any further alterations by the potter’s hands, risking loss of control over the shape, warping and subsequent wall collapse. Moreover, tired clay often lacks moisture. This increases friction between the hands and the wall. The fingers start to drag the wall along, causing spiralling dragging marks and rotating the top part compared to the lower part of the piece (P5).

The lifting of the wall requires patience (P2; P4; P5), regardless of final shape or forming technique. Most importantly, the lifting speed and the turning speed of the wheel must be balanced to ensure even lifting and avoiding warping and asymmetry (P5). The thinner the wall, the lower the turning speed should be. This should result in an even rim (P1; P5). Knowing wall thickness (without having to look) at any given point during the production process is essential to adjust following movements (P2; P5) and lifting speed in relationship to wheel turning speed. Overall, a thin, even, strong wall is preferred (P4), while remaining adequate for the intended shape and purpose of the piece (P5).

Wall thickness can be tested by lightly tapping the wall with a tip of the finger and listening to the (dull) sound it produces (P5). This helps to reduce mechanical strain and gravitational pull that could lead to wall collapse, while also ensuring even firing throughout the piece. Especially for pieces like cups, meant to lift easily and to drink from, thin, light walls are preferred (P1).

Stability in posture comes from a properly engaged core. In case of improper posture (relaxing core muscles, leaning on the elbows, tense arms), the bottom part of the piece will be thinner, while the upper part will be thicker. Tense arms will cause pressing inward of the bottom part of the wall as well (P5).

A skilled potter lifts the wall in a smooth motion with an engaged core, leaving behind a suitable amount of supporting clay suitable to the final shape while maintaining a suitable angle for the final shape between the wheel and the wall. After three, ideally two main lifts, the potter performs a few smalls lifts. The turning speed of the wheel and the lifting speed are in harmony and slow down as the wall gradually thins out, avoiding tiring out the clay and dragging. The wall is of even thickness throughout, the shape and curvature are symmetrical, and the walls are of even height. A scraper is used to scrape off the slip-layer and to finalize the shape (P5). For material outcomes of ‘mistakes’ in forming the wall, see Table 13.

Table 13: Material outcomes of ‘mistakes’ in forming the wall.

Material outcomes of ‘mistakes’ in forming the wall

- Lifting too much clay can lead to:
  ○ Thick wall and lack of supporting clay, leading to sagging and wall collapse
- Lifting too little clay can lead to:
  ○ More supporting clay, leading to a thick bottom half and requiring more trimming
  ○ Low and / or thin, fragile wall, leading to warping and wall collapse

- Lifting too many times can lead to: ○ Thin, fragile wall, leading to warping and wall collapse

- Lifting not enough times can lead to:
  ○ Thick, robust shape, requiring more trimming
  ○ Low, thick wall, requiring more trimming

- Lifting too quickly for the wheel rotation speed can lead to:
  ○ Uneven curvature
  ○ Asymmetry in wall thickness and rim height
  ○ Not achieving desired aperture / top opening width
  ○ Uneven wall thickness, leading to wall fragility and wall collapse
  ○ Finger flow spiral in the wall

- Lifting too slowly for the wheel rotation speed can lead to:
  ○ Wider aperture / top opening than desired
  ○ Tiredness in the wall, leading to warping and wall collapse

- Improper posture can lead to:
  ○ Thick upper part, requiring more trimming
  ○ Thin lower part, leading to sagging and wall collapse

4.3.2.8 Forming into a shape

The desired shape and size might have been guiding the potter’s actions from the beginning of the production process. However, some vessel shapes only truly appear in the secondary forming stage when forming the wall towards a shape (see Figure 31; Figure 32). Unnecessary supporting clay on mostly – but not exclusively – the outside of the vessel is pulled upwards while the wall is formed into a more final shape. The slip layer on top of the clay is removed, potentially using a scraper or a sponge. Spreading the fingers and slightly bending them as if playing the piano ("piano fingers"; see Figure 32) increases control over the shape. Again, the risk exists to tire out the clay (P5).

Figure 31: P2 is in the process of lifting up unnecessary supporting clay into the wall, while shaping the wall more into the final shape of the Frisian candle holder.

Figure 32: P5 uses spread-out piano fingers to support as many areas of the wall as possible in mitigating centrifugal force.

A wooden spatula, scraper or sponge may be used to clean the wheel of excess clay, although this can be done by personal preference throughout the forming process. Not performed cleaning up timely and collecting a lot of clay at the base can lead to slight unevenness in the shape, as this excess clay is being pulled up into the vessel shape again (P5).

A high level of skill is necessary to successfully recreate a shape from an example or 2D picture or even a mental image (P1; P5), especially within set absolute dimensions like height or width (P1). Considerations on centrifugal force, gravitational pull and mechanical stress may demand of the potter to adjust the final shape (P5).

Ideally, vessels have a subtle, elegant, beautiful, balanced shape, not a clumsy one (P4). In a more objective sense, the potter might search for a golden ratio leading to elegance in vessels. Equality is sought then, in top and bottom. For a bowl, the base should comprise a third of the shape. At the beginning, the height should be equal to the width. For a cylinder or vase, the desired height decides the rest of the shape: the widest diameter is just above the middle, the top and the rim are just a little wider than the base. That at least is oftentimes the case in archaeological pieces and reconstructions, but it is not always necessary to strictly follow this golden ratio (P5).

A skilled potter succeeds in creating (almost) the shape the potter had in mind at the beginning of the manufacturing process. A 'mistake' in the final shape can only be recognized as such if it can be reasonably known what shape the potter had in mind at the beginning. In case of the piece clearly being a reproduction or clearly attempting to fit a certain pottery tradition, the skilled potter will have succeeded in deviating from the ideal shape ever so minimally. For material outcomes of 'mistakes' in forming towards a shape, see Table 14.

Table 14: Material outcomes of 'mistakes' in forming towards a shape.

Material outcomes of 'mistakes' in forming towards a shape
- Too much secondary forming can lead to: ○ Tiredness in the wall, leading to warping and wall collapse
- Not enough secondary forming can lead to:

○ Irregular curvature and asymmetry in shape in height ○ Unevenness in wall thickness ○ Scraper traces and / or finger traces left on the wall
- Untimely cleaning of clay near the base can lead to: ○ Slight asymmetry in curvature, shape, and height

4.3.2.9 Centrifugal force

Properly managing, mitigating, and compensating centrifugal force though rotation speed of the wheel is essential throughout the entire forming process (P5), especially in the choice for the correct preforming shape (P1). The further in the throwing process and the more thin-walled a shape becomes, the slower the wheel should spin. Maintaining an improper rotation speed can lead to a crooked, uneven shape, irregular curvature, or a spiral in the pot. It cannot be polished away, especially if you know how to recognize is. For later final shaping in a leather-hard state, increasing the speed a little bit is possible again, but only when "locking" the piece in place at the centre of the wheel using bits of malleable clay (P5).

A skilled potter will adjust wheel rotation speed accordingly throughout the entire production process, while maintaining an angle between the wheel and the wall suitable to the final shape. For material outcomes of 'mistakes' in mitigating centrifugal force, see Table 15.

Table 15: Material outcomes of 'mistakes' in mitigating centrifugal force.

Material outcomes of 'mistakes' in mitigating centrifugal force
- Too much (uncompensated) centrifugal force due to too high rotation speed compared to forming and lifting speed can lead to: ○ Clay is spun outwards with increasing force, starting at the top part of the piece, leading to wider aperture / top opening than desired and overall wider vessel than desired ○ Thin, fragile wall, leading to warping and wall collapse ○ Accelerated tiredness of the clay, leading to warping and wall collapse
- Too little (uncompensated) centrifugal force due to too low rotation speed compared to forming and lifting speed can lead to:

○ Difficult to evenly distribute clay outwards and upwards, demanding more strength of the potter in forming overall ○ Thick, robust base ○ Low wall ○ Irregular curvature and shape in base and wall curvature ○ Finger flow spiral and irregularity in base and wall thickness, causing sagging and wall collapse

4.3.2.10 Finishing primary wet forming

To avoid tiredness in the clay, the skilled potter knows when to take the correct last action (P4). The top part of the vessel may be cut off using an iron potter's needle or small, wooden pick to achieve a horizontally even rim (see Figure 33; Figure 34). The needle is inserted slowly into the rim, using light pressure.

Figure 33: P2 trims the top part of the wall to create a horizontally even rim and get rid of excess clay. Due to a lack of an actual iron trimming tool at the location where this demonstration took place, a small iron pin from my pocketknife was used.

Figure 34: P5 trims the top part of the wall of the wall to create a horizontally even rim and get rid of excess clay using a potter's needle. This picture was taken in early wet forming while still forming the wall, as opposed to Figure 33 that was taken towards the end of primary forming.

The basic shape of the vessel has now been created, which can be seen as the end of the primary wet forming stage. However, in the fluid nature of craft, the shape is worked even further during a stage one might call secondary wet forming. In that stage, the potter is careful not to tire out the clay too much and thus shapes the clay less drastically, while still continuing to shape the wall. Towards the end of this secondary wet forming stage, the wall surface is polished in an upward shaping, refining, and smoothing motion one or several times using a scraper (see Figure 35; Figure 36). A potter's tool, such as a wooden spatula or a scraper, is used to precisely clean the unnecessary clay near the bottom of the vessel wall (see Figure 37; Figure 38). Such cleaning might be done several times during the wet forming process, mostly towards the end, as leaving this clay to pile up for too long and lifting it upwards can lead to irregular wall thickness and asymmetry in shape.

Figure 35: P2 uses a wooden scraper to shape and smoothen the wall towards the end of the secondary wet *forming stage, moving upwards the slip layer that has collected at the lower outside part and the wall.*

Figure 36: P5 uses a plastic scraper to shape and smoothen out the wall towards the end of the secondary wet forming stage, moving upwards the slip layer that has collected at the lower outside part and the wall and ensuring the hands are touching each other at all times.

Figure 37: P2 cleans the lower part of the vessel using a wooden potter's spatula. This picture was not taken during the production process of the Frisian candle holder replica, but during a production process started by P2 using left-over clay directly after finishing the candle holder.

Figure 38: P5 uses a plastic scraper to clean the wheel and the bottom part of the vessel from excess slip.

The thickness, angle, and shape of the rim greatly depend on the future use of the vessel. A round edge is preferred for drinking, whereas a more angular edge is desirable for cutting of fluid streams – like for a teapot. Too angular a rim, however, risks chipping (P5). If the (heavy) vessel is to be lifted at the rim, it will need to be sturdy and strong enough, even when the vessel might be filled when lifted.

When the pot has been formed sufficiently and further changes need to be done in dryer, leather-hard clay, the vessel is ready to be taken off the wheel using a wire cutter to slice underneath the vessel (see Figure 39; Figure 40).

Figure 39: P5 uses a wire cutter to slice the vessel from the wheel, slicing away from the body.

Figure 40: P2 has sliced the vessel off the wheel using a wire cutter slicing towards the body, leaving behind dragging traces in the clay left on the wheel. P2 explained that at different points in time, potters would prefer to either slice in one motion, or in a zigzagging motion like P2 did here.

When throwing multiple vessels in one seating, the potter may choose to not slice the wire cutter all the way down at the wheel. Instead, the bottom of the vessel is wire-cut more upwards to leave some clay on the wheel after the vessel has been lifted. This is called “throwing off the mast” (P2; P5). The remaining clay may be a large or small amount, depending on the preference, planning, and intentions of the potter (see Figure 41).

Later, more drastic forming, like pushing and pulling a round pot into one with four corners (like in the demonstration example piece) ideally takes place when the clay is still slightly wet, but has dried out a bit already. Drastic secondary forming in too wet clay risks sagging, while performing this in too dry clay will cause rupture (P5; see Figure 41; Figure 42).

Figure 41: P2 pushes outward one of the four corners of the vessel to recreate the Frisian candle holder shape. Due to time constraints, it was not possible to wait until the clay was dry enough for this, so the piece is already sagging slightly while taking this picture, as visible in a slightly too large tilting to the right in response to the pressure exerted on the vessel by P2. Note the excess clay still left on the wheel after slicing the vessel off the wheel using a wire cutter; an example of “throwing off the mast”.

Figure 42: P5 pushes outwards one of the four corners of the vessel to recreate the Frisian candle holder shape. As in the case of P2, time constraints prohibited waiting until the vessel was dry enough for this. However, since the wall in P5's vessel is thinner than the wall in P2's vessel, P5's vessel has already airdried slightly more than P2's vessel and therefore holds it new cornered shape slightly better. Moreover, P5 pushes outward the corner through placing her hands in such a way that the upper part is pushed outwards using one pointing finger from one hand, and the wall is kept in place using the thumb and pointing finger of the other. P2's hand positions do not allow for proper support of the middle and lower part of the vessel, causing the majority of the wall to be pushed outwards.

A skilled potter knows when to stop the wet forming in order to avoid tiring out the clay too much, applies adequate pressure on the vessel when using a tool to finish smoothing the wall, cleans in a timely manner unnecessary clay at the bottom of the vessel and on the wheel, and recognizes when the clay has reached a leather-hard drying state suitable for further shaping if desired. For material outcomes of 'mistakes' in finishing primary wet forming, see Table 16.

Table 16: Material outcomes of 'mistakes' in finishing primary wet forming.

Material outcomes of 'mistakes' in finishing primary wet forming
- Continuing final forming in wet clay for too long can lead to: o Increased tiredness of the clay, leading to warping
- Later, drastic forming in too wet clay can lead to: o Form not holding its new shape and sagging

-	Later, (too) drastic forming in (too) dry clay can lead to: o Clay rupture
-	Untimely and / or insufficient cleaning of clay at the bottom of the vessel wall can lead to: o Irregular wall thickness and asymmetry

4.3.2.11 Trimming leather-hard clay

Strictly speaking, trimming is optional, but it is performed most of the time in order to balance out the piece and to ensure an even, successful firing process. It takes place when clay has been put away post-forming until reaching the leather-hard drying stage. If too dry already, rehydration is possible through spritzing it with water or quickly submerging it for a few seconds.

Trimming generally involves the use of trimming tools such as an iron trimming tool, a wooden spatula, and / or a small piece of softened leather for the rim. Smaller final details may require other tools, such as wooden picks. The piece is placed on the wheel again, upside down this time, and kept in place by small dabs of wetter, malleable clay (P2; P5; see Figure 43).

Figure 43: P2 fastened the vessel into place using dabs of wet, malleable clay. Due to time constraints, the vessel had not yet reached a leather-hard drying state.

When shaping the vessel, the wheel will be turned again and the potter might lightly press a trimming tool against the areas that might require slimming down. This is preferably done using the tools in which the cut-off strip of clay does not interfere with further trimming; hence the open shape of a trimming tools (see Figure 44).

Figure 44: A demonstration of the use of an iron potter's trimming tool. Note that the open shape allows the trimmed clay to be guided off the clay so as to not interfere with further trimming. (Picture taken by potter Gary Jackson and published on www.firewhenreadypottery.com).

The piece must be dry enough not to stick to the potter's hands, the wheel, the trimming tool, or to its trimmed piece of clay. Too much moisture still present causes sagging. Yet clay can be too dry, too, causing cracking and rupture (P2; P5). The exact ideal moisture content for trimming, just like for forming on the wheel, depends on personal preference of the potter (P5).

While trimming, the potter may remove supporting clay and any irregularities in, for instance, rim height. The potter's goal is to bring about the final shape before it is fired. It is a balance between achieving the desired shape and ensuring enough stability, as trimming is an inherently reductive action. As is the case for continuing too long forming the wet clay on the wheel, the potter needs to stop trimming at the right moment to avoid thinning out the clay too much and compromising stability. Equal thickness throughout the piece helps to limit the risk of uneven firing, which could lead to breaking in the kiln otherwise. Creating a ringfoot enables a piece with a curved base to stand stably on a flat surface, reducing the need for further supporting clay.

The following remarks relate to production steps for leather-hard clay that are not necessarily part of a universal production sequence. Moreover, they are highly susceptible to stylistic choices of the potter. Regularity (P4) and consistency (P5) in decoration in the clay – but also later in glazing – signify skill of the maker, if this was a conscious choice (P4). Skill can be demonstrated, too, in the shape and the attachment of additions such as a base ring (P1), handles, and other applied parts (e.g., spout, knobs, cordons, et cetera).

A skilled potter trims until the piece has reached the desired shape including potential details on one hand, and until an even thickness in base and wall has been reached on the other hand. For bowl and plates, this can be achieved by trimming supporting clay until a ringfoot has been created for the piece to stand on – a sign of skill (P1). For material outcomes of 'mistakes' in trimming leather-hard clay, see Table 17.

Table 17: Material outcomes of 'mistakes' in trimming leather-hard clay.

Material outcomes of 'mistakes' in trimming leather-hard clay

- Trimming a piece that is too wet, still:
  ○ Stickiness to everything it comes into contact with, including trimmed clay pieces, leading to having to clean up and smoothen the piece (more) afterwards
  ○ Sagging

- Trimming a piece that has dried out too much already: ○ Increased friction between trimming tool and the piece, leading to difficulty keeping the trimming tool steady and asymmetry
- Discontinuing trimming leather-hard clay too soon can lead to: ○ Robust, thick base (and wall), leading to breaking in the kiln due to uneven firing
- Continuing trimming leather-hard clay for too long can lead to: ○ Thinness of base and wall, compromising stability and causing sagging of wall collapse, or breaking in the kiln due to uneven firing

4.3.2.12 Drying

Moisture levels of the clay need to be monitored and adjusted throughout the entire production process. While less on the mental foreground for the skilled potter after wedging, it becomes a focus point again during the trimming and drying stage (P2; P5).

The ideal moisture level before firing has varied in case of glazing and dependent on time and geographical location. In the past, cheaper glazed pieces were fired just once. Glaze was added just before the piece had completely dried and then fired. More expensive to-be glazed pieces were fired unglazed the first time when the piece was completely dry. The piece had then turned into a ceramic piece, making it much more resistant to cracking during later firing. The piece would be glazed thereafter and fired again on a higher temperature suitable for the glaze; a process that could, and sometimes was, repeated several times over for aesthetic purposes (P5).

Today, general practice is to wait with firing until the clay has dried completely, regardless of glazing. Any moisture trapped in the piece could easily lead to breakage while firing; an occurrence usually utterly undesirable. Moisture level can be tested through feeling (P2), but also through listening while tapping the piece with the tip of a finger (P2; P5) or lightly touching the piece with the tip of the tongue (P5).

A skilled potter will wait for complete dryness of the piece through tapping or feeling, potentially by lightly placing the tip of their tongue against the piece. For material outcomes of 'mistakes' in drying, see Table 18.

Table 18: Material outcomes of 'mistakes' in drying.

Material outcomes of 'mistakes' in drying
- Firing a piece that is not yet fully dry can lead to: o Cracking or breakage

4.3.2.13 Firing

During firing, the chemical constitution of the clay changes into that of a ceramic piece through a process of vitrification and subsequent hardening, along with shrinking. Successful vitrification of the clay depends on the correct temperature and duration thereof. Too low temperatures and / or too short firing duration can lead to incomplete vitrification, compromising mechanical stress during shrinkage and leading to breakage. Likewise, too high temperatures causing too rapid vitrification can also lead to compromised mechanical integrity and breakage. The acceptable ranges of firing temperature and even more so, firing duration, may be rather wide, however (pers. comm. Nirdosh Petra van Heesbeen, 3-2023).

Firing needs to take place at the appropriate temperature for the clay and the glaze (P1) and for the correct duration. Common modern-day practice is to fire to-be glazed pieces once at a lower temperature – called bisque firing – and another time after glaze application at a higher temperature suitable for the glaze (P5). Most likely the practice of firing nearly dry clay fell out of use with the introduction of industrial kilns that could reach high temperatures quickly and shorten the baking process. Traditional kilns or firing installations likely took longer to heat up, giving the piece time to let evaporate any moisture still left inside of it before vitrification occurred.

Firing can be done in many different settings, such as in a closed-off fire pit, a kiln made of bricks, over direct heat or using indirect heat from hot air, etc. One may vary with oxygen levels to get change the final colour of the piece (reduction versus oxidation firing). Further experimentation may take place through adding organic material or minerals into the kiln, for example (hair for raku firing, for instance (P4), or tree leaves, or salt[28].

In as far as a universal guideline exists regarding firing skilled potter ensures that firing temperature and duration, as well as the number of firings, suit the clay and the glaze. Luckily, industrially produced clay comes with firing instructions. Moreover, loading the kiln requires careful vessel placement; pieces touching each other means they will melt together and consistent air flow may be required depending on the chosen firing setting. For material outcomes in 'mistakes' in firing, see Table 19.

Table 19: Material outcomes of 'mistakes' in firing.

Material outcomes of 'mistakes' in firing

- Firing at a too high temperature too quickly for the vessel to dry completely can lead to:
    o Cracking or breakage
- Firing at a too low temperature can lead to:
    o Incomplete vitrification, leading to mechanical stress during shrinkage and leading to breakage

- Firing at a too high temperature can lead to: o Uncontrolled vitrification, compromising mechanical integrity and leading to breakage

[28] In connection with my bachelor thesis, I met and interviewed ceramist Nirdosh Petra van Heesbeen. During her fifty years of working as an independent ceramist, she experimented extensively with placing or throwing salt in the kiln before and during firing. The salt molecules start to 'float' around the kiln as a result of the heat, creating lasting, uncontrollable, and visually interesting chemical reactions with any exposed clay.

4.3.2.14 General remarks on (lack of) skill

Several overarching comments were made on potter's skill during and after the production process, the majority of which I have already mentioned in section 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?. Two more were overarching to the extent that a separate mention seemed fitting. Firstly, overall, skilled potters use the correct (basic) techniques (P1). Finally, a tell-tale sign of a *lack* of skill is complaining about how others produce more beautiful pots (P2).

4.4 Results for sub-question 4: How can Kuijpers' craftsperson's perspective be applied to the pottery manufacturing process?

4.4.1 Introduction to the results for sub-question 4

As has been given ample attention in the background chapter, an unquantifiable amount of knowledge is lost in reconstructing an objective reality from the conscious verbalisation of (sub-)conscious subjective experience. The craftperson's experience of the crafting process has been covered extensively in literature and in the background chapter of this thesis, so the results chapter for sub-question two was deliberately kept short. Any loss of (sub-)conscious knowledge here posed little issue to the final constructing of the ceramic craftsperson's perspective.

This posed a substantially larger issue for the third sub-question, however. Much of the information required for the ceramics craftsperson's perspective was to be derived from the face-to-face interviews and demonstrations with comments, of which I could only collect the conscious, verbally expressible kind. The demonstrations allowed me to gain more insights from close visual observation and asking further questions, but I still felt as if a large portion of sensory stimuli, interpretation, and exercised skill went unnoticed.

The current section (section 4.4 Results for sub-question 4: How can Kuijpers' craftsperson's perspective be applied to the pottery manufacturing process? presents the answers I received in the interviews on questions that explored sensory involvement in pottery manufacture. The potter's insights demonstrate a lived, interpreted, and verbalised experience of the wheel-throwing process. They proved helpful in determining differences in importance of sensory stimuli in the results for the third sub-question (section 4.3) and informed any sorting on importance within the production steps (section 4.4.3 An updated wheel-thrown pottery chaîne opératoire).

4.4.2 Senses used in pottery forming

4.4.2.1 Touch

Some material properties of the clay are perceived to varying degrees depending on the learning stage and skill level of the potter (P4). Nonetheless for all potters, the sense most prominently used in pottery manufacture is the sense of touch (P1; P2; P3; P4; P5). This mostly refers to the fingertips; P5 mentions they developed highly sensitive fingertips as a result of practicing their craft. Touching is used to perceive an array of things throughout the entire production process, such as moisture level (P1; P2) and any bumps in the clay (P1). Any inclusions will be felt during throwing – not during wedging, as the inclusions are pushed into the clay in this step (P2). P5 mentions feeling plasticity (result of moisture level) and firmness (result of clay plate size), both in relationship to the clay and in relationship to the technique she wants to perform on it. Notably, is the forming technique that determines what clay she'll prefer for a certain piece, not the end results itself. She further notes that she feels whenever clay starts to get tired and sloppy. P3 noted that that one feels what one intends to perceive, such as shape and texture; this remark extends to P5's technique of pressing the tip of the tongue against pieces to determine moisture level before firing. If it feels like prawn crackers, it can be loaded into the kiln.

4.4.2.2 Sight

In second place after touch came the sense of sight (P1; P2; P3; P4; P5), mostly for checking the shape (P3; P5). While it makes things easier, it *can* be done without; P5 only occasionally looks and P2 even mentioned a blind potter regularly throwing pots at the workshop.

4.4.2.3 Hearing

The thickness can be tested and heard by tapping the piece with a fingertip, which makes a soft, dull sound (P5). The same tapping can be used to assess moisture level (P2; P5). P3 and P4 jokingly added that hearing is the most important sense for students, as they need to listen to the teacher.

4.4.2.4 Weighing

Crucial before throwing is determining the amount of wedged clay necessary to make a certain shape (P2; P5). To help students, P5 has made sure to hang a list of guidelines to clay weight for certain shapes in the workshop and keeps a scale around. Whereas the beginner potter relies on the scale and likely choosing a 'safe' type of clay, the advanced potter relies much more on their own sense of weight and experience (P5).

4.4.3 An updated wheel-thrown pottery chaîne opératoire

4.4.3.1 Introduction to an updated wheel-thrown pottery chaîne opératoire

This section (4.4.3 An updated wheel-thrown pottery chaîne opératoire switches back from an overview of potter's self-reported use of their senses to the points of attention already extensively covered in section 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?. These sections were Imagined to seamlessly follow each other, but this turned out a bit different than anticipated. The unavoidable, persistent incompleteness of my information collection presented a challenge in finalizing my thinking about a sensory framework for craftspeople's experience in the form of an updated chaîne opératoire, which I planned as a final 'deliverable' of this master's thesis. For now, I will continue with some considerations about the preliminary (creation of the) updated ceramic chaîne opératoire.

In section 4.3, I laid out per step in a reconstructed ceramic chaîne opératoire what the most important aspects were for modern-day potters as per the interviews conducted. Insights came from potters with varying levels of experience, yet they did not mention opposing considerations and features resulting from these at any point. It was therefore possible to extract from these results the main points of attention for potters within ceramic manufacture. These are listed below per production step. Some points of attention reoccur in multiple steps. Some points do play a role in a step where they are not currently listed, yet are not the potter's primary concern during that step. I attempted to sort the points per production step in order of most to least important, inferred from the interview results.

For each point of attention, directions for a perceptive categorisation have been given. The categories are purposely vague, since firstly, this research does not specifically cover the extent to which deviations from the ideal range (negatively) impact the final object. Secondly, this chaîne opératoire aspires to be as universally applicable and adjustable to specific manufacturing processes as possible. In most of the cases, it is simply stated that an ideal range exists, with undesirable deviations in opposing directions. For example: the point of attention is plasticity, which can be categorized in too dry, correct amount of plasticity, and too plastic.

The term ‘correct’ specifically refers to a context-dependent correctness, depending in narrowness and absolute quantification on factors such as, but not limited to, forming technique, desired final object, and personal preference of the potter. In some cases, for instance for the presence of air bubbles in wedged clay, the ‘correct’, commonly desired value was expressed quite precisely in the interviews. Zero air bubbles left after wedging was the ideal value of air bubble count here. Even then, however, small deviations of this ideal value – several small air bubbles still left after wedging – might only prove a minor, solvable inconvenience in following steps. Here, a less ideal, but still workable category exists between zero bubbles and too many and / or large air bubbles. Adding such nuance might prove to be easier for some points of attention than others. This again proved that such categorization represents flexible, overlapping ranges, rather than strictly fixated ones.

As the reader will notice, the number of points of attention is rather large. Their order in sorting per attention point lacks nuance in prominence to the researcher’s considerations, since this was only mentioned in passing during the interviews. Moreover, ranking attention point in importance is likely extremely difficult to the potter, since craftspeople consider various aspects of past, current, and future actions simultaneously at any given moment in the production process. I therefore decided to add virtually all of the points I came across in the results to present a more complete picture.

The material outcomes of deviating from the ideal range concerning each of these points has been discussed extensively in section 4.3 on the results for sub-question 3, so I will not repeat them here.

4.4.3.2 A preliminary updated chaîne opératoire for wheel-thrown pottery manufacture

An updated, universally applicable and adjustable chaîne opératoire for wheel-throwing pottery, with a preliminary perceptive categorization regarding the most important points of attention for each production step, may look like the following (see Table 20).

Table 20: My preliminary updated chaîne opératoire for wheel-thrown pottery manufacture based off of Kuijpers’ craftsperson’s perspective framework (Kuijpers, 2018a).

Choosing clay type
- Feeling firmness o Too firm o Correct firmness o Too soft
Choosing clay amount

- Weighing weight
    - Too little
    - Correct amount
    - Too much

Wedging

- Feeling plasticity
    - Too supple
    - Correct plasticity
    - Too stiff
- Feeling regularity
    - Very regular
    - A bit unregular
    - Too unregular
- Feeling / seeing presence of air bubbles
    - No air bubbles
    - A few small air bubbles
    - Too many and / or large air bubbles

Centring

- Feeling irregularities
    - Completely homogeneous
    - A little bit heterogenous
    - Too heterogenous
- Feeling symmetry
    - Perfectly symmetrical
    - A little bit asymmetrical
    - Too asymmetrical

Choosing correct prebuilding / base shape

- Feeling shape
    - Choosing one of roughly three:
        - Beehive
        - Flattened pot upside down
        - Thick disc

Forming the base and the lower part of the wall

- Cylinder:
    - Feeling 90-degree angle
        - Too much inwards
        - About 90 degrees
        - Too much outwards
    - Feeling wall thickness (regarding lower part, in relationship to upper ring)
        - Too thin
        - Correct thickness
        - Too thick
- Bowl:
    - Feeling tension arch
        - Perfectly connected
        - A bit unconnected
        - Unconnected
    - Feeling supporting clay thickness
        - Too little
        - Correct amount
        - Too much
- General:
    - Feeling speed (regarding lifting speed, in relationship to wheel turning speed)
        - Too fast
        - Correct speed
        - Too slow
    - Feeling regularity / evenness in wall thickness
        - Very regular / even
        - A little bit irregular / uneven
        - Too irregular / uneven

Forming wall

- Feeling speed (regarding lifting speed, in relationship to wheel turning speed)
    - Too slow
    - Correct speed
    - Too fast
- Feeling distance between fingers
    - Too thin

o Correct thickness o Too thick - Feeling regularity / evenness in wall thickness o Very regular / even o A little bit irregular / uneven o Too irregular / uneven - Feeling tiredness of the clay o Not tired o A little bit tired o Too tired - Feeling posture o Good, relaxed o A bit tense o Very tense
Forming into a shape
- Feeling speed regarding lifting speed, in relationship to wheel turning speed) o Too slow o Correct speed o Too fast - Feeling distance between fingers o Too thin o Correct thickness o Too thick - Feeling regularity / evenness in wall thickness o Very regular / even o A little bit irregular / uneven o Too irregular / uneven - Feeling tiredness of the clay o Not tired o A little bit tired o Too tired - Feeling posture o Good, relaxed o A bit tense

  - Very tense
- Feeling / seeing shape
  - Evaluation thereof is subject to context and personal preference. Possible aspects: regularity, symmetry, elegance, balance, ease of use

Finishing wet forming

- Feeling tiredness of the clay
  - Not tired
  - A little bit tired
  - Too tired
- Feeling plasticity
  - Too plastic
  - Correct plasticity
  - Too dry
- Feeling / seeing rim function suitability
  - (Small) vessel to drink from:
    - Too thick
    - Correct thickness
    - Too thin
  - Cutting water stream
    - Too angular
    - Correct angularity
    - Too obtuse
  - Rim used for lifting heavy (filled) vessel:
    - Too thick
    - Correct thickness
    - Too thin

Trimming leather-hard clay

- Feeling plasticity
  - Too plastic
  - Correct plasticity
  - Too dry
- Feeling distance between fingers
  - Too thin
  - Correct thickness

○ Too thick
Drying
- Feeling / hearing plasticity before trimming leather-hard clay ○ Too plastic ○ Correct amount of plasticity ○ Too plastic - Feeling / hearing plasticity before firing ○ Fully dry ○ Too plastic
Firing
- Temperature ○ Too low ○ Correct temperature ○ Too high - Duration ○ Too short ○ Correct duration ○ Too long

4.5 Recapitulation

After a failed data collection approach using a questionnaire, I contacted potters in my area directly, asking for the possibility of an interview and perhaps a demonstration. The potters I interviewed and who performed demonstrations for me all varied in self-proclaimed skill level in wheel-throwing pottery, experience in working with clay overall, age, and vocational background. However, P1, P2, P3, and P4 shared (part of) their learning trajectory, as they were all at some point pottery students taught by P5 and still regularly spent time P5's workshop, where I collected most of my data.

Regardless of their differences, the potters highlighted similar topics in their reports on their experiences in the act of wheel-throwing pottery. These included a sense of automatism in their movements in which the knowing and acting body was leading, more so than conscious cognition. This automatism was furthermore expressed as a state of a combined mental and physical flow. The most experienced potter (P5) reported on having very sensitive fingertips and being skilled at interpreting wall thickness from a dull sound when tapping a vessel, which I interpreted as a high level of sensory attunement of a craftsperson to their material as a result of decades of craft training.

Differences in the potters' crafting experiences correlated the most clearly with differences in skill level, which most prominently came to the fore in their self-perceived relationship to clay. Increased skill level was strongly correlated with an increased feeling of entanglement with the material, up to a point of "not being able to live without it" (P3; P4) and even comparing working with clay to meeting the needs and demands of children (P5).

After a return to the workshop to check my own reasoning, I integrated the majority of the data derived from the potters into an extensive description of the wheel-thrown pottery manufacturing process from a potter's perspective, amply visually illustrated. Forced to abandon the pre-identified segmentation of the ceramic chaîne opératoire, I opted for a presentation of sensorily informed 'points of attention' that would be sometimes more, and sometimes less, consciously considered by the potter throughout the manufacturing process. Behind the rather detailed descriptions lay the intention to communicate to an archaeologist and / or another interested researcher how the potter's considerations, and subsequently, their actions, might become visible in the final object. Their order of presentation loosely corresponded to their sequential order of direct relevance to the potter during manufacture. While not able to quantify attributes resulting from specific actions (only) or even particularly skilful manufacture, I *was* able to provide directions in which 'mistakes' of the potter could be retraced after they had been made, if not grave enough to give reason to end the manufacturing process.

In an attempt to consolidate these insights into a framework that was 1) based on Kuijpers' sensorily informed craftsperson's perspective framework, 2) even remotely workable for the researcher, and 3) true to the potter's experience, I created a preliminary updated chaîne opératoire for the manufacturing process of wheel-thrown pottery, centred around my identified points of attention. For each of these points, I provided one or more ideal, albeit context-dependent, directions in actions leading to a desired outcome ('correct [e.g., amount of water]'), while providing directions in actions leading to mistakes in the final object (such as 'too much [water]').

5 Discussion

The discussion chapter begins by interpreting key changes in the archaeological literature on skill in ceramic manufacture. This is done firstly through evaluating the work of specific authors, and secondly, by discussing overarching processes that have been shaping the field of potters' skill research at large. After considering to what extent the first and third sub-question of this thesis was answered, the focus shifts towards reflecting on the potters' shared experiences and addressing the second sub-question.

This is followed by a comparison of results from the literature review and those from the work with potters. Through acknowledging the fundamentally distinguishing, fragmenting, and decontextualizing nature of conducting empirical research, it becomes possible to understand why certain points of attention to potters within their manufacture process have been systematically overlooked by researchers. Possible reasons for the overlooking of several important (parts of) potters' points of attention are given, with particular attention to the solidified methodology of Gandon's research group. Then follows an attempt to help both potters and researchers relate to each other's verbal descriptions of potentially similar processes, and the degree to which the fourth sub-question has been answered is debated.

Thereafter, the research is situated in the existing literature. The chapter then proceeds with a reflection on the methodology and potential improvements, subdivided in the literature review firstly, and interviews, demonstrations, and observations secondly. After assessing the timing of this research, theoretical and practical implications are explored in- and outside of archaeology, followed by a consideration on the reaching of research aims. The chapter concludes with promising directions, approaches, and interdisciplinary collaboration in future research into skill in ceramic manufacture.

5.1 Literature review: an interpretation of previous research

The rapidly evolving archaeological field of skill in ceramic manufacture yielded several additional relevant references towards the final stages this thesis, theoretically fitting the scope of the literature review (see Appendix 3.4.1 Literature review and literature relevance). Nonetheless, the references that were included therein provided an insightful, mostly quantitative overview. What follows is my interpretation of key changes in literature on the archaeological study of skill in ceramic manufacture linked to the work of specific researchers firstly, and secondly, from a more overarching point of view.

5.1.1 Interpretation of the work of specific researchers

<u>Identifying and naming attributes</u>
Focusing mainly on retracing children's development in pottery decorating and later, manufacture, Crown (2001) offered later archaeologists analytical foundations in systematically identifying and naming attributes related to what she recognized as particularly lacking in potters' skill, strongly implying that lack of them would signify a higher skill level.

<u>Linking attributes to skill level</u>
In systemically linking of attributes to potters' skill levels, Budden and Sofaer (2009) 'scored' analytically separated attributes based on their assumed necessary potters' skill level, ignoring their context, interconnectedness of material outcomes, and the importance of studying (combinations of) attributes in relation to one another. A method was proposed for standardization in an attribute-based quantification of skill.

<u>Putting the potter in the potter's perspective</u>
Attempting to counteract decontextualization in archaeological analyses of manufacture processes based on assessments of final objects, Botwid (2013; 2016a; 2016b; 2022) strongly argued for and demonstrated inviting a craftsperson to retrace the object's production process and skill level of its maker. While answering previous archaeologists' calls for a craftsperson's perspective, challenges remain in feasibility, lack of structural advancements in knowledge transmission between craftsperson and archaeologist, and the method's anecdotal character.

<u>Bridging an epistemological divide</u>
Drawing on similar philosophical theory as cognitive archaeologists, predominantly Swedish arts, craft, and design (practitioner-)researchers provide insights on a potters' perspective. While faced with the aforementioned epistemological divide (Spatz, 2015; see 4.2.2 Technique versus practice: epistemological division), a fruitful, inter- and transdisciplinary[29] exchange of knowledge is fostered in a recent volume (see Westerlund et al. 2022)[30].

[29] See Morse et al., 2007; Adams et al., 2009; Nimkulrat & Groth, 2024.
[30] Even though much work remains to be done here (Molander, 2022).

Leading in the field: Gandon's research group

While taking a pioneering, innovating role in their first four studies (Gandon et al., 2011; Gandon et al., 2013; Gandon et al., 2014a; Gandon et al., 2014b), progress in gaining fundamental knowledge on skill in ceramic manufacture had faced apparent plateauing in methodological development, changes in experimental set up, and a constant, narrow vision on vessel attributes of interest in four of their most recent five[31] studies (the four studies being Gandon et al., 2018; Gandon et al., 2020; Gandon et al., 2021a; Gandon et al., 2024, the other one being Gandon et al., 2021b). Researchers from the group are seen (co-)authoring own work on the topic (including Harush, 2020; Nonoka (2024) and Roux et al. (2024), likewise suggesting loss of a leading role in the field for Gandon's research group.

According to the literature review, Gandon's research group yielded the following innovative contributions:

1) Introducing an experimental research approach within skill(-related) research in ceramic studies, in line with archaeology adopting natural-scientific methodologies and the developing field of archaeological sciences,
2) Establishing a research focus on skill in ceramic manufacture alone, decoupled from an archaeological context, and allowing for result-oriented hypothesis testing, and
3) Developing research methodologies for specific attribute types, mainly standardization[32].

Currently, insights gained by Gandon et al. have not been consolidated in an overview, nor translated into an analytical tool potentially applicable in archaeological context. This likely contributes to even less knowledge exchange between them and 'applying' archaeologists.

Recent interdisciplinary research: neuroscience

Most recently, skill in ceramic manufacture has been of interest to neuroscientists (for example, see Nakamura et al., 2021), and neuroscientists collaborating with archaeologists (for example, see Forte et al., 2025.)

[31] This is excluding Gandon & Roux (2019), which was not part of the literature review but has been listed in Appendix A.2 List of further relevant literature. As a matter of fact, this study applies yet another methodology in an experimental setting similar to that in other studies of Gandon et al.

[32] However, the way in which Gandon et al. have been measuring the attribute of standardization is not at all in line with what I learned from the potters. To this I will return in section 5.3.2.2 Overlooking inter-vessel variability in measuring standardization: the case of the methodology of Gandon's research group.

5.1.2 Overarching perspective: fragmentation, lack of shared direction, and an epistemological challenge

Zooming out even further, three overarching processes might be recognized having shaped and still shaping archaeological research in skill in ceramic manufacture. These include fragmentation, a lack of shared direction, and an epistemological divide. Each is discussed separately, after which I discuss the extents to which the first and third sub-question of this research have been answered; on the nature of previous research in skill in ceramic manufacture, and the observability of skill in both the process and the final object, respectively.

Fragmentation

Archaeological insights into skill in ceramic manufacture are highly fragmented within the wider archaeological field, as well as among the archaeologists studying it using different approaches. A lack of scholarly consolidation is necessary to draw together knowledge gained regarding singular (combinations of) attributes, to incorporate it into a wider research context, and / or even consider it to be integrated into a discourse to be built upon to in future research. A thorough, both quantitative and qualitative literature review, consolidating current archaeological knowledge on skill in ceramic manufacture and mapping out promising directions for future research, is lacking[33].

Lack of shared direction

Having been developed within processualist tradition, archaeological potters' skill research now finds itself internally conflicted between processual ('applying' theory to past assemblages) and post-processual ('experimental', archaeological science, challenging assumptions, exploring different perspectives) research approaches. Again, a lack of consolidation hinders creating a shared understanding and finding common research goals.

Moreover, the resulting lack of direction in research is partially explained by the rapid evolving of post-processual approaches and the unprecedented number of highly modern, likewise quickly

[33] Although Roux seems to have done so to some extent in her book Ceramics and society (2019) in the chapter Technical skills (p. 259-282). Unfortunately, I have not been able to access this book online on the website of SpringerNature (www.springer.com), nor could I find it in the Leiden University Library online database. Judging from the abstract and the references she used, however, I am able to infer that my review was considerably more focused on providing an overview on potters' skill in archaeological research as complete as possible, whereas her use of references was more focused on supporting her outlook the analysis of technical traditions. Assumed skill levels are linked to "markers significant of manufacturing difficulties" in its abstract. The research aims to be achieved through this analysis are in the realms of "skill investment, the rate of ceramic production, or the organization of craft production (learners *versus* experts, domestic *versus* specialized, size of workshops)", as per the abstract; an outlook very much befitting of a processual application approach.

evolving measurement techniques for material culture. More broadly, questions are raised regarding the aims of skill research into ceramic manufacture, increasingly answering the call for a craftsperson's perspective therein, while faced with a completely modernized range of research possibilities.

Epistemological divide

While archaeologists favouring experimental approaches are working to deconstruct their own assumptions, the ungraspable, ephemeral nature of skill in action makes it extremely challenging to study from an etic point of view, while a solely emic point of view presents its own challenges. Hence attempts from mainly the emic field of arts, craft, and design to let both converge in joint volumes, but a truly interconnecting narrative remains to be constructed.

I can thus conclude that I have satisfactorily addressed my **first sub-question: How has skill in pottery manufacture been studied previously in archaeology?**

The question rises as to whether craft practitioners tell a more easily unifiable story regarding manufacture, and how skill is recognized therein. While hardly comparable, it is extremely difficult, even (nearly) impossible, to (verbally) capture the cognitive unification of sensory input, as well as this guiding the potter's attention, considerations, and actions that lead to material outcomes[34]. It was attempted, nonetheless, to provide a potter's account thereof that might prove helpful to archaeologists seeking to better understand skill visibility both in craft and in the final object.

This brings me to a discussion on the extent to which I have answered my **third sub-question: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? How does this translate into aspects visible / detectable in the finished product?**

This question has been answered to some extent, albeit differently than implied in the question. In both a theoretical as well as in a practical sense, skill is, in fact, found and recognizable by (informed) bystanders in all parts of a manufacturing process, regardless of any analytical segmentation therein.

[34] Therefore, completeness cannot be claimed in the description of wheel-thrown pottery manufacture in section 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?.

Tracing back the creation of all possible attributes signifying skilful manufacture would be a nearly impossible and rather futile task for the following reasons:

1) "Technological signatures of action" (Budden, 2018, p.370) are created in *every* potter's skilful (non-)action (*what*) and the way in which it is performed (*how*),
2) Clay is polysemic in nature (Roux, 2016, p. 106)[35], challenging absolute certainty within a detailed reconstruction of its manufacture, and
3) Skill quantification in craft manufacture is highly context-dependent on the standard of the time (Kuijpers, 2018a, p. 43-44; p. 76).

However, if desiring to quantify skill in craft, endeavours focusing on the most telling attributes might be necessary, despite risking further fragmentation in the literature.

From the challenges of empirical research, I now turn to a discussion of the non-empirical potters' experiences in craft.

5.2 A potter's experience of skill

In this section, I will discuss several underlying tangents regarding an increase in potters' skill noted in the potters' self-reported craft experiences, which may be applicable to any other (skilled) craftspeople. Finally, I discuss to what extent I have answered my second sub-question on how actual potters view and see skill.

<u>Alternating streams of attention</u>

At any given moment in the manufacturing process, the potter could be noticed balancing, and sometimes shifting between, two dominant streams of attention: 1) striving for perfection in recreating a mental image of an end product, and 2) avoiding mistakes in attaining this perfection. In case of a mistake occurring, further mistakes are avoided more intensely (flow number 2), concentrating again on reaching perfection (flow number 1). If the mistake risks ending up outside of the acceptable margins of error as measured against the standard of the maker[36] (flow number 1), the desired end product might change. Perfection is sought again in recreating the new mental image (flow number 1), avoiding mistakes (flow number 2).

[35] Meaning here that different treatment of the clay might lead to the same result, and that the same treatment of the clay might lead to different results (Roux, 2016, p. 106).

[36] This notion is based on Kuijpers' standard of the time at which an assemblage was produced (2018a, p. 43-44; p. 76. In the case of present-day experimenting, a more personal standard can be established fitting the stage in the learning process at which the learning potter can be placed at that moment.

Learning to trust one's hands

More skilled potters are able to react faster and more adequately to stop mistakes in their earliest stages. Likewise, they rely more heavily on their overarching sense of touch, as opposed to vision[37]. Aside from (embodied) experience, another possible reason for their increased ability and agility in correcting mistakes is the reduced (sub-)conscious cognitive strain of interpreting not one, but two general streams of sensory input. Moreover, more experience means increased ease in mentally mapping out directions of further error development, allowing for a faster counteraction and shifting focus towards attaining perfection again.

I can thus conclude that I have satisfactorily addressed the **second sub-question: How do actual potters view and see skill?**

Higher levels of skill likewise coincide with increased visible and potter-perceived fluidity in manufacture, creating significant difficulty to scholarly efforts seeking to distinguish between production steps. This leads me to a comparison between potters' insights and the literature.

5.3 Comparing literature with potters' insights: of results and processes

This section compares and contrasts results derived from the literature review and the potters' insights. Firstly, I attempt to understand the lack of research consensus through the very nature of empirical research, arriving at processes of fragmentation, decontextualization and continued reinvention. A researcher's results-oriented point of view, as opposed to the potter's process oriented point of view, might explain the literature having systematically overlooked important potter's (parts of) points of attention. Specific attention is given to the solidified methodology of Gandon's research group. Finally, I present the result of my own inferring regarding the connecting of

[37] All potters except for P5 (whose perspective on this became clear from other questions and the demonstration) agreed straightaway on the sense of sight to be the first and most prominent sense used in pottery manufacture. Interestingly, all potters (except for P5) immediately thereafter mentioned the sense of touch to actually be more important. P4 mentioned the possibility of throwing a pot without looking, to which P3 likely agreed silently. P1 knew blind potters as well, but P1 had to rely on sight for themselves. However, P1 would consider blindfolding any students to let them practice relying on their sense of touch. P2 described themselves as sometimes looking around the workshop while throwing, and mentioned a blind potter regularly working in the workshop. P5 shared that they only look at a vessel while throwing to check the shape, but rely on touch for the most part.

researchers' attribute descriptions with things of interest to the potter, inviting both parties to potentially relate to each other's descriptions of the same underlying processes.

5.3.1 Empirically induced data fragmentation and processes of scholarly decontextualization

Origins of researcher-recognized attributes of skilful manufacture oftentimes seem to stem from ethnographic accounts or, in case of lacking references, untraceable inferences of researchers[38]. This might partially explain the resulting lack of scholarly consensus on their representativeness of (different levels of) potters' skill and skill expression. However, an additional explanation might be found in the core of empirical research.

In order to quantify, analyse, and compare objective truths stemming from the world around us, empirical researchers are forced to discriminate; the distinguishing between one thing and another, and make apparent the basis on which these things are recognized differ from each other. Such a distinguishing is *created* – thus, 'artificial' – and fundamentally dependent on the perspective of the person who is distinguishing. While empirical researchers are able to effectively narrow their research scope to increasingly well-defined topics, consolidation of relevant previous and new findings is necessary to keep an overview and advance in research.

Returning to the topic of this thesis, processes of increasingly detailed differentiation and analytical separation of vessel attributes and manufacturing processes might be attributed to the empirical nature of (a part of) skill research in craft. The large variability in archaeologists' descriptions of attributes can be seen as attempts to counteract increasing decontextualization[39], and to continuously reinvent attributes. Furthermore, the overarching focus is 'results-oriented' (etic), studying that what can be empirically studied; a term I used before to describe the rationale behind the experimental approach of Gandon's research group in section 5.3 Comparing literature with potters' insights: of results and processes.

A vessel, however, consists of intricately interconnected and interdependent vessel features, not accidentally existing in their final form, but having been created in direct relationship to each other

[38] Naturally, this is not the case for first-hand personal experience, such as in the case of practitioner-researchers.
[39] In that regard, my own research approach of even further decontextualized quantification of attribute mentions in the literature is not particularly helpful, either.

through (manufacturing) time and (vessel) space. Contrary to the archaeologist, the potter assesses a vessel through a process of its manufacture, overseeing the interrelated, diachronological processes that have led to the creation of a specific attribute in its context of other (combinations of) attributes. This I refer to as a 'process-oriented' (emic) point of view.

The identification of a researcher's result-oriented and a potter's (/ craftsperson's) process-oriented point of view are central in the following analysis of more apparent disparities between the literature and the potter's data; potters' points of attention that have been systematically overlooked in literature.

5.3.2 Lines of reasoning behind archaeologists overlooking potters' points of attention

This section presents two reasonable explanations as to why archaeologists tend to overlook specific potters' points of attention, or parts thereof. These include: clay type choice, clay amount estimation, centring, prebuilding, base thickness and leaving supporting clay, top opening size, and slicing the vessel off the wheel. Applicable to these points may be the following two lines of reasoning.

<u>Line of reasoning number 1: 'faulty' vessels are started over, rather than fired</u>

Mistakes made early in the production process have more time and possibilities to develop into mistakes grave enough to demand restarting the manufacturing process[40]. A routinely producing potter will likely choose not to let such 'faulty' vessels be fired, using up valuable resources and taking up valuable space in the kiln[41][42]. This implies that most, if not any, (grave) mistakes made in these 'early' points of attention are less likely to be found in the archaeological record than their more successfully manufactured counterparts, if they even survived the complete manufacturing

[40] The stage at which the potter continues the process again depends on several factors, such as, but not limited to: the gravity of the mistake, the place where this mistake presents itself the most prominently, the potter's personal preference, and the accepted deviation from perfection in that specific context and to that specific potter. The potter might start again by, for example, trimming away a top part of the vessel, or by reshaping all clay into a ball and start again with centring, or by even by wedging all clay again.

[41] This might be different for a less advanced potter. Exploring the directions in which mistakes may develop, and seeing own work be fired, even if it is not perfect, can work most encouraging and benefit further learning curves.

[42] Perhaps, then, the standard for finished vessels with which the archaeologist is commonly confronted in the archaeological record is skewed towards a standard of rather high potters' skill. If true, this would extend to other types of craft where the very fabric of the material is being transformed during manufacture (e.g., metallurgy).

process. If hardly being confronted with the consequences of such 'early' mistakes, the archaeologist is more prone to overlooking the skill it took to avoid them in the first place.

Line of reasoning number 2: the features are polished away

Other points of attention mostly refer to later stages in the forming process. They have in common a subtractive nature, or are 'polished away' due to the subtractive nature of another process. Thus, some features that might hold clues to processes less apparent in the final object are removed before entering the kiln, long before the unsuspecting archaeologist is ever confronted with them.

5.3.2.1 Commonly overlooked potters' points of attention

The archaeologists' overlooking of important potters' points of attention can be likely explained by one or both of these lines of reasoning. Each of these potters' points have a retraceable effect on how the final object turns out. Every time one of the lines of reasoning is applicable, I have added the number assigned to it in between brackets.

Choice of clay type

Choosing a type of clay (very) unsuitable to throwing will hinder the potter from the very first moments of throwing, hence the fact that thrown vessels are always made using a suitable clay (1) that was available at the time of manufacture and, ideally, preferred by the potter throwing multiple vessels in one session.

Estimation of clay amount and imperfect centring

Both incorrectly estimating clay amount and imperfect centring on the wheel can lead to issues early on in the production process (1). They can be compensated through using a potter's needle to trim off the top part of a vessel or when using a trimming tool on leather-hard clay (2).

Prebuilding[43]

[43] Thér & Toms describe prebuilding as "a matter of the throwing style, which can affect the final structure of the ceramic body. The main potter [of the potters participating in the study] was asked to throw vessels without prebuilding of the structure." (2016, p. 37). They see prebuilding as an action that is optional, and that leaving it out of the production process will help to reduce seemingly unnecessary research parameters. It would be futile here to guess as to how Thér & Toms seem to have arrived at such a very different understanding of the nature and relevance of prebuilding than I have in my research, but it does raise questions regarding their understanding of these topics. Left unmentioned was the response the main potter gave to this request, so that is left to the reader to imagine.

Choosing an unsuitable prebuilding shape in line with the desired forming technique results in great difficulty still reaching the original desired shape (1).

Base thickness and leaving supporting clay

A base too flat risks instability (1), while a base too thick initially can be trimmed down to the desired thickness in later wet forming or using a trimming tool on leather-hard clay (2). Exactly the same applies to leaving supporting clay near the vessel base when pulling up the wall.

Orifice / aperture / top opening size

The width of a top opening is more easily expanded than closed again. Lack of control therein can easily lead to warping in the wall due to tiredness of the clay (1), which might be solvable by trimming away the top part of the vessel in wet forming (2).

Slicing off the wheel

The slicing using a wire cutter leaves the outer bottom surface of the vessel with wire cutter markings, which are trimmed away in the leather-hard stage (2). The potter might choose to create a ringfoot here, but only if the base is of sufficient thickness.

5.3.2.2 Overlooking inter-vessel variability in measuring standardization: the case of the methodology of Gandon's research group

Gandon's research group has worked towards methodological solidification for the study of one specific attribute: a higher degree of intra-vessel standardization in vessel shape, both in one potter and between multiple potters and / or potter groups, and predominantly in final vessel shape (these studies include Gandon et al., 2013; Gandon et al., 2018; Gandon et al., 2020; Gandon et al., 2021b; Gandon et al., 2024). This attribute encompasses many other attributes identified in other studies, as standardization in final vessel shape is the result of a high level of skill in the execution of all previous manufacturing steps[44].

However, in their measuring approach of intra-vessel standardization, they chose to only trace once per vessel the "2D coordinates of the cross-sectional profiles" (Gandon et al., 2013). While seemingly logical, the possibility of measuring asymmetry within a single vessel is overlooked here. The later

[44] To be recognized in my description by potters' mistakes that can lead to asymmetry (see section 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?).

studies applying a more solidified version of this method trace even less; the right outside profile only. Their reasoning behind this choice is as follows:
"Because wheel-thrown vessels are typically axisymmetric, profiles [photographed cross-sectional right-side profiles converted into x coordinates] were subsequently converted to full pot outlines by multiplying the x coordinates by -1 to create the corresponding left edge." (Gandon et al., 2018, p. 303).

In contrast, the potters interviewed for this thesis all repeatedly explained the plenitude of mistakes leading to asymmetry; the resulting asymmetry showcased the inability of the potter to successfully mitigate the affordances and constraints at play during manufacture. Increased inability therein characterizes the particularly unskilled potter. Conversely, a low level of inter-vessel symmetry, and thus, higher standardization in the potter's actions, is a clear, well-attested marker of skill both in the literature and among the potters I interviewed.

Perhaps, measuring inter-vessel variability was simply not the goal of the abovementioned studies, and limiting measurements of each vessel to one half profile allowed for easier comparability between vessels. If this were the case, I would completely agree with their approach. However, if their underlying research aim was to understand the ability of the potter to carry out their craft in a standardized manner, meaning their ability to reach a desired vessel shape repeatedly, while successfully mitigating affordances and constraints, and avoiding mistakes on the road towards perfection therein[45], then it would be a more logical choice would be to *increase* profile measurements of individual vessels, rather than *decreasing* them.

In an attempt to make my reasoning regarding the abovementioned issue a bit clearer, and to infer further humble beginnings of bridges over the epistemological divide archaeologists are facing in their study of skill in craft, I now continue with an attempt to further consolidate the potter's data I have collected.

5.3.3 Building bridges in words

Implied in the previous paragraphs is that the overlooking of certain potters' points of attention suggest a lack of knowledge in the archaeologists studying ceramic manufacture. However, it may

[45] See the underlying flows of potter's attention described in section 5.2 A potter's experience of skill.

have been a descriptive issue in some cases. Perhaps, the 'missing' potters' points of attention might have actually simply been described differently.

In an attempt to (re-?)connect the potter's process-oriented and the researcher's result-oriented points of view on directions of mistakes in pottery manufacture, I will briefly explore some terms that were used to potentially describe the same thing(s). More directly, potters' descriptions of seemingly interrelated processes were grouped. These were then coupled to seemingly closely related literature-derived attribute descriptions potentially referring to the same larger process.

It must be noted that these connections are based on my own inferring from any and all data I have presented thus far. I can and will not present these connections as well-researched truths. Rather, I intend to explore them regardless, potentially helping fellow archaeologist in gaining an understanding of the potter's view. Perhaps, it might even enable both parties, should they ever read this (part of this) thesis, to relate each other's words to knowledge and experience from the other party, and find common ground in underlying processes they seek to capture.

5.3.3.1 Exploring connections between potter's process-oriented language and researcher's result-oriented language

The left side of Table 21: Possible connections between potters' descriptions of processes leading to pottery production failure and undesired outcomes (indicated with a 'P') and researchers' descriptions of final results in the vessel signifying (a lack of) skill (indicated with an 'R'). contains words frequently used by the potters to describe generally undesired outcomes likely resulting in a seriously flawed vessel. Their assigned number holds no value other than linking the words of potters to potentially corresponding researchers' attributes in the right side of the table.

These larger processes might occur simultaneously in manufacture and affect each other (and other of these processes). I tried to group them into four trains of thought I interpreted as common to the potter's considerations. Any misinterpretation therein is my fault and mine alone.

Table 21: Possible connections between potters' descriptions of processes leading to pottery production failure and undesired outcomes (indicated with a 'P') and researchers' descriptions of final results in the vessel signifying (a lack of) skill (indicated with an 'R').

Potter (1)	**Researcher (1)**

Forming too much and / or incorrect turning speed of the wheel in relation to forming speed, leading to tiredness of the clay and warping, sagging, and collapse	Relative forming speed regulation Profile standardization Size Maximum diameter (Maximal) wall thickness (in relation to profile length increase) Maximum orifice diameter in relation to the vessel Mechanical strain division Wall evenness Basis collapse Maximum thickness Curvature Deviation on horizontal plane Rim evenness Thorough drying before firing Integrity
<u>Potter (2)</u>	**<u>Researcher (2)</u>**
Misjudging necessary amount of supporting clay, leading to a potential lack of supporting clay and an unsupported ((dis-)connected tension arch, leading to sagging, and collapse	Maximum height Size Maximum diameter (Maximal) wall thickness (in relation to profile length increase) Maximum orifice diameter in relation to the vessel Mechanical strain division Wall evenness Basis collapse Maximum thickness Curvature Deviation on horizontal plane Rim evenness ‘Fineness’ / ‘luxury’

	Integrity
<u>Potter (3)</u>	**<u>Researcher (3)</u>**
Imperfect wedging and / or centring, and / or incorrect turning speed of the wheel in relation to forming speed, leading to asymmetry and an uneven and / or unplanned curvature	Form complexity Relative forming speed regulation Refining and accuracy Maximum diameter located close to the mid- Height of the vessel Symmetry Mechanical strain division Base roundness Wall evenness Basis collapse Maximum wall thickness Curvature Deviation on horizontal plane Rim evenness Labour intensity / investment 'Fineness' / 'luxury' Integrity
<u>Potter (4)</u>	**<u>Researcher (4)</u>**
Incorrect turning speed of the wheel in relation to forming speed and / or not keeping a constant distance between the fingers, leading to finger flow- / spiral traces. Leaving scraper -, finger-, and trimming tool traces unsmoothed	Forming speed regulation Interior and exterior finish / smudging Wall thickness Maximum thickness Labour intensity / investment 'Fineness' / 'luxury'

This table attempts further consolidation and re-evaluation of gathered data into a framework. On that note, I continue with reflecting on the extent to which the **<u>fourth and final sub-question</u>** was answered: **<u>How can Kuijpers' archaeological craftsperson's perspective be applied to the pottery manufacturing process?</u>**

Indeed, a sensorily informed skill assessment framework, such as Kuijpers', faces important limitations in capturing a complete first-person experience in craft. It does, however, allow for a suitable, workable tool enabling approaching thereof, adjustable to at least the wheel-throwing of clay vessels and potentially any other manufacturing process of interest.

On a more critical note, truthful capture of the frequently coinciding processes within (wheel-thrown pottery) manufacture is hindered by the framework's sequential nature and aim of workability for archaeologists. This is seen in the difficulty of pinpointing the singular most relevant potters' point of attention in analytically segmented manufacture and the most telling sensory aspect therein, inevitably losing nuance in the potter's experience and the *how* in craft actions. An adequate, sense-making balance remains to be found[46].

5.4 Situating this research in the existing literature

Hitherto lacking[47], this research has attempted to produce a (quantitative) review of previous archaeological skill research in ceramic manufacture including useful directions for future research, and has succeeded herein. The likewise innovative approach of comparing archaeological literature and potters' insights demonstrated clearly fundamental disparities between them, including the archaeologists' seeming lack of understanding of the potter's considerations and lived experiences in manufacture.

Most importantly, this research pioneers in translating Kuijpers' concept of a sensorily informed craftsperson's perspective to another manufacturing process – indeed, even a vastly different material, and the constructing of a perceptive categorisation of important sensory aspects in this manufacturing process[48]. Much in-dept experimentation on that topic fell outside of the current research scope, however, and would most likely be more appropriate in the case of specific pottery recipes.

[46] A consolation in this regard is a well-known quote from German novelist, dramatist, poet, humanist, scientist, and philosopher Johann Wolfgang von Goethe (1749-1832; von Goethe, 1802, p.70): "In der Beschränkung zeigt sich erst der Meister." ("In limitation only the master shows itself")
[47] See section 5.1.2 Overarching perspective: fragmentation, lack of shared direction, and an epistemological challenge, and see section 5.9 Future research.
[48] In his PhD research, Kuijpers had the luxury of a pre-established sensory categorisation to work with, building on work done by Kienlin (2010; see Kuijpers, 2018a).

Furthermore, this research encompasses the foundations for the first analytical tool describing both the *how* and the *what* in wheel-thrown pottery manufacture, seeking to balance 1) universal applicability and adjustability, 2) workability for the archaeologist, and 3) staying truthful to the potters' (sub-)conscious sensory experience and considerations. In the absence of a finalized tool, archaeologists and ceramics researchers alike may find most insightful the verbal and visually supported description of a potter's perspective[49].

On another note, this research is one of few suggesting that systemic underappreciation of pottery manufacture as a craft, requiring just as much training, effort, knowledge, talent, and skill as any other craft, has contributed to a lack of interest among archaeologists in studying potters' skill, even though change therein is attested with formalization of post-processual research approaches in archaeology at large.

Finally, alternating flows in the underlying concentration processes of the potter[50] seem rather indirectly related to archaeology, and describing it in an archaeological context is therefore likely very new to the field.

This rather innovative research was made possible through its methodology, on which I will reflect in more detail in the next section.

5.5 Reflection on methodology

This section begins with a discussion of the overall suitability of the complete methodology. I then discuss various challenges, limitations, biases, unexpected ancillaries, and potential improvements for, firstly, the literature review. The same is then done for the interviews, demonstrations, and observations.

5.5.1 Methodology: overall suitability

The overall design of the methodology was well-suited to the research questions, with firstly a literature review in order to understand the current state of knowledge on the topic. Likewise,

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[49] To be found in section 4.3 Results for sub-question 3: At which steps in the pottery manufacturing process can the skill of a potter be well-observed? (How) does this translate into aspects visible / detectable in the finished ceramic product?
[50] See section 5.2 A potter's experience of skill.

interviewing potters in a semi-structured interview and observing demonstrations with comments by the potter proved effective in piecing together a potter's perspective during and outside of the manufacturing process. Nonetheless, some more critical notes follow, divided between the literature review and collecting potters' data.

5.5.2 Reflection on methodology: literature review

This section discusses any biases, limitations, and challenges that occurred in relation to the literature review methodology, followed by suggestions for improvement.

5.5.2.1 Number of references collected

The field of archaeological research into skill in ceramic manufacture is continuously evolving, thus the literature collection here must not be seen as final. However, several references I found in the later stages of writing this thesis and theoretically fitting the filtering criteria were included in the Appendix (see Appendix A.2 List of further relevant literature). Overall, I find the number of relevant, reviewed references satisfactory, especially in the context of a master's thesis focusing on two streams of data collection[51].

5.5.2.2 Data fragmentation by research design

The applications of my methods, consisting of analysing and categorizing information, risked further loss of context, connections, and interdependencies. Specifically in extracting attributes, this proved problematic, not in the least due to having to read between the lines when attempting to understand underlying assumptions about potters' skill appearance in vessels. Despite working systematically and precisely, I might have missed or misinterpreted nuances therein. The same likely applies to less apparent connections between research perspectives, methods, attributes, and the recognition of these attributes, although I would have to guess the extent to which the missed information was vital to the aim and purpose of the literature review.

Furthermore, many of the vessel features mentioned by the potters, and some of the attributes described by researchers, were related to a *lack* of skill. Striving for analytical cohesion and clarity, it was sometimes necessary to invert researchers' attributes, hoping that its opposite might signify (a

[51] The quantitative nature of the literature review resulting from this was the main reason why in the review, the research perspective of 'Specialization and standardization' was such a large category. Drawing an exact line between the two perspectives is complicated, as the two are frequently studied combined. This debate could have been explored in more detail in a qualitative review.

high level of) potters' skill to the original author. Despite attempting to take a little liberty as possible here, further decontextualization could be attested here[52].

5.5.2.3 Possible improvements for the literature review

Possible improvements for the literature review are the following:

- Search more broadly and for more terms, but do sift on strictly skill, pottery, and archaeology. Extend to outside of archaeology only if implied in the research aim, for example in the fields of arts, crafts, and design, as well as vocational craft (teaching), pedagogy, philosophy, (art) history, culture studies, biophysics, psychophysics, neuroscience, and bio-mechanics / kinematics.
- Trace publishing histories of particularly interesting authors.
- Apply a timeframe filter when searching in an online database, focusing for instance on five-year periods at a time to include references that would not come up when searching in an entire database.
- Explore more in-depth researchers' inferences and its underlying patterns, not in the least to better estimate already present knowledge in the researcher and corresponding level of detail desirable in a final analytical tool.

5.5.3 Reflection on methodology: interviews, demonstrations, and observation

This section contains a critical reflection on any limitations, biases, unexpected challenges, and developing insights regarding the methodology of interviews, demonstration, and observation. Lastly, it proposes potential improvements.

5.5.3.1 Limitations in time

My supervisor and I had agreed on aiming for three to five interviews, with demonstrations if possible. Given the expected timeframe of my thesis writing, I was limited in the number of possible workshop visits and interviews I could conduct and transcribe[53]. Working on my literature review simultaneously meant that I had to use my time wisely, especially since my potter's data gathering process had faced an initial setback with the questionnaire.

[52] While not keeping track of inverted attributes, the words 'lack thereof' behind an attribute description could be the result of such an inversion.
[53] I knew from previous transcription tasks that I could not rely on automatic transcription software, and I wanted to be able to form my own thoughts again while carefully transcribing the interviews.

The search for potters to interview was focused on those teaching both throwing and hand-forming pottery. Fortunately, I received the one positive reply necessary to exclusively focus on the much more standardized process of wheel-throwing, meaning that skill in hand-forming has received little attention in this research.

The open workshop days at P5's workshop were rather ideal for interviewing and collecting observational data; the teacher would be present and approachable for questions, teacher-learner interactions could be observed, and having a morning and an afternoon group meant that more potters could be observed (and potentially interviewed) in a single visit. Moreover, I could easily come into contact with potters of varying skill levels. However, open workshop days were held monthly. At the beginning of April, there were not many opportunities left if still aiming for summer graduation.

A further limitation was the number of potters I would interview in one day. Preferably, any follow-up interviews were not strictly necessary so as to not overstay my welcome. Fortunately, P5 offered ample opportunities for follow-up questions and even a second visit.

However, the small quantity of interviews and demonstrations did increase the risk of biases, which are discussed next in more detail.

5.5.3.2 Assessing biases in participant (potter) diversity

Waiting for interested potters to take the initiative to partake in this study ensured increased openness, honesty, and willingness to answer further clarifying questions. Consequentially, there was little control over the diversity within the final interviewing participant group during that day at that specific workshop.

In some ways, the potters interviewed shared similar backgrounds. I inferred that they were all completely able-bodied and native Dutch people, speaking Dutch, with (predominantly) Dutch ancestry, theoretically educated[54], and have been taught by the same potter (P5) at some point in, or

[54] I here refer to the Dutch division in post-high school between more practical and more theoretical education. More theoretical education, also referred to as 'higher' education, includes university-level or 'higher vocational' school level (in Dutch: 'hoger beroepsonderwijs' or 'hbo'). More practical education, also referred to as 'lower' education, includes 'middle vocational' school level (in Dutch: 'middelbaar beroepsonderwijs' or 'mbo'). In referring to these types of education as 'lower' and 'higher' inherently reflects and gives way to a reduced appreciation for vocational education, although multiple Dutch (non-)governmental organisations are

for the complete duration of, their wheel-throwing learning process and / or pottery manufacture education. All still regularly threw vessels under P5's supervision. Nonetheless, they were of varying ages, had varying degrees of experience with other crafts, had different education backgrounds, and had different job histories.

The most important here I consider pottery education history and physical ability. Regarding the latter, the perspective of the multiple times referred-to blind potter sometimes working at the studio would have been most interesting. On the other hand, the clear overlap in pottery education history might have caused a bias towards repeating P5's teachings, although the core of teaching wheel-throwing will likely differ little between teachers. Regardless, the exact parameters for desired clay, shapes, and ways of working are very personal, as is the learning process of the student; P5 does not ask students outside of the beginner's course to create certain shapes using certain clay. Individual to the potter is the incorp(s)orating of teachings into their own prior (embodied) knowledge, their reporting on it, and their experiences in (learning) the craft. Lastly, the most important diversity factor was found in the skill level differences within the potters participating in this study.

5.5.3.3. The researcher stepping into the potters' realm

Compared to the questionnaire, the six-question semi-structured interview targeted more relevant matters, but gave less direction to the interview. Gained, however, was the freedom to ask further clarifying questions. Still, after stressing at the beginning of the interview that every answer was welcome, some questions might have been more (sub-)consciously formatted to my academic outlook, for example in:

- 'Surrendering' to the sequentially segmented structure of a chaîne opératoire when reflecting on the fluid process of manufacture.
- Fitting responses on sensory perception in the framework of the five (classical) human senses straightaway, but also more broadly catering response content and presentation to what I as a researcher might have (sub-)consciously communicated to be looking for.
- Withholding or simplifying information, perhaps out of fear of overloading a young researcher working within the constraints of a master's thesis, or due to the lack of (practical) background knowledge in the researcher.

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working to change both the framing and the naming of different types of post-high school education to reduce this issue.

Regarding the last note, considerable time and energy was spent getting acquainted with the workshop and discussing the very basics of (wheel-thrown) pottery manufacture. This could have been avoided had I had taken pottery classes prior to, or during, my thesis writing progress. However, this lack of practical preparation likely helped in understanding the archaeologist lacking experiential knowledge and studying final objects only.

Furthermore, my researchers' perspective was very different from the potter's in a quite literal sense: I was sitting in front of the potter and to the side a bit, at a slight distance of the pot. The potter was sitting very close to the pot, mostly looking at it from above and at a slight angle. As such, my stepping into the potter's perspective was not ideal, and I have undoubtedly missed a large number of visual clues of (sub-)consciously of importance to the potter left unnoticed otherwise.

5.5.3.4 Of the missing parts: the subconscious and P2's recordings

The interview questions on the use of senses almost automatically steered the conversation towards sensory stimuli that are 1) consciously perceived, 2) even more consciously considered, and 3) still even more consciously acted upon[55]. Any additional subconscious processes were not considered. Thus, the presented results in section 4.3 and 4.4 can and must not be seen as a complete representation of the potter's experience.

Moreover, the potters all considered sensory input within the classically thought of system of five senses and their commonly corresponding body parts (see section 2.2.2.2 Sensory perception). Potentially, the phrasing of the questions was leading in this direction. As such, the connections were lost, or established only superficially, between:

1) what body parts were used in gaining relevant sensory information,
2) what type of information was gained through these body parts,
3) the correct corresponding sensory systems that created these relevant sensory stimuli in the body,
4) what (and how) information coming from multiple sensory systems was unified into a conscious experience, and
5) reflection on the words used to describe the sensory experience.

As a result, the connection between section 4.3.4.1 (interview results about use of senses) and 4.3.4.2 (preliminary updated ceramic chaîne opératoire) might appear rather thin.

[55] P3 made a fitting comment in our interview stating that one feels what one intends to perceive (Appendix C.2.2.3 Transcript of interview with P3 and P4 (translated into English)).

To expect this level of philosophical reflection in a casual interview, even more so without asking for it directly, would be extremely short-sighted of me as a researcher. Including this in a follow-up study would likely still demand the researcher draw these connections, equipped with solid academic background knowledge on these topics.

Lastly, regardless of the highly qualitative nature of the research, the strong similarities in responses reduced loss of context and content when merging information. Still, valuable information might have been lost. The interviews with, and demonstration of, P2 was not recorded, relying on me taking notes in real time. Only when actually recording later interviews, it became apparent that taking notes in real-time must have been quite a hindrance my concentration on the interview and the demonstration, and to the fluidity of P2’s thoughts. The insights gained in the later interviews can hopefully make up for this.

5.5.3.5 Possible improvements for the interviews, demonstrations, and observations

Possible improvements for the interviews, demonstrations, and observations are the following:

- Taking pottery classes as a researcher, although starting with little to no prior practical experience in the craft can help in understanding the challenges of the researcher lacking experiential knowledge.
- Attaching a small camera to the forehead of the potter to capture literally the visual perspective of the working potter.
- Further diversifying the group of potters in terms of pottery (education) background, physical ability, age, gender, crafting background, educational background, vocational background, demographic and / or cultural background, and perhaps even socio-economic background.
- Not showing the chaîne opératoire before the interview, but allowing the potters to create more freely their own narrative on the division of production steps. Unmentioned steps can be addressed through clarifying questions.
- Asking what sensory input potters collect and rely on to start the conversation around senses. After the potters’ responding with first thoughts, widen the scope of possible senses to involve in pottery manufacture by naming a few likely relevant ones (such as perception of physical placement in space, or pressure, temperature, depth, et cetera), and allow for reconsideration of the first response.
- Recording all interviews straightaway, leaving transcribing for later.

5.6 Timing of the research

Several reasons can be given as to why this research can be rightfully called very timely. Firstly, it is a step closer towards making more tangible Malafouris' Material Entanglement Theory, attempting to help create an archaeology of mind in pottery manufacture – the production process of main interest in his research (Malafouris, 2008; 2021; O'Brien & Malafouris, 2024). It further builds on the concept of 4E cognition, still highly relevant to the humanities (Cook et al., 2018, see Kuijpers, 2018a). This thesis demonstrates that skill in ceramic manufacture has recently received increasing attention in archaeological research, too.

Outside of the pottery domain, archaeological research into skill in lithic craft has had a considerably more extensive history of researching and debating skill in craft[56]. Research into potters' skill could therefore be seen as primarily catching up with, and learning from, the archaeological study of lithic craft, in which this research can provide a timely help.

Moreover, this research investigates the (more structural) crossing of the epistemological divide between archaeology and arts, craft and design, in line with similar, recent scholarly attempts (see Westerlund et al., 2022) and debate on this practice (Alberti, 2018; Molander, 2018; Talaga et al., 2021).

Lastly, this study fits perfectly in a larger movement of reappreciation and revalorization of handicraft, not in the least linked to present-day sustainability efforts (Ferris, 2009; Gudowska, 2020; Chen, 2022; Zbuchea, 2022). Secondly, progressive industrialization and AI-digitalization have been seen to induce a desire for authenticity in the world around us (Lee & Kim, 2024; Pedersen & Ritter, 2024; Kirk & Givi, 2025).

5.7 Theoretical and practical implications

This section first deals with theoretical implications of this thesis, followed by its practical implications. Theoretical implications are sought in the current state of archaeological knowledge on skill in ceramic manufacture, general directions for future development of a craftsperson's

[56] Studies into skill in lithic craft have been addressing its necessity (see van der Leeuw, 1999, p.122-123), reporting on intense scholarly debate on how to study it (see Dobres, 2006), applying insights on past society (see Olausson, 2017), researching skill learning processes (see Stout, 2005; Roux & David, 2005; Geribàs et al., 2010; Majoe & Stout, 2023; Muller et al., 2023), and discussing suitable research approaches (see Bamforth & Finlay, 2008; Herzlinger, 2017; Kolhatkar, 2022; Proffitt et al., 2022).

perspective, and the relevance of interdisciplinarity therein. Practical implications are discussed in applicability to modern-day production processes in an increasingly industrialized world, and learning processes both within and outside of the realm of traditional craft. Moreover, advice is given to archaeological teaching institutes and archaeologists studying craft. Lastly, practical applications are explored through people who might be interested in working with a sensorily informed framework in general.

5.7.1 Theoretical implications

Firstly, this research implies that potter's skill in ceramic manufacture has been subject to underappreciation compared to, most prominently, metallurgical craft. It further implies that therein, potter's skill in wheel-throwing ceramics has been valued over skill in hand-forming[57], and prioritized accordingly by skill researchers. The main theoretical implication of this research, however, is that the current result-oriented archaeological understanding of potters' skill has been, and is, actively hindering moving towards a process-oriented understanding of craft more in line with the potters' perspective. The search for new, diachronological, process-oriented frameworks is justified and necessary in order to advance our understanding of potters' skill on a fundamental level. I continue with guidelines for such framework development based on what this research further implies.

Kuijpers' craftsperson's perspective framework appears promising, although its applicability potential for wheel-thrown ceramic manufacture proves challenging due to the large number of simultaneously occurring processes and corresponding points of attention within a matter of minutes. A definite verdict on the applicability of Kuijpers' framework for the wheel-thrown pottery manufacture is yet to be reached.

An experience is inherently ephemeral, situated, and personal. Therefore, a process- and perspective-centred framework will inevitably always hold the value of a guide only, that can, and should, be adjusted to fit the situated organism and research context of interest. Even then, the insights derived from its application cannot be understood as complete, objective truth. Some (parts of) craftspeople's realities are inevitably non-retraceable, but objective truth in them is *approachable*, more closely even if researchers themselves explore such realities through their own lived experience.

[57] This might be due to underlying scholarly underappreciation of slightly less seemingly perfect, symmetrical vessels.

This research further implies that constructing such a craftsperson's perspective best begins with a thorough understanding of the craftsperson's Umwelt and its affordances to the craftsperson. Ideally, its theoretical underpinnings focus on the unification, consolidation, and evaluation of different streams of sensory input within the craftsperson, placed in the context of (universal) craftsperson's previous experiences and (embodied) knowledge.

Lastly, implied is that consistent progress in skill research in craft at large both inside, as well as outside of archaeology is best done through interdisciplinary research, potentially exchanging insights, perspectives, methodologies, frameworks, analytical frameworks, and (experimental) research designs. Of particular interest herein within archaeology is the study of lithic craft, but research into other (non-)traditional crafts may prove useful as well.

5.7.2 Practical implications

On a global level, the 21st century is characterized by progressive industrialization, segmentation, and standardization in production processes, which is directly causing a general loss of human-material interaction in production, and correlates with a decreased appreciation and devalorisation of human manufacture and human-manufactured objects, as well as general craft skill erosion. In contrast, Kuijpers' concept of a sensorily informed craftsperson's perspective is rooted in the fuzzy ranges of human sensory experience – utterly impractical and therefore, useless to an industrialized society. The challenge, then, lies in finding production processes that still rely extensively, or at crucial moments in the process, on a human deciding when, and how, to carry out production steps, if not being the one manufacturing the object.

Thus, the focus shifts to modern-day production processes in which a (crafts-)person's judgement is considered crucial and leading in ensuring high quality of final products and semi-finished goods. These may include, but are not limited to, high-end artisanal objects and art pieces produced out of all types of materials, high-end architecture and design, and high-end cuisine. That is, if sensorily informed reference frameworks do not exist there already.

Working with such frameworks could be especially useful in contexts were multiple people work on the same object in different stages of its production / manufacture. It could be used as a 'product passport', transmitting crucial information on past production steps to the next, based on which a (crafts-)person might adjust their own production choices. Potential, desirable secondary effects could include gaining familiarity with less well-visible productions steps and their material outcomes, as well as an increase in perceived human-material connection.

On another note, a sensorily informed framework for production processes could be highly useful in any process of craft teaching and -learning, helping the learner to more quickly and more adequately perceive, and respond to, changes in the material, and to assess possible material outcomes of their actions.

A basic familiarity with material outcomes of actions within manufacture, and inferred from that, a craftsperson's likely considerations, coupled with a recognition of the processes leading to material outcomes in the final product, are crucial to any archaeologist studying craft. Any researchers seeking to understand any of such processes may be considerably helped through gaining first-hand practical experience with these processes. As such, this thesis might be seen as an encouragement to archaeology teaching institutes to incorporate a course on experimental archaeology[58] teaching (about) various crafts common in the archaeological record (e.g., ceramics, metallurgy, lithics, perhaps also glass-working, bone-working, woodworking, wickerwork, and making textiles). In any case, archaeologists studying craft and manufacturing processes are strongly advised to gain first-hand lived experience in their craft of interest to further enhance their scholarly interpretations.

Taken out of its production process context, a sensorily informed perspective framework might be valued by those seeking to design, maintain, standardize / diversify, or restore spaces, objects, and digital and / or object interfaces, and by those seeking to study these in relation to the perceiving human. The potential of such a perspective in- and outside of these areas is endless, and providing examples here would not do justice to those left unmentioned. I will therefore provide, in no particular order, examples of people possible particularly interested in working with such a framework: archaeologists; artists; craftspeople in general; art curators and -restorators; arts, craft, and design (practitioner-)researchers, museum exhibition designers; heritage managers; historians; architects and interior designers; urban designers and -planners; industrial designers; policy makers and designers working on safety- and warning systems; front-end website engineers; pedagogists; psychologists; philosophers; neuroscientists, biophysicists, and many more.

[58] Such a course used to exist in the Leiden University Archaeology curriculum, but was taken out of the programme during my years there as a bachelor student. Fortunately for the current bachelor students, a course on experimental archaeology aiming to do what I propose here, and more, has returned again in the form of an optional seminar (www.studiegids.universiteitleiden.nl).

5.8 Reaching my research aims

The aims of this thesis were trifold:

1) Understand what has been done previously in archaeological potters' skill research,
2) Creating a description of the wheel-thrown pottery manufacturing process from the multi-sensory potters' perspective(s) of modern-day professional and amateur potters, including their considerations, and
3) Laying the foundation for an updated chaîne opératoire for wheel-thrown pottery manufacture after Kuijpers' craftsperson's perspective framework

The first aim has been met satisfactorily. The second aim, however, has been met only met partially, since the majority of subconsciously perceived, unverbalized knowledge was not directly communicated. Concerning the third aim, a foundation for an updated chaîne opératoire has been laid, albeit still far removed from applicability by the skill-assessing archaeologist. Nonetheless, this research has provided an extensive number of insights, considerations, and opinions on what such a framework should entail, what can be done in future research to construct it – as can be read in the following and final section of this discussion chapter, and why these aspects must be considered in potential further framework development.

5.9 Future research

This section contains steps and inspiration for research questions aimed at helping future researchers develop a more process-oriented point of view on craft, and a better understanding and recognition of skill therein. It strongly argues for potters' involvement, not in the least to help reconstruct craft recipes. The challenge of balancing workability for the researcher and truthfulness to the potters' experience is discussed, following by outlining fields suitable for interdisciplinary research on the matter.

5.9.1 Towards a process-oriented understanding of ceramic manufacture

An attempt at understanding the connection between production processes, material outcomes, and their resulting final features should start at seeing these as the result of a continuous balancing act of the craftsperson striving for perfection, while avoiding mistakes as much as possible. Only through tracing back the (size of) potters' mistakes, researchers might recognize better and appreciate more the potter's skill hidden in the mistakes that were successfully kept to a minimum or avoided entirely. Such mistakes might best be interpreted in a context of general flaw directions throughout the manufacturing process, rather than as decontextualized occurrences, while staying mindful of the polysemic nature of clay. A qualitative literature review of previous archaeological skill research in ceramic manufacture would provide a good starting point for this.

Furthermore, a results-oriented (etic / 'hard' / technology / empirical) researcher cannot be expected to understand all there is to understand in the manufacturing process of a vessel. However, any substantial progress towards the integration of the process-oriented (emic / 'soft' / practice / non-empirical) perspective of the maker required future researchers to adopt a diachronological, or four-dimensional, view on craft processes. Fundamental to such a view would be the understanding of the relationships between multiple, simultaneously occurring, interdependent processes in the material throughout manufacture, recognizable by (combinations of) attributes created over time.

In order to arrive at a process-oriented understanding of potter's skill in a finished vessel, researchers must reach consensus on the following topics:

- What potters (sub-)consciously perceive using their senses, how they evaluate that information, and what types of information may guide what types of (re-)action.
- To what degree processes of (failed) mistake avoidance can be recognized from resulting (combinations of) attributes, both in universal pottery manufacture and in specific pottery recipes.
- Connecting the pronouncedness of (combinations of) attributes to differences in potter's skill levels, both in universal pottery manufacture and in specific pottery recipes.
- The development of these processes over time, and their effect upon each other.
- How to recognize, measure, quantify, and evaluate these processes through their corresponding (combinations of) attributes.

Regarding each of these topics, detailed measuring and the application of various methods within the field of archaeological science and beyond are most encouraged, especially those having been applied successfully in studying skill in lithic craft. In guiding of such research endeavours, the crucial, pivotal role of practitioner-researchers cannot be overstated; it is in the combination of both an empirical outlook and first-hand craft experience in the same individual where the foundations for a possibly uniting perspective may emerge[59].

[59] This insight is exactly what motivated Feenstra to collect written accounts of practitioner-researchers describing their lived experiences in craft (learning) (2016).

5.9.2 Potters' involvement in archaeological research: a challenging necessity

Naturally, scholarly consensus on the abovementioned topics must be reached in close collaboration with potters. This is specifically true in the reconstruction of specific pottery recipes, as these provide a narrower range of accepted deviation from perfection. Ideally, the collaborating potter is trained in the recipe of interest, or at least in one relatable to it. Common production patterns within this recipe might be traced back when assessing production choices in an assemblage, although discerning with certainty the potentially skilled individual remains difficult, if not impossible.

The 'language barrier' between archaeologists / researchers and potters must not be shunned; it must be met with curiosity, and the shared aim to find words and frameworks that capture the truth existing in both. Kuijpers' perceptive categories could be a great help in bridging this language barrier. However, a balance must be found between workability for the researcher and truthfulness to the breadth of (sub-)conscious sensory perception, considerations, and resulting actions of the potter.

Further complication lies in the fact that human sensory perception cannot be reduced to the five commonly thought-of senses (see section 2.2.2.2 on sensory systems). The interview questions I used to inquire about sensory perception were not blindly chosen; the responses to them may be telling of promising areas for future research into potters' sensorimotor feedback loops of potters[60].

Such research may start, for instance, at the potter's overarching sense of 'touch' (including sensory stimuli regarding friction, force, and temperature (Feenstra, 2016, p.35)). Secondly, sight may be researched further (including sensory stimuli regarding depth, shape, and the mind's eye (Feenstra, 2016, p. 22; p. 111-114)). Another important sense includes the sense of where and how the body is situated in relation to itself – specifically where the fingertips are located in relationship to each other, unaided by vision, and the planning of body movement in the future in relation to the clay's response. One might research the potter's sense of time as well (Feenstra, 2016, p. 22-23), and body movement and physical balance therein (Feenstra, 2016, p. 35; p. 58-63). Regarding methodologies, taking a potter's literal visual perspective through, for instance, attaching a small camera to their forehead, might prove most insightful.

[60] This holds true even when the analytical depth I had hoped for was not reached in the casualness of the interviews, as described in section 5.5.3.3 The researcher stepping into the potters' realm.

5.9.3 Future research alongside and beyond archaeologists

Some of the abovementioned topics lie outside of the archaeological field. However, it might be of interest to, for instance, arts, crafts, and design researchers (see Groth, 2016), neuroscientists (see Nakamura, 2021; for neuroscientists working together with archaeologists, see Forte et al., 2025), bio-mechanical / kinematic researchers (see Palmer, 2020). Likewise, the fields of vocational craft (teaching), pedagogy, philosophy, (art) history, culture studies, biophysics, and psychophysics could very well be involved in such research and / or might be interested in the results and conclusions of such studies. Just one possible direction of future research might be, for example, investigating links between movement patterns of (un-)skilled potters, resulting attributes or sets of attributes, and (sub-)consciously perceived sensory input and considerations flowing from them.

From an archaeological perspective, future researchers would have to consider the use of such information in further developing a functional archaeologist's tool, if that were still the main research aim. If anything, *reducing* the number of potters' points of attention instead of extending on them will improve workability for the researcher. Nonetheless, it might help in counteracting any persisting underappreciation of potter's skill and the potter's craft in- and outside of archaeology, both for wheel-throwing and hand-formed pottery. That is, if this exists; in researching this more thoroughly lies another possible direction for future research. Such research might consist of reviewing literature in a more targeted manner for hints of (silent) underappreciation or active devaluation of potter's skill and the potter's craft in- and outside of archaeology, on its own as well as in comparison to other crafts.

6 Conclusion

6.1 Motivation for this research

Diverse, large-scale archaeological narratives about past societies have been, and are being, constructed based on ceramics researchers' knowledge of skill in pottery manufacture. However, potters' skill assessments largely depend on (own or copied) researchers' assumptions on how to retrace skilful pottery manufacture in final vessels. While called for it by various archaeologists over the last three decades, an archaeological skill assessment framework involving a well-supported potters' perspective is still lacking. Ideally, such an analytical tool combines the *how* and the *what* in craft actions, balancing universal applicability and adjustability, workability for skill-assessing researchers, and truthfulness to potters' (sub-)conscious sensory experience and considerations in manufacture.

6.2 Research aims and relevant frameworks

Building on Maikel Kuijpers' craftsperson's perspective in the book An Archaeology of Skill (2018), and inspired by my grandfather's academic interest in skill of the craftsperson, the **main aim of this thesis was to lay the foundations for a sensorily informed framework in wheel-thrown pottery manufacture**, pioneering in translating Kuijpers' ideas to another craft. The framework relies on the retracing of material outcomes in craft through the potters' (re-)acting on sensory cues in the material, which leaves permanent traces in the final object. A resulting reconstruction of *how* the craftsperson operates can hold clues to skill levels in *what* actions the craftsperson performs. For each step in the production process or *chaîne opératoire*, a differentiation in relevant sensory input ranges or *perceptive categories* can be created. Heavily relying on philosophical thought on embodied, embedded, extended, and enacted cognition – commonly referred to as 4E cognition, the concept of this framework may be seen as making more tangible Malafouris' Material Engagement Theory.

Exploring possibilities to capture potters' skill in an archaeological craftsperson's perspective is done through the following sub-questions:

1) **How has skill in pottery manufacture been studied previously in archaeology?**
2) **How do actual potters view and see skill?**
3) **At which steps in the pottery manufacturing process can the skill of a potter be well-observed? How does this translate into aspects visible / detectable in the finished product?**

4) **How can Kuijpers' archaeological craftsperson's perspective be applied to the pottery manufacturing process?**

6.3 Methodology

Since the basis of such a framework draws on both empirical research and (embodied) knowledge of the craftsperson, the methodology of this research was divided into two parts: a mostly quantitative literature review on previous archaeological skill research in pottery manufacture, and attaining potters' insights through interviews, demonstrations with comments, and observation.

6.4 Interpretation of key findings

Encompassing 43 relevant publications spanning four decades of research, the mostly quantitative literature review focused on research perspectives, skill-studying methodologies, attributes or features signifying (a high level of) potters' skill, and, more qualitatively, on what basis these attributes had been related to skill. In the rather fragmented research field, a most productive research group led by Enora Gandon initially pioneered in the field through an experimental research approach, a focus on skill outside of archaeological context, and the development of a research methodology for assessing intra-vessel standardization. Currently, however, the group seemingly faces plateauing, due to methodological solidification and a narrow attribute focus.

The potters' insights allowed for an extensive description of a potters' perspective during wheel-thrown pottery manufacture, from choosing clay to firing. Despite their qualitative nature, the potters' responses proved much more easily unifiable than literature-derived findings, which highlights the extreme difficulty of grasping skill in craft through an empirical research approach.

Although the work of individual researchers contributed to impactful changes in the literature, the research field has been, and still is, characterized by fragmentation and lack of a shared direction. Moreover, it is fundamentally challenged by the epistemological divide between the etic, empirical, 'technology'-focused, results-oriented research approach employed by archaeologists and archaeological scientist, and the emic, non-empirical, 'practice'-focused, process-oriented point of view employed by arts, craft, and design researchers and craftspeople. Furthermore, while the lack of scholarly consensus on skill-representing attributes might stem from a large variety of ethnographic accounts and untraceable inferring of the researcher, the inherently differentiating and analytically separating nature of empirical research might have, likewise, been actively hindering moving towards a more process-oriented view on craft. This can be attested in the large variability in archaeologist's descriptions of attributes, attempting to counteract increasing decontextualization through continued content-based and / or linguistic reinvention of attributes.

The potters' insights yielded much clearer patterns. Potters mentioned and were seen alternating in attention between attaining perfection, and avoiding mistakes therein. Increasing potters' skill was recognized in the following: increases reliance on the overarching sense of touch as opposed to vision, increased ability in detecting early mistakes, more easily and quickly mapping out directions of further error development later in the manufacturing process, an increased ability and agility in correcting mistakes, and an increased visible and self-perceived fluidity in crafting. As such, a high level of skill could be attested in all (non-)actions of skilled potters.

Compared to the potters, the researchers were results-oriented, focusing on final-vessel features, causing systemic overlooking of several (parts of) potters' points of attention in pottery studies. Possibly, two lines of reasoning could help to explain this: 1) 'faulty' vessels are started over, rather than fired, and 2) some features are polished away. Lastly, theorization of ideal vessel symmetry might have caused Gandon's research group to overlook inter-vessel standardization as telling of a high level of skill, strongly contradicting the potters' insights.

Constructing a sensorily informed framework on wheel-throwing pottery proved challenging due to the large number of potters' points of attention in simultaneously occurring processes within a matter of minutes.

This thesis is written most timely in a process of ceramics researchers catching up, and learning from, lithics researchers studying skill in craft. Secondly, recent publications explore the (more structurally) crossing of the epistemological divide between archaeology and arts, craft, and design studies. Lastly, this research fits recent handicraft reappreciation and revalorization inspired by sustainability efforts, as well as an AI-digitalization-driven increased desire for authenticity in the world around us.

6.5 Research limitations

Due to the quantitative nature of the literature review and the forced inversion of attributes signifying a *lack* of skill, further scholarly decontextualization might have occurred. A significant loss, difficult to quantify, is highly likely of more qualitative connections and interdependencies between research perspectives, methods, attributes, and the recognition of these attributes.

Collecting potters' insights was mostly constrained in time. This was due to an initial setback, the number of interviews that could be conducted in a single day, and the number of workshops that responded to emails. In the single workshop visited, the potters might have been unknowingly repeating their shared teacher's lessons and adjusting their responses to an academic format. Furthermore, since (verbally) capturing the (sub-)conscious unification of sensory input guiding the potter's considerations and actions proved extremely difficult, the potters' insights can and will claim completeness. The rather casual interviews did not allow for such philosophical reflection. Lastly, nuance was lost in the merging of the highly qualitative potters' responses.

6.6 Answering the main research question

Skill in the ceramic production realm *can* be captured in an archaeological craftsperson's perspective, *but only if* such a results-oriented researcher succeeds in constructing a diachronological or four-dimensional, more process-oriented view on the intricate interrelated connections between production processes, material outcomes, and resulting interdependent final vessel features. Such a view should be rooted in an understanding of processes of unification, consolidation, and evaluation of the potters' sensory input streams, placed in the context of (universal) craftsperson's previous experiences and their (embodied) knowledge. Instead of searching for attributes as decontextualized occurrences, it is advised to consider final material outcomes as the results of diachronological processes in the pottery manufacturing process, and in a context of general flaw directions, while staying mindful of the polysemic nature of clay. However, (fully) capturing a first-hand, inherently ephemeral, (sub-)conscious experience in craft in a strictly empirical framework remains an unattainable scholarly ideal. Until such a tool exists, archaeologists and ceramics researchers alike might find most insightful the potter's perspective description in the results section of this thesis, amply illustrated with pictures, as well as the advice to gain first-hand experience in the craft themselves.

6.7 Suggestions for future research

When aiming at further development of an analytical potters' skill assessment tool, future researchers are advised to increase their understanding of the interrelatedness and interdependencies in the multiple, simultaneously occurring processes taking place in the material throughout the manufacturing process, along with the ways in which these, and the corresponding potters' (non-)actions, might be recognizable by (combinations of) attributes in the final vessel the archaeologist will encounter. The tool may be adjusted to different vessel 'recipes', evaluated according to the standard of the time of interest. Furthermore, the various potters' sensorimotor feedback loops in craft might be explored.

A more archaeology-focused research topic would be investigating potential systemic underappreciation and devalorization of potters' skill in archaeology, as well as for other crafts. Within the craft realm, a sensorily informed production step framework might be most helpful in many processes of craft teaching and -learning.

If desirable, interdisciplinary research might focus on developing a 'product passport', transmitting information on the material's responses in past production steps to those overseeing the next. Additionally, a guide to sensory experience could be highly valuable to those designing, maintaining, standardizing / diversifying, or restoring spaces, objects, and digital and / or object interfaces, as well as to those studying human perception.

Regardless of the research direction taken, interdisciplinary research, and, if relevant, close collaboration with potters / craftspeople, is crucial. Epistemological 'language' barriers must be explored and carefully mitigated, driven by curiosity from all parties involved, respect for different perspectives, and a shared aim of mutual understanding. Particularly relevant in this is the researcher becoming a practitioner-researcher in their craft of interest.

6.8 Concluding remarks

Since a lived experience is inherently ephemeral, situated, and personal, capturing skill therein using a process-oriented, perspective framework will never lead to a complete, objective truth. Rather, it affords sheer endless approaching of the inevitably non-retraceable. Therefore, this research may be seen as testimony to the immense difficulty that characterizes any research into crafting. However, instead of giving up on it, scholars are increasingly exploring new approaches, combining and contrasting knowledge across disciplines, and reaching surprising new insights into the puzzling nature of skill in craft.

Regarding skill research in archaeology, research endeavours focused on new, diachronological, process-oriented frameworks has proven necessary in fundamentally advancing our understanding of potters' skill. This insight alone might inspire archaeology teaching institutions to incorporate undergraduate courses on experimental archaeology. Most importantly, this research strongly encourages any archaeologist to gain necessary crucial, pivotal insights on craft and craftsperson's skill through becoming a practitioner-researcher.

Abstract

Large-scale archaeological narratives about past societies have been, and are being, constructed based on ceramics researchers' knowledge of skill in pottery manufacture. However, potters' skill assessments largely depend on (own or copied) researchers' assumptions on how to retrace skilful pottery manufacture in final vessels. While called for by various archaeologists over the last three decades, an archaeological skill assessment framework involving a potters' perspective is still lacking. Ideally, such an analytical tool combines the *how* and the *what* in craft actions, balancing universal applicability and adjustability, workability for skill-assessing researchers, and truthfulness to potters' (sub-)conscious sensory experience and considerations in manufacture.

Building on Maikel Kuijpers' craftsperson's perspective and my grandfather's academic interest in skill in craft, the main aim of this thesis was to lay the foundations for a sensorily informed framework in wheel-thrown pottery manufacture, pioneering in translating Kuijpers' ideas to another craft. For each step in the production process or *chaîne opératoire*, a differentiation in relevant sensory input ranges or *perceptive categories* can be created. This research is rooted in philosophical thought on 4E cognition and Malafouris' Material Engagement Theory. Sub-questions explore 1) previous archaeological skill research in pottery manufacture, 2) the perspective of actual potters on (their) skill, 3) skill visibility during crafting and in the final object, and 4) the application of Kuijpers' framework to wheel-thrown pottery manufacture.

Since the framework draws on empirical research and (embodied) knowledge of the craftsperson, the methodology of this research was twofold: a mostly quantitative literature review on previous archaeological skill research in pottery manufacture, and attaining potters' insights through interviews, demonstrations, and observation.

The literature review demonstrated fragmentation and a lack of a shared direction. Furthermore, a fundamental epistemological challenge for empirical, results-oriented researchers hindered moving towards the non-empirical, process-oriented view adhered to by potters and arts, craft, and design (practitioner-)researchers alike. As a result, archaeologists systematically overlooked specific potters' points of attention in the manufacturing process, likely because 'faulty' vessels are started over, rather than fired, and some features are polished away. For the field-dominating research group led by Enora Gandon, theorization on ideal vessel symmetry might have caused overlooking of inter-vessel standardization as a marker of skill completely, strongly contradicting potters' insights on skill visibility.

In conclusion, capturing potters' skill in an archaeological craftsperson's perspective is possible, *if* a diachronological or four-dimensional, more process-oriented view on pottery manufacture can be constructed, in which material outcomes flow from general flaw directions,

rather than studied as decontextualized features. Though highly challenging, such research endeavours are necessary in fundamentally advancing our understanding of potters' skill, as is the need for interdisciplinary research therein. However, (fully) capturing a first-hand, inherently ephemeral, (sub-)conscious experience in craft in a strictly empirical framework remains an unattainable scholarly ideal. Crucial foundations for a uniting framework must be derived from the lived experience of both practitioner-researchers and craftspeople, which could additionally benefit potentially lacking archaeologists' appreciation for the 'humble' potters' craft.

Outside of craft or even outside of archaeology, frameworks based on sensory experience might prove highly valuable for those designing, maintaining, standardizing / diversifying, or restoring spaces, objects, and digital and / or object interfaces, as well as to those studying human perception in general.

Keywords: Skill, pottery manufacture, craftsperson's perspective, potter's perspective, framework, ceramic manufacture

Abstract (Dutch / Nederlands)

Grootschalige archeologische narratieven over vroegere samenlevingen zijn en worden geconstrueerd op basis van de kennis van keramiekonderzoekers over vaardigheid in het vervaardigen van aardewerk. Die beoordeling van pottenbakkersvaardigheden is echter deels gebaseerd op (eigen of overgenomen) aannames van onderzoekers over hoe vakkundigheid in pottenbakken in de uiteindelijke potten kan worden teruggetraceerd. Hoewel diverse archeologen de afgelopen drie decennia hebben gevraagd om een kader voor de beoordeling van archeologische vaardigheden waarbij het perspectief van de pottenbakker centraal staat, ontbreekt dit nog steeds. Idealiter combineert een dergelijk analytisch instrument het *hoe* en *wat* in de handelingen van de pottenbakker. Hierin moeten met elkaar in balans zijn: universele toepasbaarheid en aanpasbaarheid, bruikbaarheid voor vaardigheidsbeoordelende onderzoekers, en de waarheidsgetrouwheid aan de (onder-)bewuste zintuiglijke ervaring en overwegingen van pottenbakkers tijdens het maakproces.

Dit onderzoek bouwt voort op het ambachtsperspectief van Maikel Kuijpers en de academische intersse van mijn grootvader in ambachtelijke vaardigheden. Het hoofddoel van deze scriptie is om de basis te leggen voor een zintuiglijk geïnformeerd kader voor de vervaardiging van gedraaid aardewerk, waarmee een pionierende rol wordt ingenomen in het vertalen van Kuijpers' ideeën naar een ander ambacht. Voor elke stap in het productieproces of de *chaîne opératoire* kan een differentiatie in relevante sensorische inputbereiken of *perceptieve categorieën* worden gecreëerd. Dit onderzoek is geworteld in filosofisch gedachtengoed over 4E-cognitie en Malafouris' Material Engagement Theory. De deelvragen richten zich op 1) voorgaand archeologisch onderzoek naar vaardigheden in het pottenbakken, 2) het perspectief van daadwerkelijke pottenbakkers op (hun) vaardigheid, 3) de zichtbaarheid van vaardigheden tijdens het pottenbakken en in het eindproduct, en 4) de toepassing van Kuijpers' raamwerk op het pottenbakproces.

Omdat het raamwerk gebaseerd is op empirisch onderzoek en (belichaamde) kennis van de ambachtsman, was de methodologie van dit onderzoek tweeledig: een voornamelijk kwantitatief literatuuronderzoek naar eerder archeologisch onderzoek naar vaardigheden in het pottenbakken, en het verkrijgen van inzichten van pottenbakkers door middel van interviews, demonstraties en observatie.

Het literatuuronderzoek liet fragmentatie en een gebrek aan een gedeelde onderzoeksrichting zien. Daarnaast belemmerde een fundamentele epistemologische uitdaging empirische, resultaatgerichte onderzoekers die wilden toebewegen naar de niet-empirische, procesgerichte visie van zowel pottenbakkers als (praktisch-)onderzoekers in de kunsten, ambacht, en design. Archeologen negeerden systematisch specifieke aandachtspunten van pottenbakkers in

het productieproces, waarschijnlijk omdat 'defecte' potten opnieuw worden begonnen in plaats van gebakken, en sommige kenmerken worden weggepoetst. Voor de onderzoeksgroep onder leiding van Enora Gandon, leidend in het veld, zou theorievorming over ideale symmetrie in handgedraaide potten ertoe kunnen hebben geleid dat standaardisatie in een individuele pot als aanwijzing voor vaardigheid volledig over het hoofd werd gezien. Dit zou de inzichten van pottenbakkers over de zichtbaarheid van pottenbakkersvaardigheid sterk tegenspreken.

Concluderend is het mogelijk om de vaardigheden van pottenbakkers vanuit het perspectief van een archeologisch ambachtsman vast te leggen, *maar alleen als* een diachronologische of vierdimensionale, meer procesgerichte visie op de vervaardiging van aardewerk kan worden geconstrueerd, waarin materiële resultaten voortvloeien uit algemene fouten in het maakproces in plaats van bestudeerd te worden als gedecontextualiseerde kernmerken. Hoewel zeer uitdagend, zijn dergelijke onderzoeksinspanningen noodzakelijk om ons begrip van de vaardigheid van pottenbakkers fundamenteel te vergroten, evenals de behoefte aan interdisciplinair onderzoek daarin. Het (volledig) vastleggen van een persoonlijke, inherent vluchtige, (onder)bewuste ervaring van ambacht in een strikt empirisch kader blijft echter een onbereikbaar wetenschappelijk ideaal. Cruciale fundamenten voor een verenigend kader moeten worden ontleend aan de belichaamde ervaring van zowel praktijkonderzoekers als ambachtslieden, wat bovendien de mogelijk gebrekkige waardering van archeologen voor het 'bescheiden' pottenbakkersambacht ten goede kan komen.

Buiten het ambacht of zelfs buiten de archeologie kunnen kaders gebaseerd op zintuiglijke ervaring zeer waardevol kunnen zijn voor diegenen die ruimtes, objecten en digitale en/of object-interfaces ontwerpen, onderhouden, standaardiseren / diversifiëren of restaureren, evenals voor degenen die de menselijke waarneming in het algemeen bestuderen.

Trefwoorden: Vaardigheid, aardewerkproductie, ambachtsperspectief, pottenbakkersperspectief, wetenschappelijk kader, keramiekproductie

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Personal communication

Left anonymous by research design, but I obtained data through personal communication with the following potters nonetheless:

P2 and an anonymous potter (questionnaire results), 2-2025 and 3-2025.

P1, P3, and P4 (interviews, and observations), 12-4-2025.

P2 (interviews and demonstrations), 6-3-2025 and 13-3-2025.

P5 (interviews, demonstrations, and observations), 12-4-2025 and 12-7-2025.

Dr. PhD Louw Feenstra v (emeritus professor in ear-, nose-, and throat medicine and PhD in Philosophy (philosophy of the senses), 19-7-2025.

Dr. Maikel H.G. Kuijpers (assistant professor in European prehistory at Leiden University, focusing on skill in craftspersonship and Bronze Age metallurgy), 4-2023.

Dr. Martina Revello Lami (assistant professor on material culture studies in the department of archaeological sciences, focusing on (ceramic) craft production and material culture), 8-8-2025.

Nirdosh Petra van Heesbeen (professional independent ceramist for over fifty years), 3-2023.

Roderick Geerts (PhD candidate in Roman archaeology, studying Romanisation and pottery at Leiden University), 6-3-2025.

Appendix

A Literature review: extended results and further literature

A.1 Extended quantification tables of literature review results

A.1.1 Extended quantification tables of research perspective results

RELEVANT REFERENCES SORTED IN CHRONOLOGICAL ORDER	Year of publication	Ceramic ethnoarchaeology	Standardization and specialization	Craft production systems	Social dynamics	Theoretization / context	Reconstructing forming techniques	Artisanal knowledge	Real-time processes	Neuroscience	
Kramer	1985	1									
Hagstrum	1989	1									
Longacre	1991	1									
Costin	1991		1								
Crown	1999		1								
Costin	2000	1	1								
Crown	2001		1								
Eerkens & Bettinger	2001		1								
Kamp	2001				1						
Costin	2001			1							
Stark	2003	1									
Roux	2003		1								
Crown	2007		1								
Michelaki	2008				1						
Budden & Sofear	2009				1						
Dobres	2010					1					
Sofaer	2010		1								
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011		1								
Gandon, Bootsma, Endler & Grosman	2013		1								
Botwid	2013							1			
Gandon, Coyle & Bootsma	2014a		1								
Gandon, Roux & Coyle	2014b		1								
Duistermaat	2016				1						
Thér & Toms	2016						1				
Botwid	2016a							1			
Botwid	2016b							1			
Santacreu	2017				1						
Gandon, Coyle, Bootsma, Roux & Endler	2018		1								
Forte	2019		1								
Roux & Karasik	2019		1								
Miloglav & Vukovic	2019		1								
Gandon, Nonoka, Endler, Coyle & Bootsma	2020		1								
Palmer	2020								1		
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a		1								
Gandon, Coyle, Pous, Boloup & Bootsma	2021b		1								
Nakamura, Nagayoshi & Komiya	2021								1		
Berg	2022						1				
Botwid	2022							1			
Medbo	2022							1			
Solnay, Kreitner & Szilágyi	2023						1				
Nonoka, Gandon, Endler, Coyle & Bootsma	2024		1								
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025									1	
		Ceramic ethnoarchaeology	Standardization and specialization	Overview	Social dynamics	Theoretization / context	Reconstructing forming techniques	Artisanal knowledge	Real-time processes	Neuroscience	Total references
Total number of references per research perspective		5	20	1	5	1	3	5	2	1	43

Figure 45: Extended table of research perspective results. The studies by Gandon et al. have been marked light yellow.

A.1.2 Extended quantification tables of methodologies results

RELEVANT REFERENCES SORTED IN CHRONOLOGICAL ORDER	Year of publication	Visual observation	Physical measuring	Coefficient of Variation	Analysis of Variance	Von Mises mechanical stress index	Global Shape Variability	Cluster tree of variation	Videorecording	Video image capture + 2D image of one half, pixels to coordinates, mirrored + elliptical Fourier analysis + Principal Component analysis + Permutation test	Petrography / magnified images of plane sections of inclusions and voids in pottery, extracted and separated using software	X-ray fluorescence + X-ray diffraction + petrology + textural characterisation via image analysis + scanning electron microscope + macro trace analysis	Gaze tracking	Shape analysis and TMS-EEG co-registration	Verbal protocol + biophysical measurements + digital visual observation + self-reporting review	Personal experience and reflection	Literature review	Non-experimental approach	Experimental approach	Total references
Kramer	1985	1																1		
Hagstrum	1989	1																1		
Longacre	1991	1																1		
Costin	1991	1																1		
Crown	1999	1	1															1		
Costin	2000																1	1		
Crown	2001	1	1															1		
Eerkens & Bettinger	2001	1		1														1		
Kamp	2001	1			1													1		
Costin	2001																1	1		
Stark	2003																1	1		
Roux	2003	1		1														1		
Crown	2007	1	1															1		
Michelaki	2008	1																1		
Budden & Sofear	2009	1	1															1		
Dobres	2010																1	1		
Sofaer	2010	1																1		
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011	1	1			1													1	
Gandon, Bootsma, Endler & Grosman	2013	1							1										1	
Botwid	2013	1														1		1		
Gandon, Coyle & Bootsma	2014a	1			1		1												1	
Gandon, Roux & Coyle	2014b	1		1															1	
Botwid	2016a	1														1		1		
Botwid	2016b	1														1		1		
Thér & Toms	2016										1								1	
Duistermaat	2016	1															1	1		
Santacreu	2017	1										1						1		
Gandon, Coyle, Bootsma, Roux & Endler	2018	1								1									1	
Forte	2019	1																1		
Miloglav & Vukovic	2019	1		1														1		
Roux & Karasik	2019	1		1				1										1		
Gandon, Nonoka, Endler, Coyle & Bootsma	2020									1									1	
Palmer	2020	1													1				1	
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a	1								1									1	
Gandon, Coyle, Pous, Boloup & Bootsma	2021b	1		1					1										1	
Nakamura, Nagayoshi & Komiya	2021								1				1						1	
Berg	2022	1	1																1	
Botwid	2022	1														1		1		
Solnay, Kreitner & Szilágyi	2023	1									1							1		
Nonoka, Gandon, Endler, Coyle & Bootsma	2024	1								1									1	
Forte, Sartori, Visalli, Yildrim, Galati,	2025													1					1	
Total per method		33	6	6	2	1	1	1	3	4	2	1	1	1	1	4	5	27	14	41

Figure 46: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 1/6.

A.1.3 Extended quantification tables of attribute results

ATTRIBUTES OF SKILFUL POTTERY MANUFACTURE MENTIONED		Preparing clay				Prebuilding	Weight	Forming					Surface								
References sorted in chronological order	Year of publication	Inclusion sorting (better)	Temper (lack thereof; context-dependent)	Clay preparation (more appropriate for manufacturing process and final vessel use)	Homogeneity in kneading / wedging (more homogenous, no air bubbles)	During kneading and centring the clay on the wheel (axis of kneading in line with turning direction of the wheel)	Clay amount (more)	Form / shape	Form complexity (more complex)	Technique (more complex)	Quality (higher quality, context-dependent)	Relative regulation of forming speed (appropriate wheel turning speed in relation to pulling up the clay)	Successive coil bonding (less traces, no crevices; in handforming)	Scraping marks (lack thereof; in hand-forming)	Patched areas (lack thereof; in hand-forming)	Spalled surfaces (lack thereof; in hand-forming)	Refining ability and accuracy (more refined and more accurate)	Interior finish / surface treatment (presence thereof)	Smudged interior (smoother)	Presence of prefiring surface treatment techniques called preforming, such as shaving, scraping, beating, or comparable techniques (in hand-forming)	Exterior finish / surface treatment (presence thereof)
Kramer	1985																				
Hagstrum	1989																1				1
Longacre	1991																				
Crown	1999																				
Crown	2001							1	1	1	1										
Kamp	2001																	1	1		1
Roux	2003																				
Crown	2007								1	1											
Michelaki	2008													1	1	1					
Budden & Sofaer	2009			1									1					1			1
Sofaer	2010																				
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011						1														
Gandon, Bootsma, Endler & Grosman	2013																				
Botwid	2013											1									
Gandon, Coyle & Bootsma	2014a																				
Gandon, Roux & Coyle	2014b							1													
Thér & Toms	2016					1						1									
Duistermaat	2016											1									
Santecreu	2017				1				1	1											1
Gandon, Coyle, Bootsma, Roux & Endler	2018																				
Forte	2019								1								1				
Miloglav & Vuković	2019							1													1
Palmer	2020											1									
Gandon, Nonaka, Endler, Coyle & Bootsma	2020																				
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a																				
Gandon, Coyle, Pous, Buloup & Bootsma	2021b						1	1				1									
Berg	2022				1							1									
Solnay, Kreitner & Szilági	2023	1	1		1															1	1
Nonaka, Gandon, Endler, Coyle & Bootsma	2024																				
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025												1								
Total number of mentions per attribute		1	1	1	3	1	2	4	4	3	1	6	2	1	1	1	2	2	1	1	6
		Preparing clay				Pre-forming	Weight	Forming					Surface								
Total number of mentions of attributes per overarching attribute category		6				1	2	18					17								

Figure 48: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 2/6.

ATTRIBUTES OF SKILFUL POTTERY MANUFACTURE MENTIONED		Standardization				Absolute dimensions				Relative dimensions				Symmetry (more)			Mechanical stress division
References sorted in chronological order	Year of publication	Standardized paste composition (more standardized)	High-rate production standardization (more in base, height, aperture, and for closed shapes maximum diameter and height thereof)	Profile standardisation in working with unfamiliar shapes and / or tools	Standardization in profile reproduction (complete profile; closer to original)	Size (larger)	Maximum height (higher)	Maximum diameter (wider)	Neck length (longer; for jars)	Maximum diameter located close to the mid-height of the vessel (smaller diameter)	Wall thickness in relation to profile length increase (thinner)	Height and maximal diameter in relation to clay mass (larger)	Maximum orifice diameter in relation to the vessel (larger)	General symmetry, visually observed or measured symmetry (less lopsidedness)	Handle symmetry	Profile symmetry	Mechanical strain (less local, more evenly divided, in more complex shapes)
Kramer	1985					1											
Hagstrum	1989																
Longacre	1991												1	1			
Crown	1999																
Crown	2001						1	1	1					1			
Kamp	2001													1			
Roux	2003		1														
Crown	2007					1								1			
Michelaki	2008					1							1	1			
Budden & Sofaer	2009														1	1	
Sofaer	2010																
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011										1						1
Gandon, Bootsma, Endler & Grosman	2013					1	1	1				1					
Botwid	2013												1				
Gandon, Coyle & Bootsma	2014a			1													
Gandon, Roux & Coyle	2014b		1	1						1							
Thér & Toms	2016																
Duistermaat	2016																
Santecreu	2017	1				1								1			
Gandon, Coyle, Bootsma, Roux & Endler	2018				1												
Forte	2019					1								1			
Miloglav & Vuković	2019						1	1					1				
Palmer	2020																
Gandon, Nonaka, Endler, Coyle & Bootsma	2020				1												
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a				1												
Gandon, Coyle, Pous, Buloup & Bootsma	2021b				1	1											
Berg	2022																
Solnay, Kreitner & Szilági	2023																
Nonaka, Gandon, Endler, Coyle & Bootsma	2024				1												
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025						1										
Total number of mentions per attribute		1	2	2	5	7	4	3	1	1	1	1	4	7	1	1	1
		Standardization				**Absolute dimensions**				**Relative dimensions**				**Symmetry (more)**			**Mechanical stress**
Total number of mentions of attributes per overarching attribute category		**10**				**15**				**7**				**9**			**1**

Figure 49: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 3/6.

ATTRIBUTES OF SKILFUL POTTERY MANUFACTURE MENTIONED		Base	Wall								Rim					Orifice / aperture / top opening	Drying			Additions (context-dependent)
References sorted in chronological order	Year of publication	Roundness (rounder)	Evenness (more even / regular)	Evenness, especially at the base (more even)	Basis collapse (lack thereof)	Thickness (thinner)	Thickness (thicker; in hand-forming)	Thickness, especially at the base (thicker)	Maximum thickness (lower)	Curvature regularity (more regular)	Angle to wall (more acute)	Thickness (slightly thicker than wall)	Deviation on horizontal plane (less)	Evenness (more even)	Rim symmetry (more)	Minimum diameter (smaller)	Thorough before firing (dry)	Drying cracks (lack thereof)	Thorough before firing, avoiding warping of the pot (dry)	Presence thereof
Kramer	1985																			
Hagstrum	1989																			
Longacre	1991	1	1	1		1		1			1	1								
Crown	1999																			
Crown	2001					1			1							1				
Kamp	2001																	1		
Roux	2003																			
Crown	2007																			
Michelaki	2008							1												
Budden & Sofaer	2009					1					1		1		1					1
Sofaer	2010					1														
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011					1				1										
Gandon, Bootsma, Endler & Grosman	2013					1														
Botwid	2013		1			1						1		1			1		1	
Gandon, Coyle & Bootsma	2014a																			
Gandon, Roux & Coyle	2014b																			
Thér & Toms	2016					1				1							1	1	1	
Duistermaat	2016																			
Santecreu	2017		1			1														
Gandon, Coyle, Bootsma, Roux & Endler	2018																			
Forte	2019					1														
Miloglav & Vuković	2019																			
Palmer	2020																			
Gandon, Nonaka, Endler, Coyle & Bootsma	2020																			
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a																			
Gandon, Coyle, Pous, Buloup & Bootsma	2021b																			
Berg	2022																			
Solnay, Kreitner & Szilági	2023																			
Nonaka, Gandon, Endler, Coyle & Bootsma	2024																			
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025		1		1		1													
Total number of mentions per attribute		1	4	1	1	10	1	2	1	2	2	2	1	1	1	1	2	2	2	1
		Base	**Wall**								**Rim**					**Orifice / aperture / top opening**	**Drying**			**Additions (context-dependent)**
Total number of mentions of attributes per overarching attribute category		**1**	**22**								**7**					**1**	**6**			**1**

Figure 50: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 4/6.

ATTRIBUTES OF SKILFUL POTTERY MANUFACTURE MENTIONED		Firing					Post-firing treatment (context-dependent)								Aesthetic features			
References sorted in chronological order	Year of publication	High temperature (higher)	High temperature yet avoiding calcite decomposition	Colour extending through firing core through consistent atmosphere (reduction / oxidation; extending more thoroughly)	Fire cracks and star-shaped cracks (lack thereof)	Fire clouds (lack thereof) / equal temperatures along the vessel	Presence thereof (more aesthetic and more even final result)	Technique (more complex)	Interior finish / surface treatment (presence thereof)	Exterior finish / surface treatment (presence thereof)	Refining ability and accuracy (more refined and more accurate)	Surface roughness (less)	Shiny surface (successful burnishing)	Finishing quality (higher quality)	"Fineness"	Decoration (presence thereof)	"Luxury" (aesthetical pleasantness? Subjective? Combination of many different attributes and strongly context-dependent)	Lack thereof due to focus on output and speed
Kramer	1985															1		
Hagstrum	1989														1			
Longacre	1991																	
Crown	1999															1		
Crown	2001													1		1		
Kamp	2001																	
Roux	2003																	
Crown	2007							1										
Michelaki	2008				1	1												
Budden & Sofaer	2009			1					1	1			1			1		
Sofaer	2010			1		1									1			
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011																	
Gandon, Bootsma, Endler & Grosman	2013																	
Botwid	2013	1					1						1		1			
Gandon, Coyle & Bootsma	2014a																	
Gandon, Roux & Coyle	2014b																	
Thér & Toms	2016			1	1	1												
Duistermaat	2016																	1
Santecreu	2017		1			1				1								
Gandon, Coyle, Bootsma, Roux & Endler	2018																	
Forte	2019										1	1						
Miloglav & Vuković	2019									1				1	1		1	
Palmer	2020																	
Gandon, Nonaka, Endler, Coyle & Bootsma	2020																	
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a																	
Gandon, Coyle, Pous, Buloup & Bootsma	2021b																	
Berg	2022																	
Solnay, Kreitner & Szilági	2023									1								
Nonaka, Gandon, Endler, Coyle & Bootsma	2024																	
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025																	
Total number of mentions per attribute		1	1	3	2	4	1	1	1	4	1	1	2	2	4	4	1	1
		Firing					Post-firing treatment (context-dependent)								Aesthetic features (context-dependent)			
Total number of mentions of attributes per overarching attribute category		11					13								10			

Figure 51: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 5/6.

ATTRIBUTES OF SKILFUL POTTERY MANUFACTURE MENTIONED		Fitting to customs (context-dependent)	Labor intensity / investment	Integrity (unclear: structural, functional, aesthetic or material?)		
References sorted in chronological order	Year of publication	Adherence to appropriate customs (strongly culturally embedded)	Labor intensity / investement (more; larger task size)	Integer (more)	Number of mentions per reference	Number of mentions over five-year period
Kramer	1985				2	2
Hagstrum	1989		1		4	
Longacre	1991				9	
Crown	1999				1	14
Crown	2001				13	
Kamp	2001				5	
Roux	2003				1	19
Crown	2007				5	
Michelaki	2008		1		10	
Budden & Sofaer	2009				16	
Sofaer	2010				4	35
Gandon, Casanova, Sainton, Coyle, Roux, Bril & Bootsma	2011				5	
Gandon, Bootsma, Endler & Grosman	2013				5	
Botwid	2013				12	
Gandon, Coyle & Bootsma	2014a				1	
Gandon, Roux & Coyle	2014b				4	27
Thér & Toms	2016				10	
Duistermaat	2016				2	
Santecreu	2017			1	13	
Gandon, Coyle, Bootsma, Roux & Endler	2018				1	
Forte	2019				7	
Miloglav & Vuković	2019		1		10	
Palmer	2020				1	
Gandon, Nonaka, Endler, Coyle & Bootsma	2020				1	45
Gandon, Nonoka, Coyle, Sonabend, Ogbonnaya, Endler & Roux	2021a				1	
Gandon, Coyle, Pous, Buloup & Bootsma	2021b				5	
Berg	2022				2	
Solnay, Kreitner & Szilági	2023	1			7	
Nonaka, Gandon, Endler, Coyle & Bootsma	2024				1	
Forte, Sartori, Visalli, Yildrim, Galati, Vidale, Faresin & Vallesi	2025				5	21
Total number of mentions per attribute		1	3	1		
		Fitting to customs (context-dependent)	**Labor intensity / investment**	**Integrity (unclear: structural, functional, aesthetic or material?)**	**Total mentions**	
Total number of mentions of attributes per overarching attribute category		**1**	**3**	**1**	163	

Figure 52: Extended table of methodologies results. The studies by Gandon et al. have been marked light yellow. 6/6.

A.1.4 Quantification of researchers collaborating in Gandon's research group

Researchers collaborating in Gandon's research group in studies focused on skill	2011	2013	2014a	2014b	2018	2019*	2020	2021a	2021b	2024	**Total**
Gandon, E.	1	1	1	1	1	1	1	1	1	1	10
Coyle, T.	1		1	1	1		1	1	1	1	8
Bootsma, R.	1	1	1		1		1		1	1	7
Endler, J.		1			1		1	1		1	5
Roux, V.	1			1	1	1		1			5
Nonoka, T.							1	1		1	3
Casanova, R.	1										1
Sainton, P.	1										1
Bril, B.	1										1
Grosman, L.		1									1
Sonabend, R.								1			1
Ogbonnaya, C.								1			1
Pous, F.									1		1
Buloup, F.									1		1

Figure 53: Quantification of researchers collaborating in Gandon's research. Note that the 2019 reference was not part of the literature review.

A.2 List of further relevant literature

Baysal, E. L., & Yelözer, S. (2023). Searching for the individual: Characterising knowledge transfer and skill in prehistoric personal ornament making. *Journal of Archaeological Method and Theory, 30*(1), 172–202. https://doi.org/10.1007/s10816-022-09589-z

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Forte, V. (2021). Craft identities and skill in Copper Age communities: A multidisciplinary approach to the pottery production of Central Italy. In S. Beyries, C. Hamon, & Y. Maigrot (Eds.), *Beyond use wear* *traces: Going from tools to people by means of archaeological wear and residue analyses* (pp. 381–392). Sidestone Press.

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Jin, X., & Li, X. (2025). Painting style-based recognition of potters: Using convolutional neural network techniques. *Archaeological and Anthropological Sciences, 17*(5), 100. https://doi.org/10.1007/s12520-025-02206-6

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March, P. L. (2022). Time and clay: The clayful phenomenology of Jōmon flame pots in a post-modern world. In T. Wynn, K. Overmann, & F. Coolidge (Eds.), *The Oxford handbook of cognitive archaeology* (pp. 915–948). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780192895950.013.56

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Padovani, C., Flahaut, J., & Willems, S. (2025). Exploring craft spaces: A new insight into the archaeology of pottery production. *Journal of Archaeological Science: Reports*, 105183. https://doi.org/10.1016/j.jasrep.2025.105183

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B Collecting potters' data

B.1 Ethical considerations

Leiden University Faculty of Humanities

Ethical considerations for research involving human subjects

HOW TO USE THIS FORM

This form is to be used by students who, during the course of their thesis research, will be collecting personal data about participants. Personal data means any information relating to an identified or identifiable natural person. Sensitive personal data refer to, among others, data regarding racial or ethnic origin; religious, political and philosophical beliefs; sexuality orientation and gender identity; genetic and biometric data. Please consult the GDPR for further information. The form should be used during the preparatory stage of the research and its contents discussed between the student and their supervisor. Ideally, it should be filled out after the research topic has been determined but before data collection begins. This form is provided for guidance only and is not intended to be submitted to a committee or board for approval. We do, however, recommend, that a copy of the completed form be attached as an appendix to the thesis (not counting toward the total number of words).

1. **RESPONSIBLE PROJECT INVESTIGATOR (RPI)** Include all persons who will be directly responsible for 1) the project's design or implementation, 2) recruitment of participants, 3) obtaining informed consent, 4) data collection, data analysis, or follow-up.

Last Name: Feenstra	First Name: Lisoula	Academic Degree(s): MSc Archaeological Science

Dept. or Unit: Faculty of Archaeology	
Phone: +31 6 54985196	E-mail: lifeenstra@gmail.com / s2325586@vuw.leidenuniv.nl

2. **PROJECT TITLE**

➔ "Grasping the ungraspable. Laying the foundations for an archaeologist's assessment tool for potter's skill using a sensorily informed craftsperson's perspective"

3. **Research Summary:** Please summarize, in no more than 150-200 words and in lay language, the objectives and significance of the research.

➔ Assumptions on skill level of craftspeople have drastically shaped beliefs in archaeology about the socio-economic structures of past societies, although frequently made through eyeballing of aspects of hand-crafted objects believed to reflect high quality craftspersonship. Currently, a shared framework for skill quantification of a craftsperson is lacking, despite many research efforts. This research argues for broadened applicability of a craftsperson's perspective framework.

This research strives to adapt a foundational framework and toolbox for recognizing skill of a craftsperson (initially in European Bronze Age metalsmiths) by making the toolbox suitable for archaeologists studying skill of potters regardless of timeperiod and geographical location. The toolbox could be adapted for any other craft as well. Central to the framework stands the idea that craftspeople notice, create, and react to differences in the changing material using their senses. Their actions on the material leave permanent traces, noticeable for those with plenty of experience working with the material and researchers that know precisely where to look. Sensory perception of relevant material aspects during the production process can be categorized in such a way that researchers afterwards can retrace the production steps and considerations of the craftsperson when only presented with the final hand-crafted object.

4. **Participants:**

4A. What is the estimated total number of participants?

➔ About 5

4B. Briefly describe the population(s) from which participants will be recruited. Do they include vulnerable populations (e.g., children under 18, pregnant women, incarcerated individuals)?

- ➔ The participants have been recruited from a group of hobby- and professional potters practicing their craft in the Leiden region. A child under 18 was present at the potter's workshop, but was not obliged in any way to take part in the research.

4C-1. Describe how participants will be recruited.

- ➔ Potters with an online presence as potter were emailed directly asking them to take part in the research. When visiting a potter's workshop, I asked potters working there to answer a few questions about skill and making pottery if they would like to.

4C-2. Attach copies of all recruiting materials that you will use for this study. This includes text that will be used for online recruitment (via social media), final copy of printed advertisements and/or the final version of any audio/taped advertisements.

- ➔ I did not create any type of recruitment materials for this research.

4D-1. Are you reimbursing participants financially? If not, are there other ways in which you recognize/remunerate participation in your project?

- ➔ I am not financially reimbursing the participants.

4D-2. In case you are reimbursing participants financially, will reimbursements be made by Leiden University directly or by a third party?

NB: If reimbursements are made by Leiden University, you may be obliged to collect personal information (see https://www.staff.universiteitleiden.nl/finance-and-procurement/financial-services/payments-to-research-participants for more information). If you need to collect personal information for payments, please explain how you will keep this information separate from other information that you collect. If you prefer to make anonymous (cash) payments, please explain why doing so is important (as opposed to a different type of non-financial recognition).

5. Research Procedure:

5A. What will participants do and where will research activities take place?

- ➔ The participants responded to a series of questions (six) in an interview format, being asked more questions as they arose. I recorded the interview for me to transcribe at a later moment. When possible and agreed to, they did a demonstration where they manufactured a pot on a potter's wheel. I also recorded any comments of the potter and took pictures, both in accordance with the potter.

5B. What is the estimated length of time participants will spend on research activities and in how many visits/meetings?

- ➔ The interview: 15 to 60 minutes, depending on how talkative the potter was. The demonstration and comments took between 15 and 90 minutes. Meetings were intended to be held once, but a second meeting was planned with two potters to finish the interview and to discuss additional questions. I furthermore spent a day observing in a workshop, where I interviewed multiple potters after their work was done if they were interested. I observed them while at work, sitting at a table at a bit of a distance overseeing the workshop.

5C. What are the approximate study dates?

- ➔ Thursday 6-3-2025, Thursday 13-3-2025, Saturday 12-4-2025, and Saturday 12-7-2025

5D. What research tools (questionnaires, interviews, surveys etc.) do you use? Please list them below and attach complete copies as an Appendix to your thesis (include translations, if applicable).

Tool 1:	Interview questions
Tool 2:	Pottery example for demonstration
Tool 3:	Example of archaeological chaîne opératoire used to understand the pottery production process

List additional tools on an attachment and check here: V☐

Confidentiality:

Please explain how confidentiality will be maintained during and after data collection. Issues to consider after data collection include risk mitigation strategies (how will you minimize risk of e.g. data leaks, theft?), storage (how and where will you store your data, who will have access to it?), and retention of data (what happens to the data once your project is over?). For more information, please consult Privacy policy and procedures - Leiden University.

- ➔ The transcriptions are stored on my laptop, my personal USB-stick and personal Google Drive. No other people have access to these locations. The pictures and recordings are stored on my phone. The transcription and relevant pictures will be presented in my thesis, of which I will keep a digital copy on my laptop, personal USB-stick and Google Drive. Upon receiving a sufficient grade for my thesis, I will delete the recordings and pictures from my phone.

6. Consent Process:

7A. Describe when and where voluntary consent will be obtained, how often, by whom, and from whom.

- ➔ Voluntary consent from the potter to participate in the research was obtained by me in the response I got upon emailing them, if I received a response at all. After emailing back and forth with one interested potter, I scheduled a phone call to further discuss the research and data collection, and to plan our appointment. Before starting the interview, I asked their consent to record the interview and comments during the demonstration, and to take pictures during the demonstration. Of the interviewed potter, I also asked consent to use their names to be able to recognize the recordings in my phone.

  Voluntary consent of potters at the workshop to participate in an interview was given by quickly introducing myself and inviting potters for an interview on skill and craftspersonship in ceramic manufacture, should they be interested. Potters approached me for an interview, verbally agreeing to me recording the interview and including their answers and age in my study.

7B. Please indicate all that apply for the consent process and provide all consent documents (including translations, if applicable).

- ☐ Written informed consent
- ☐ Online consent
- V Oral consent
- ☐ Unsigned Information Sheet Provided
- ☐ Waiver of Informed Consent (if informed consent will not be sought, please explain briefly why this is not necessary in the box below)
- ➔ Informed consent will not be sought, since I will not be including personal details beside age in my research and any comments will not reflect sensitive data.

7. Publication plans:

8A. What is (are) the proposed form(s) of dissemination (e.g., journal article, thesis, academic paper, conference presentation, sharing with the industry or profession, etc.)? If you are planning to publish, please contact a data steward or CDS librarian for help on FAIR archiving

- ➔ MSc thesis only. The thesis as such will not be published, so no additional paperwork will be needed.

8B. Could your presentations and/or publications be potentially harmful to the participants in your study? If so, what safeguards will you take during the presentation and publication of your data to minimize this risk?

- ➔ I do not think that this will be the case; the potters I spoke to were more than happy to share their knowledge and were willing to contribute to my research. I did always offer to only photograph their hands during the demonstration, should they be uncomfortable with full-body pictures. I also did not ask every potter to do a demonstration, as time and space were limited; the potters working in the workshop paid per time block in the workshop and wanted to use this time working on their pieces. One of them had other appointments after the interview was done. I did not want to intervene too much in their day, so I limited my data collection at the workshop to voluntary interviews only.

8C. If you work with publicly available (e.g. internet) data: how will you ensure that your dissemination of the results demonstrates respect for the interests and concerns of the persons behind the data?

- ➔ Not applicable

8. **Individually identifiable information:** Will any individually identifiable information, including images of participants, be published, shared, or otherwise disseminated?

No
Yes
If yes, participants must provide explicit consent for such dissemination. Provide appropriate options on the relevant consent documents.

- ➔ Pictures were taken of the potters after giving verbal consent to this and using the pictures in my thesis. I cropped their faces, however, focusing on the hands and the clay.

9. **Expected Completion Date: 23-8-2025**

Supervisor: Dr. Martina Revello Lami Date: 15-4-2025

Additional information: You can find more information about Privacy Policy and Procedures on the site Privacy policy and procedures - Leiden University. For any remaining questions regarding privacy and data protection only, please contact your unit's privacy officer.

B.2 First attempt at collecting results: questionnaire

B.2.1 Questionnaire (original in Dutch)

Enquête Masterscriptie Archaeological Science

Lisoula Feenstra

Universiteit Leiden

Februari 2025

Goedendag! Mijn naam is Lisoula Feenstra en ik ben 25 jaar. Momenteel ben ik bezig met het schrijven van mijn scriptie voor de Master Archaeological Science aan de Universiteit Leiden. Hiervoor doe ik onderzoek naar vaardigheid in ambacht, specifiek het keramisch ambacht. Uiteindelijk hoop ik een bestaand model voor het quantificeren van ambacht van metaalsmeden aan te passen naar een model voor keramisten. Op die manier kunnen archeologen, die vooral potscherven tot hun beschikking hebben, beter inschatten hoe vaardig een keramist in het verleden mogelijk was en waarin. Zo kunnen we beter begrijpen hoe het verleden eruit zou kunnen hebben gezien.

Hier komt u om de hoek kijken als de keramist van nu! Uw inzichten over (uw) vakmanschap en keramische vaardigheden zijn van essentieel belang om dit model zinvol aan te passen.

De vragen zijn onderverdeeld in zeven categorieën met tussen de twee en zeventien vragen. Deze zullen ingaan op persoonlijke gevens, uw achtergrond als keramist, uw leertraject, eventuele doceerervaring, eerste ervaringen van eigen vaardigheid, gevorderdheid in vaardigheden en slotvragen. Alle vragen zijn open en alle antwoorden zijn welkom.

Goed om te weten: alle antwoorden zijn anoniem en u kunt op elk gewenst moment afzien van deelname. Bij deelname zou ik wél graag de volgende persoonlijke gegevens willen vermelden in mijn scriptie: huidige leeftijd, gender, en op welke leeftijd u bent begonnen met het leren van uw vak. Bij bezwaar hiertegen, vragen en opmerkingen, of als u bij nader inzien toch afziet van deelname, kunt u mij altijd bereiken via lifeenstra@gmail.com. Afzien van deelname is mogelijk t/m 24 maart. De deadline voor het invullen van deze enquête is 28 februari.

Tot slot wil ik u bij voorbaat hartelijk bedanken voor uw deelname aan dit onderzoek! Ik kijk er erg naar uit om uw antwoorden door te nemen en hoop dat deze vragen ook voor u tot interessante reflectie zal leiden.

Persoonlijke gegevens

1) Wat is uw naam?
2) Wat is uw emailadres?
3) Wat is uw leeftijd?

A) Achtergrond als keramist

1) Op welke leeftijd begon u met het leren van uw vak?
2) Waar leerde u uw vak?
3) Heeft u voorafgaand aan / tijdens / na het leren van uw vak nog (een) andere opleidingen gedaan?
4) Zo ja, welke opleiding(en)?
5) Had u eerdere ervaring met een ander ambachtelijk vak?
6) Zo ja, welk vak? Op welke leeftijd leerde u dit? En waar? Hoe goed was u in dit vak?
7) Op wat voor manier(en) bent u na uw leertraject bezig gebleven met dit andere vak?

B) Leertraject als keramist

1) Hoe zag uw leertraject eruit? Denk aan wat u hebt geleerd, hoeveel uur per week en waar u naartoe hebt gewerkt.
2) Hoe was uw interactie met de docent? Denk aan hoeveel uur u met uw docent hebt doorgebracht, de groepsgrootte en hoe de docent u heeft begeleid.
3) Hoe gaf de docent les en hoe gaf de docent feedback? Welke methoden gebruikte de docent en wat moedigde de docent aan?
4) Wat viel u op aan de manier waarop de docent dingen uitlegde of feedback gaf?
5) Waarop concentreerde u zich tijdens de uitleg- en feedbackgesprekken?
6) Wat vond u fijn aan deze manier van lesgeven en waarom?
7) Wat vond u niet fijn aan deze manier van lesgeven en waarom?
8) Welke manier van lesgeven werkt het beste voor u en waarom?

9) Welke manier van lesgeven werkt het minst goed voor u en waarom?
10) Is de manier van lesgeven veranderd naarmate u meer ervaren werd? Zo ja, hoe?
11) Hoe zag u uw toegenomen ervaring terug in uw productieproces? Wees specifiek.
12) Hoe zag u uw toegenomen ervaring terug in uw eindproducten? Wees specifiek.

C) <u>Doceertraject als keramist</u>

(Alleen invullen indien van toepassing. De vragen staan in verleden tijd, maar u kunt reflecteren op uw huidige manier van lesgeven indien van toepassing)

1) Aan wie gaf u les in uw vak?
2) Hoe was uw interactie met studenten? Denk aan uren per week, groepsgrootte en hoe u ze begeleidde.
3) Hoe gaf u les en gaf u feedback? Welke methoden gebruikte u en wat moedigde u aan?
4) Wat gaf u prioriteit bij het uitleggen en geven van feedback? Denk aan hoe u uitlegde, wat u uitlegde en wat u belangrijk vond.
5) Waarop concentreerde u zich bij het geven van uitleg en feedback?
6) Wat vond u leuk aan uw lesmethode en waarom?
7) Wat vond u niet leuk aan uw lesmethode en waarom?
8) Welke lesmethode werkt het beste voor u als docent en waarom?
9) Welke lesmethode werkt het minst goed voor u als docent en waarom?
10) Hoe beoordeelde u wat voor uitlegmethode(n) werkte(n) voor uw studenten?
11) Is uw lesmethode veranderd naarmate u meer ervaren werd als docent? Zo ja, hoe?
12) Hoe reageerden uw studenten op deze veranderingen?
13) Hoe merkte u dat uw studenten vooruitgang boekten in het vak?
14) Hoe zag u deze verbetering terug in het productieproces, en in het eindproduct? Wees specifiek.

D) <u>Een basisniveau bereiken</u>

(Denk terug aan ongeveer het eerste moment waarvan u zich kunt herinneren dat u merkte dat u een goed basisniveau had bereikt in uw vak)

1) Wat was er veranderd voor u waardoor u zich op een goed basisniveau voelde ten opzichte van daarvoor?
2) Waaraan merkte u dat u dit basisniveau had bereikt? Denk aan wat u merkte in/aan uw lichaam, uw denken, uw voelen, uw bewegingen, etc.

3) Veranderde uw houding tegenover klei en uw vak? Zo ja, hoe?
4) Hoe merkte u dat u dit basisniveau had bereikt in de verschillende onderdelen van het productieproces van uw vak? Wees specifiek.
5) Hoe merkte u dit op in de eindproducten? Wees specifiek.
6) Hoe herkende de docent dit basisniveau in u als leerling? Wees specifiek.

E) <u>Een gevorderd niveau bereiken</u>

(Hoewel het lastig aan te geven is wanneer een gevorderd niveau is bereikt, wil ik u toch vragen om te reflecteren op een moment of een reeks momenten waarop u merkte dat u naar eigen inzicht veel gevoel en een grote hoeveelheid aan technische en praktische kennis bezat voor het werken met klei.)

1) Wat was er veranderd voor u waardoor u zich op een gevorderd niveau voelde ten opzichte van daarvoor?
2) Waaraan merkte u dat u dit gevorderde niveau had bereikt? Denk aan wat u merkte in/aan uw lichaam, uw denken, uw voelen, uw bewegingen, etc.
3) Veranderde uw houding tegenover klei en uw vak? Zo ja, hoe?
4) Hoe merkte u dat u dit gevorderde niveau had bereikt in de verschillende onderdelen van het productieproces van uw vak? Wees specifiek.
5) Hoe merkte u dit op in de eindproducten? Wees specifiek.
6) Hoe herkende de docent dit gevorderde niveau in u als leerling (indien van toepassing)? Wees specifiek.

F) <u>Slotvragen</u>

1) Hoe vond u het om deze enquête in te vullen?
2) Heeft u nog vragen of opmerkingen naar aanleiding van deze enquête, het onderzoek of andere gerelateerde onderwerpen?

B.2.2 Questionnaire (translated into English)

Survey Master’s thesis Archaeological Science

Lisoula Feenstra

Leiden University

February 2025

Hello! My name is Lisoula Feenstra and I am 25 years old. I am currently writing my thesis for the Master Archaeological Science at Leiden University. For this I am doing research on skills in crafts, specifically ceramic crafts. Ultimately, I hope to adapt an existing model for quantifying metalsmithing skills to a model for ceramists. In this way, archaeologists, who mainly have potsherds at their disposal, can better estimate how skilled a ceramist may have been in the past and in what. This way we can better understand what the past might have looked like.

This is where you come in as the ceramist of today! Your insights into (your) craftsmanship and ceramic skills are essential to meaningfully adapt this model.

The questions are divided into seven categories with questions ranging from two to seventeen in number. These will address personal information, your background as a ceramist, your learning path, any teaching experience, first experiences of your own skills, advanced skills and final questions. All questions are open and all answers are welcome.

Good to know: all answers are anonymous and you can decide not to participate at any time. If you do participate, I would like to include the following personal information in my thesis: current age, gender, and at what age you started learning your craft. If you have any objections to this, questions or comments, or if you decide not to participate after all, you can always reach me at lifeenstra@gmail.com. Withdrawing from the study is possible until the 24th of March. The deadline for filling out this questionnaire is the 28th of February.

Finally, I would like to thank you in advance for your participation in this research! I am very much looking forward to reading your answers and hope that these questions will also lead to interesting reflection for you.

A) Personal information

Your name and email address will be known to the researcher only, will not be published in the thesis and will be discarded after the thesis has been graded with a sufficient grade.

1) What is your name?
2) What is your email address?
3) What is your age?

B) Background as a craftsperson / ceramist

1) At what age did you start learning your craft?
2) Where did you learn your craft?
3) Did you follow any other kind of post high school education before / during / after learning your craft?
4) If yes, which type(s) of education?
5) Did you have previous experience with another craft?
6) If yes, which craft? At what age did you learn this? And where? How good were you at this craft?
7) In what way(s) did you continue with this other craft after your learning trajectory?

C) Learning trajectory as a craftsperson / ceramist

1) What did your learning trajectory look like? Consider what you learned, how many hours per week, and what you worked towards.
2) What was your interaction with the teacher like? Consider how many hours you spent with them, the group size, and how they guided you.
3) How did the teacher teach and give feedback? What methods did they use and what did they encourage?
4) What stood out to you about how the teacher explained things or gave feedback?
5) What did you focus on during explanations and feedback discussions?
6) What did you like about this teaching style and why?
7) What didn't you like about this teaching style and why?
8) What teaching style works best for you and why?
9) What teaching style works least well for you and why?
10) Did the teaching style change as you got more experienced? If so, how?

11) How did you notice your growing experience in the production process? Be specific.
12) Hoe did you notice you growing experience in the final products? Be specific.

D) Teaching trajectory as a craftsperson / ceramist

(Only answer if applicable. The questions are in the past tense, but you can reflect on your current way of teaching if applicable)

1) Who did you teach in your craft?
2) What was your interaction with students like? Consider hours per week, group size, and how you guided them.
3) How did you teach and give feedback? What methods did you use and what did you encourage?
4) What did you prioritize when explaining and giving feedback? Consider your delivery, what you explained, and what you found important.
5) What did you focus on when giving explanations and feedback?
6) What did you like about your teaching method and why?
7) What didn't you like about your teaching method and why?
8) What teaching method works best for you as a teacher and why?
9) What teaching method works least well for you as a teacher and why?
10) How did you assess what teaching method(s) worked for your students?
11) Did your teaching method change as you got more experienced in teaching? If so, how?
12) How did your students respond to these changes?
13) How did you notice your students improving in the craft?
14) How did you see this improvement in the production process, and in the final product? Be specific.

E) Reaching a basic level

(Think back to approximately the first moment you can remember noticing that you had reached a good basic level in your craft)

1) What had changed for you that made you feel at a good basic level compared to before?
2) How did you notice that you had reached this basic level? Consider what you noticed in/about your body, your thinking, your feeling, your movements, etc.
3) Did your attitude towards clay and your craft change? If so, how?

4) How did you notice that you had achieved this basic level in the different parts of the production process of your craft? Be specific.
5) How did you notice this in the final products? Be specific.
6) How did the teacher recognize this basic level in you as a student? Be specific.

F) <u>Reaching an advanced level</u>

(Even though it is hard to tell when an advanced level has been reached, I would like to ask you to reflect on a certain moment or series of moments in which you noticed that you had a lot of feeling and a great deal of technical and practical knowledge for working with clay.)

1) What had changed for you that made you feel at an advanced level compared to before?
2) How did you notice that you had reached this advanced level? Consider what you noticed in/about your body, your thinking, your feeling, your movements, etc.
3) Did your attitude towards clay and your craft change? If so, how?
4) How did you notice that you had achieved this advanced level in the different parts of the production process of your craft? Be specific.
5) How did you notice this in the final products? Be specific.
6) How did the teacher recognize this advanced level in you as a student (if applicable)? Be specific.

G) <u>Final questions</u>

1) How do you look back on filling out this survey?
2) Do you have any questions or comments regarding this survey, the research or other related topics?

C Interviews and demonstrations

C.1 List of interview questions

C.1.1 List of interview questions (original in Dutch)

1) Hoe zie jij (jouw) vaardigheid?
2) Hoe beleef jij het maken van keramiek in het algemeen? Welke zintuigen gebruik je daarbij, en waarvoor?
3) Hoe herken jij vaardigheid in anderen? En een gebrek aan vaardigheid? (Acties en object!)

4) Als je lesgeeft, welke zintuigen verwacht je dan dat je student gaat gebruiken en op welke manier(en)?
5) Hoe is je relatie met klei?
6) Wanneer je klei oppakt en ermee gaat kleien, welke informatie verzamel je dan?

C.1.2 List of interview questions (translated into English)

1) How do you view (your) skill?
2) How do you experience making ceramics overall? Which senses do you use, to perceive what?
3) How do you recognize skill in others? And a lack thereof? (Actions and object!)
4) If you teach, which senses do you expect your student to use and in which way(s)?
5) What is your relationship with clay like?
6) Whenever you pick up clay and start handling it, what type of information do you collect?

C.2 Interview and demonstration transcripts

C.2.1 Interview and demonstration transcripts (original in Dutch)

C.2.1.1 Transcript of interview with P1 (original in Dutch)

<u>Interview met P1, 12-4-2025 (17 min)</u>

Hoe zie jij vaardigheid in het pottenbakken?

Ik ben geen beginner meer, want ik snap opzich al wel de techniek van centreren, optrekken, en verschillende vormen maken, maar ik ben ook zeker geen gevorderde. Ik zou me een beetje in het midden willen scharen.

Je beschrijft nu het niveau van je vaardigheid. Hoe merk je dat je vaardig wordt?

Ik merk dat het me steeds beter lukt om de vorm te maken die ik voor ogen heb. Wat ik dan nog lastig vind, is dat ik bijvoorbeeld een aantal centimeters heb bedacht voor de hoogte en breedte en dat dat dan niet lukt. Maar een bolletje of cilinder lukt; de vormen gaan al redelijk goed.

Hoe verloopt het proces om naar een bepaalde vorm toe te komen?

Ik merk als verschil dat ik echt merk dat ik bij een bepaalde vorm wil komen. Eerst had ik nog niet bedacht welke vorm ik wilde maken. Ik was vooral bezig met da t ik de klei wilde optrekken. Nu heb ik al veel meer een vorm voor ogen en dan begin je daarmee ook anders. Dan maak je andere stappen tussendoor.

Wat voor andere stappen maak je?

Ik ben nu het verschil tussen een komvorm en cilinder aan het leren. Je opent hem dan echt op een andere manier en trekt hem op een andere manier op.

En waar zit het verschil?

In de kom maar een puntje in het midden en vanuit daar ga je opzij en moet je meer aan een bloempotvorm denken. Zo trek je hem ook op. Bij een cilinder staat het recht en ben je ook telkens bezig om de klei terug naar het midden te krijgen om die rechte vorm te behouden. Als je uiteindelijk een kommetje wil hebben, dan moet hij juist naar buiten gaan staan.

En die trek je ook naar buiten?

Je trekt hem op in een schuine lijn naar buiten.

Hoe beleef jij het maken van keramiek in het algemeen?

Super ontspannend. Je bent helemaal met je lichaam bezig. Je moet natuurlijk wel even met de technieken in je hoofd nadenken hoe je je handen moet houden of dit of dat moet, maar op een gegeven moment gaat dat ook meer automatisch. Je merkt dat wanneer je vastloopt, dus fouten maakt, dat je dan wel weer echt even moet nadenken. Hoe komt het nou dat ik dat doe? Voor de rest gaan dingen gewoon heel erg op je lijf en je gevoel. Ik werk zelf heel erg met mijn hoofd, dus ik vind het heel fijn dat ik echt helemaal ontspanning en rust kan vinden.

Merk je dat je in je hoofd ergens mee bezig bent? Of is het echt totaal je lichaam dat iets doet?

Je bent wel enigszins in je hoofd bezig in de zin van bedenken welke vorm je gaat maken. Je moet soms ook echt bepaalde houdingen aannemen met je handen waar je over moet nadenken. Ik denk dat als je gevorderd bent, dat je daar dan niet meer over na hoeft te denken. Heel veel komt dan uit je lichaam.

Welke zintuigen gebruik je?

Je handen. Je voelt hoe droog of nat de klei is, waar bobbeltjes in de klei zitten waar je iets mee moet. Je ogen ook heel erg. Je ziet of de klei naar buiten walkt of niet, of hij recht in het midden staat. Dat zou je eigenlijk ook allemaal moeten voelen, hoor. Ik ken ook mensen die blind zijn die dat allemaal kunnen, maar ik moet het toch wel zien.

Je noemt nu vooral de tastzin en dikte kunnen inschatten, dus de afstand tussen je handen.

Klopt. Je wil dat die wand helemaal gelijk is qua dikte. Als je ergens een dunner stukje hebt, dan wil je dat corrigeren. Anders wordt dat een zwakke plek, dus dat moet je qua dikte kunnen voelen. Soms *heb je het niet goed gewalkt en dan komen er luchtbelletjes in. Dat moet je leren herkennen, anders kan je niet meer verder.*

Hoe herken je vaardigheid in anderen, in hun acties en het object wat ze produceren?

In acties zie ik het in of je de basis goed doet. Lukt het je om het goed te centreren? Dat is de eerste stap. Lukt het je om hem open te trekken en stabiel te laten blijven staan? Wat ik heel erg merk in acties bij mezelf, maar ook bij anderen, is dat des te vaardiger je wordt, des te meer klei je kan optrekken bij de eerste optrekbeweging. Je doet in principe drie optrekbewegingen. De eerste keer dat ik begon, was er nog niet zo veel gebeurd. Nu merk ik dat het me lukt om steeds hoger te komen.

Waar merk je een gebrek aan vaardigheid in? Merk je dan dus dat je erin slaagt om minder omhoog te trekken in je eerste optrekbeweging?

Ja, en dat de wand aan de zijkant niet overal even dik is, dat het uit het lood en niet in het midden zit, dat je eigenlijk verkeerde technieken gebruikt.

Wat voor verkeerde technieken bedoel je?

Hoe je optrekt, welke kant je optrekt - rechts of links, maar ook hoe je handen staan. Hangen die langs je lichaam te wapperen? En hoe je rug staat, hoe je onderrug staat. Je gebruikt vanaf je kont je hele lichaam tot helemaal naar boven.

Hoe kan je zo een verkeerde techniek terugzien in de uiteindelijke pot?

Je ziet niet per sé terug welke verkeerde techniek is gebruikt, maar ik zie wel dat het potje niet klopt. Dan heeft hij een heel dikke onderkant, bijvoorbeeld. Wat ik nu laatst aan het leren ben is dit. Dit potje is van mij (wijst potje aan). De onderkant is heel dik en bovenaan heeft hij een boogje naar buiten. Aan dat soort kleine dingen kan je zien hoe iemand bezig is met zijn ontwerp, bijvoorbeeld met de rand. Die kan je naar binnen zetten, die kan je laten omkrullen of juist recht zetten. Dat je daar nog specifieke dingen mee kan doen is wel iets wat je bij gevorderden ziet. Als je echt helemaal begint, dan zie je dat niet. Dit is bijvoorbeeld een beginnerspotje (laat beginnerspotje zien). Het is geen echte cirkel. Je ziet dat de onderkant niet recht is en dat je en puntje ziet. Je ziet de vingerstroming.

"Vingerstroming"? Dat woord ken ik niet.

Het is een raar woord. Ik heb het zelf bedacht. Met je vinger zou je deze (het puntje in het midden van de bodem aan de binnenkant) naar buiten moeten trekken. Maar je ziet hier een losse vinger zitten, en daar.

Het ziet eruit alsof het hele zaakje gewoon naar beneden is gezakt.

Ja, en het staat ook allemaal niet goed naar buiten. Ik pak er even een andere bij die ik heb gemaakt. Hier zie je die vinger ook weer. Je ziet daar een bobbeltje zitten. En daar een vinger. Dat wil je eigenlijk niet hebben. Je wil het in één keer glad hebben. Je wil geen spiraaltje onderin je pot. En niet dat het daar langs de rand inzakt.

Ik hoor mensen het hebben over een spanningsboog in de pot. Is dat een term die jullie veel gebruiken?

Ik niet... Nog iets anders wat je kan zien aan een potje is of iemand een standring heeft gemaakt of niet. Deze (het beginnerspotje) zal dat waarschijnlijk niet hebben. Je voelt ook dat die heel zwaar is. Dat is eigenlijk nog veel te zwaar. Je ziet het niet per sé aan de buitenkant, maar hier zit eigenlijk nog veel te veel klei in.

Je kan het verkappen als stevigheid.

Voor een vaasje maakt het niet uit, want die staat gewoon op tafel. Maar het is niet fijn als het een theekopje is waar je uit drinkt.

Je geeft natuurlijk geen les, maar als je les zou geven, welke zintuigen verwacht je dan dat je leerlingen gaan gebruiken en hoe?

Voelen vooral. Ik zou ze misschien een keertje blind laten draaien, dus geblinddoekt.

(Ik vertel over het onderzoek van een pottenbakker die zichzelf blindeerde, potten ging draaien, en haar studenten begeleidde bij het pottenbakken terwijl ze zelf geblinddoekt was.)

Je voelt de afstand van de klei ook tussen je vingers. Dat voelde ik in het begin helemaal niet. Je voelt ook de stevigheid van de klei tussen je vingers. Daarmee weet je of er heel veel klei zit of heel weinig en of hij bijna instort.

Wanneer je klei oppakt en ermee bezig gaat, welke informatie verzamel je dan? En gedurende het proces?

Wat dat betreft heb ik het makkelijk. Ik weet dat de klei die Elly neemt moet worden afgebakken op een bepaalde temperatuur. Als ik een eigen atelier zou beginnen, dat zou ik dat zelf moeten weten. En ik zou moeten weten of het glazuur wat ik wil gebruiken, matcht met de temperatuur waarop het glazuur afgebakken kan worden. Porselein is heel moeilijk, omdat het heel zacht is. Je wil ook de uiteindelijke kleur weten (wijst verschillende gebakken en ongebakken potjes aan om te laten zien dat klei van kleur verandert als het gebakken wordt). Je bakt eerst een keer laag, doet er dan glazuur over, en dan bak je hem hoog. Je kan een glazuur gebruiken waardoor je de kleur van de klei eigenlijk helemaal niet meer ziet. De kleur van de klei maakt wel heel erg uit voor hoe de kleur die onder het glazuur zit, eruit komt.

Welke stappen zitten er in het productieproces volgens jou?

Walken, dus het kneden van de klei zodat je er op een bepaalde manier de lucht uit kneedt. Het wegen, want je moet weten hoeveel klei je nodig gaat hebben. Dan moet je hem op de schijf zetten en sealen aan de schijf. Dan ga je met een natte vinger langs de zijkant zodat er geen lucht onder komt. Dan ga je de homp centreren zodat hij mooi in het midden ligt. Dan moet je het bolletje open maken, dus een gat in het midden creëren. Het is dan eerst recht, maar dan is het meer als een driehoekje naar beneden. Die moet je dan open gaan zetten op zo een manier dat de zijkant aan alle kanten ongeveer even dik wordt. Dan heb je een soort van ring met een bodem en dan zorg je dat dit ring overal ongeveer even dik is. Die ring moet je dan gaan optrekken. Daarna moet je hem gaan vormen.

(P1 laat me de geplastificeerde instructies zien voor de stappen, zie C.2.1.1.1 Picture of step-by-step instructions for throwing a narrow bowl shape.)

(Ik leg uit dat we in de archeologie een chaîne opératoire gebruiken om een productieproces te beschrijven. Maar zo een proces is heel vloeiend en wij proberen het in stukjes te hakken, waardoor er ook veel kritiek op is. De geplastificeerde instructies die ik ze zien krijgt nu zijn veel gedetailleerder dan wat spreekt uit de chaîne opératoire die ik ken, en dat niveau van detail heb je wel nodig om te begrijpen waar je naar kijkt wanneer je alleen het eindresultaat ziet.)

Als je heel vroeg in het proces al een fout maakt, dan lukt de rest eigenlijk al niet meer. Het lijkt me ook moeilijk om dit proces straks in stapjes op te gaan delen.

C.2.1.1.1 Picture of step-by-step instructions for throwing a narrow bowl shape

Figuur 54: De stap-voor-stap instructies voor het vormen van een smalle komvorm die P5 in diens atelier heeft liggen ter uitleg.

C.2.1.2 Notes of interviews and demonstration with P2 (original in Dutch)

C.2.1.2.1 Notes of first interview with P2 (original in Dutch)

Eerste interview met P2, 6-3-2025 (45 min)

Hoe zie jij (jouw) vaardigheid?

Het is een automatisme wanneer je iets maakt, waar je niet veel bewust bij nadenkt. Het potje wat je wil maken staat er, of in je hoofd dan. Ik zie het niet voor me, maar ik weet wat ik wil. Het is tweede natuur. Ik weet hoeveel klei ik ongeveer nodig heb. Je doet dit en dat en dan kom je uit waar je wil. Je hoeft niet alle zintuigen te gebruiken om iets te maken. In de studio hebben we een heel goede blinde pottenbakker. Ikzelf kijk soms ook om me heen als ik aan het draaien ben. Je hoeft er niet extreem op gefocust te zijn. Je moet het veel doen en dan zit het vanzelf in je vingers. Volgens mijn docent had ik een heel steile leercurve. Dat kan, want ik had daarvoor 10 jaar lang aardewerk bestudeerd en wist hoe het eruit moet zien. Dat moet je ook leren als pottenbakker: je moet de pot vasthouden en weten hoe dik de wanden zijn. Je moet weten hoeveel klei je nodig heb en wat je nog weg kan halen. Ja, en dat is ook het lastige van skill: sommige dingen liggen je gewoon. Ik kan me opzich de dikte voorstellen. De pot zit in mijn hoofd. Ik weet hoe hij eruit moet zien. Mijn handen hoeven alleen nog maar iets te doen. Het is makkelijker om iets te maken wat je al kent.

Hoe beleef jij het maken van keramiek in het algemeen? Welke zintuigen gebruik je?

Zicht, maar het kan dus ook zonder. Tastzin vooral. Reuk is niet essentieel bij het draaien. Misschien wel bij het bakken in een vuurgestookte oven, maar daar heb ik geen ervaring mee. Je kan ook horen als hij droog is, maar alleen later in het productieproces. Maar meestal klop je niet, maar voel je.

Hoe herken jij vaardigheid in anderen? En een gebrek aan vaardigheid? Zowel in de actie als in het object wat er wordt geproduceerd.

Een gebrek in vaardigheid merk je omdat mensen zelf al beginnen te klagen: "Mijn potje is niet zo mooi als de jouwe." Aesthetica is een lastige hierbij. Je ziet het aan het potje dat het scheef is of onregelmatig. Dan zijn mensen te ongeduldig geweest. Of je ziet het aan klei die teveel luchtbellen heeft; dan hebben ze iets niet goed gedaan met het walken. Op de draaischijf prik je die dan door met een naaldje en dan vul je het weer op door verder te gaan. Als je weer gaat draaien, duw je vanzelf weer klei in het gaatje. Je ziet het in de afwerking of iemand wel of geen versiering heeft aangebracht, wel of geen glazuur. Regelmatigheid in de versiering telt alleen als dat een bewuste keuze was om het regelmatig te doen.

Als je lesgeeft, welke zintuigen verwacht je dan dat je student gaat gebruiken en op welke manier(en)?

Ik heb wel eens wat eenmalige workshops gegeven. Die waren gericht op het reproduceren van een vorm of een techniek. Ja, maar voor zo een eenmalige curcus wil je mensen met een goed gevoel naar huis sturen. Dus als hun klei is uitgedroogd, dan geef je ze nieuwe. Met industriële klei weet je precies wat je krijgt. Klei uit de natuur is veel zachter en minder stevig door bijvoorbeeld algen. Je weet niet wat erin zit en dus ook niet hoe het bakt.

Hoe is je relatie met klei?

De meeste mensen beginnen omdat ze het leuk vinden. Ik heb 10 jaar lang keramiek bestudeerd. Toen wilde ik het ook zelf gaan doen. Ik ben vanuit de wetenschappelijke hoek ingestapt en ben vooral Romeins spul gaan namaken.

Wanneer je klei oppakt en ermee gaat kleien, welke informatie verzamel je dan?

- Vochtigheid (merk je tijdens het walken al)
- Gewicht t.o.v. wat je wil maken (oefening baart kunst met beter inschatten)
- Kleur beetje, maar zegt weinig over eindproduct
- Inclusies voel je heel slecht bij walken (je duwt de zandkorrels erin), maar dat merk je wel goed bij het draaien

C.2.1.2.2 Notes of second interview and demonstration with P2 (original in Dutch)

<u>Tweede interview + demonstratie met P2, 13-3-2025 (45 min)</u>

De chaîne opératoire en mogelijke onderwerpen voor perceptive categories:

Verzamel onbewerkte materialen

- Onbewerkte klei
    - Zandkorrels duw je in de klei, dus die voel je niet zo als je klei oppakt. Wel als je gaan draaien
    - Voel plakkerigheid: meer silt is meer plak
    - Ringetje maken: barst hij? -> <u>**elasticiteit**</u>, heeft te maken met **inclusies**
- Verzamel magering -> ligt aan het doel. Kookpot liever wel grof gemagerd, tafelwaar niet. In het verleden: beschikbaarheid + cultureel bepaald
- Verzamel brandstof -> sommige houtsoorten zijn meer en minder geschikt, branden op een ander tempo (is onderzoek over). Niet relevant voor moderne stookovens

Transformatie naar pottenbakkersklei (deels niet van toepassing bij industriële klei)

- Walk klei
    - Voel elasticiteit (wat gebeurt maar je merkt het niet direct: kleiplaatjes gaan dezelfde richting op staan)
    - Wat je merkt: **plasticiteit**
        - Water wat eruit verdwijnt. Eerst blijft het op tafel liggen, dan plakt het steeds meer aan elkaar
        - Te veel walken: te droog (dan meer water, wordt dan minder goed vormbaar) of te veel lucht (luchtbellen die vormen, als die niet hersteld worden, dan merk je dat wel tijdens het bakken)
        - Te weinig ga je merken: microscopisch kan je zien dat de plaatjes dezelfde kant op gaan liggen. Dus dan minder bij minder walken. Maar lastig om achteraf nog te zien
- Overwegingen voor waar op te walken: gipsplaat neemt minder vocht op en het kleeft minder dan aan hout. Sla de klei op elkaar op de plaat om luchtbellen te voorkomen. Slight dragging om de klei te walken, niet alleen rollen. Water toevoegen: plakje afsnijden met een snij-ijzer, gaatjes in de plak drukken met duimen, water tussen elk plakje druppelen. Soort
- PERCEPTIVE CATEGORIES:
    - Vocht: "te weinig", genoeg, "te veel"
    - Plasticiteit: stroef
- (Add temper
    - Feel/SEE grain size inside of clay (Meestal niet voelen, maar kijken)
    - Feel amount of temper inside of clay)
- Sealen van de onderkant – vinger langs de onderkant. Vocht afdeppen onder de kleihomp, anders gaat hij aan de wandel
- Handen er tegenaan drukken van de buitenkant
- Naar beneden drukken met de vlakke hand
- Doel: klei centreren op de schijf en compacte, ronde vorm maken
- Cupping of the hands om de vorm smaller te maken
- Klei openen: duim in het midden erin drukken en de buitenkant pinchen. Handig om te weten wat voor potje je maakt om te weten hoe diep je moet gaan. Klei overhouden aan de onderkant (opsparen voor voet). Je kan maximaal 3 keer optrekken, 4 niet wenselijk (te **instabiel**). Na elke keer optrekken, weer naar binnen duwen met de vlakke hand aan de buitenkant. Want klei wil uitwijken naar buiten door de middelpuntvliedende kracht. Ronden vanaf de buitenkant na elke keer optrekken stabiliseert de vorm

- Je voegt ook telkens water toe na elke keer optrekken. Als je het te vaak doet, dan wordt het te nat en te dun en creeër je zwakke punten. Handen proberen elkaar continu te raken voor meer controle en stabiliteit in de vorm
- Te snel optrekken of draaien: onregelmatige verdeling van klei en onregelmatige vorm Spanningsboog kan weg zijn ("die ronding van binnen")
    - Spanningsboog is weg: dan zakt de klei in elkaar. Heeft te maken met zwaartekracht en verdeling van de krachten (denk aan vectorpijltjes). Groeven maken verslapt de boogvorm.
- Met een naaldje (priem) een randje klei er afhalen
- Twee handen: van de binnenkant uit drukken tegen de buitenste hand aan
- Met een lomer kan je klei aan de buitenkant eraf schrapen en maak je de klei iets droger
- Groef maken met een houten spateltje
- Bij draaien: extra steunklei weghalen pas als hij meer gedroogd is en stabieler is
- Met snij-ijzer pot lossnijden, op een stuk krant zetten
- Pot is nu droog genoeg om hoekige vormen erin te vormen. Dan wil je niet meer draaien -> zo min mogelijk uberhaupt om de spanningsboog niet te verslappen
- Als de klei te droog is, dan gaat de klei aan je vingers plakken. Bij te natte klei: verlies van stevigheid, instabiel potje. Te plastisch

------kleien draaien van slechts het bovenste deel van de klei op de draaischijf: "van de mast draaien"--------

- Tweede makkelijkere optie: klei was of te snel gedraaid, of ongecentreerd. Wanden net niet
- helemaal gelijke dikte door niet helemaal perfect gecentreerd
- Je kan al beginnen met de decoratie tijdens het draaien
- Spanningsboog: je kan hem laten verslappen, dan kan hij over zichzelf heen vouwen
- Weghalen met snij-ijzer: kan in rechte beweging, kan ook zigzaggend. Dan krijg je ronde boogjes
- Afdraaien in leerharde klei (demonstratie met nog te natte klei, dus vastzetten op de draaischijf met stukjes klei. Met een gaatjestool kan je de leerharde klei eraf halen in wormpjes en je kan er dus ook een standring van maken. Met een lomer kan je weer dingen gladstrijken en trek je de inclusies mee, met een sponsje kan je dat weer rechttrekken

- Sommige stappen zijn heel helder, andere zijn veel meer fluïde en kunnen op verschillende momenten in het proces gedaan worden

- Oor trekken: nat genoeg, moet goed glijden. Te nat: plakt niet goed aan de pot, vorm verslapt. Te droog: glijdt niet lekker en scheurt misschien af. Oor trekken is stevigst. Coil is niet stevig, persen kan, is in sommige periodes wel gedaan. Stand van vingers, wil een goede vorm maken
- Met nat mes hendel afsnijden. Hendel en potwandje bevochtigen, hendel afronden. Oor tegen pot aandrukken, oor met duim aansmeren/opwrijven tegen potwand. Onderkant ook tegen pot aan smeren + in 1 beweging afsmeren en overig stukje klei met de duim afknijpen + beetje zwaluwstaartje voor extra stevigheid

C.2.1.3 Transcript of interview with P3 and P4 (original in Dutch)

<u>Interview met P3 en P4, 12-4-2025 (36 min)</u>

Hoe zien jullie jullie vaardigheid in het pottenbakken? En vaardigheid in het algemeen?

P4: Dus op welk niveau je zit?

Ja ook, maar ook abstracter nog. Is vaardigheid iets wat los van je staat, zit het in je, is het iets van komt, is het iets wat van jou is.

P3: Bij mij zit het in me. Ik heb altijd met mijn handen gewerkt. Het is een vorm van met mijn handen werken. Het is een stuk van mij. Ik zie het ook als een talent dat je met je handen dingen kan maken en dat had ik in mijn werk ook. Ik was oogarts en opereerde veel. Het is dus in de lijn daarvan dat ik heel makkelijk met mijn handen dingen doe. Het is een absolute verlenging van mezelf.

Het komt er gewoon op een andere manier uit.

P3: Ja. Ik kan bijvoorbeeld niet tekenen, maar ik kan wel heel makkelijk maken of doen wat ik wil doen met die handen, zonder dat ik erover na hoef te denken.

P4: Ik maakte onlangs een peer, een prachtige peer. Mijn zus maakt een peer, en dan... vraag ik me af hoe er bij mij wél echt een peer uitkomt. Blijkbaar kan ik dat.

P3: Kan jij ook tekenen?

P4: Niet heel erg.

P3: Ik heb het nog niet echt geprobeerd met echt bestaande vormen, dus ik vind verhoudingen ook lastig. Maar als ik bezig ben, gaat het vanzelf.

P4: Meer dat intuïtieve. Ik heb nu net Japans leren schilderen. Tenminste, twee uurtjes, sumi-e. Maar dat met die rust, er zit een soort schwung in. Je zet hem zo neer en haalt hem zo weg. Dat is meer een techniek. Dat is niet van: maak een Rembrandtschilderij. Dat kan ik niet. Maar die techniek leren... Ik kon het dus.

P3: Bij Caroline heb je dat gedaan?

P4: Ja.

P3: Ja, dat heb ik vorig jaar gedaan. Het was heel moeilijk, maar nu zag ik die rol en dacht ik: oh, ze zijn heel leuk!

P4: Dat is echt de techniek dan, hè?

P3: Ja.

P4: Ja. Maar als je het echt over vaardigheid hebt, zoals bij artsen... Of gitaarspelen, of autorijden. Dat is dan echt die hand-oogcoördinatie. Het is heel gaaf om dat te ontwikkelen.

P3: Het is ook echt een talent, maar je moet het ontwikkelen door de techniek. Het grappige ook is dat muziek een ander stukje van je brein is, voor mijn gevoel. Ik kan daar niets mee.

P4: Dat is net als hier. Als ik een slechte dag heb, dan weet ik: mijn hersenen hebben wel iets geleerd vandaag. Er is niets uit mijn handen gekomen, maar mijn hersenen. Mijn handen weten nu waar de grenzen liggen en wat ik niet meer moet doen. Dat ontwikkel je heel erg. En je moet doendoendoen. Over vaardigheid gesproken: op mijn negentigste kan ik nog steeds geen goede schaal maken denk ik. De ene dag wel, de andere dag niet. Het is bizar. Je blijft maar leren. Ik ben nu met porselein bezig en ik ben zo gefrustreerd. Ik ben net weer een beginner.

Je bent al best een tijd bezig in het vak. Het zag er echt best goed uit.

P4: Ik had totaal nul controle vandaag.

P3: Maar als je die dingen ziet die jullie vandaag gemaakt hebben...

P4: Jaa, maar die hebben we met Jose gemaakt. Het is echt alsof je weer opnieuw begint. Het is nieuwe klei. Wat dat betreft qua vaardigheid: hartstikke leuk als je met die klei kan werken, maar met porselein begin je weer opnieuw. Dan is er weer een nieuwe techniek. Ik denk dat we op ons negentigste nog niet uitgeleerd zijn.

Hoe beleef je het maken van keramiek in het algemeen? En welke zintuigen gebruik je daarbij?

P4: Voelen.

P3: Voelen, maar ook kijken.

P4: Ja, dat is meer als je iets namaakt.

P3: Ja, maar ook zo een vorm. Je voelt het, maar je controleert het wel met je ogen. En welke vorm je naartoe wilde. Dat controleer je ook veel met je ogen.

P3: Dat is er ook één. Je moet van tevoren bedenken wat je wil maken, anders gaat de klei een kant met je op die je niet wil.

P3: Primair is het voelen.

P4: Je zou het blind kunnen doen.

Wat voel je dan?

P3: Dat wat je beoogt om te voelen. Je voelt dat je die klei meeneemt. Je voelt de vorm, de textuur.

P4: Ik denk aan dat zachte, dat [maakt slush- en slurpgeluiden]. Dat vloeiende, dat glooiende van die klei. Als je dat op een gegeven moment kan... En dat doet hij [Jose] heel erg. Die gaat er echt met zijn vingers in. En dan komt dat omhoog, en dan een vuist erin, en dan komt het omhoog, en dan zit je al daar. Het is een soort masseren van de klei. Dat gaat soms heel goed, soms niet.

P3: Dat is niet vanaf moment één.

P4: Nee. Maar het is een soort golfbeweging.

P3: Ja, variërend van complete extase naar complete frustratie.

P4: Ik denk dat je dat ook heel erg voelt als het goed gaat. Dat vloeit dat van hup en hup. Dan ben je eigenlijk al binnen vier minuten klaar. Dan moet het er ook staan. Als je maar bezig blijft en het wil maar niet... met je ene hand dit, en je elleboog, en...

Ik hoorde net ook al wat dingen over dat je hele lichaam meedoet. Is het echt zo dat je helemaal meegaat in de massagebeweging?

P3: Als het goed gaat wel. Als het niet goed gaat, verstram je.

P4: Ik ben wel eens van m'n kruk afgepleurd. Ik ging afdraaien zo, en toen [doet voor hoe ze verstijfde in haar beweging en valt bijna opzij].

P3: Het komt soms ook voor dat je geconcentreerd rechtop gaat staan [vanachter de draaischijf vandaan] om maar niets om te stoten.

P4: Het pottenbakkersloopje.

Hoe herken je vaardigheid en non-vaardigheid in anderen? In hun acties en in wat ze produceren.

P3: Hoe ze bezig zijn. Er zit daar [in de studio] een meisje. Haar vader en grootvader hebben hier ook les. Ze komt hier nu al een tijdje en heeft nog niet zo heel veel ervaring met draaien. Maar je ziet gewoon dat ze talent heeft.

P4: Ik denk dat het de rust is die erin zit en de evenwichtigheid van opbouwen. Je hebt alle basis nodig om verder te komen. Je moet de klei goed kunnen walken om mooie klei te hebben om mee te *draaien. Heb je dat niet, dan wordt het al gauw niets. Je moet kunnen centreren. Kan je dat niet, dan wordt het al gauw niets. Je ziet of iemand daar de moeite en de tijd voor neemt. Je moet massief opbouwen, zodat het goed staat, en dan pas die laatste handeling doen. Dat zijn de stappen, hoe je ze maakt. Als je die beginstappen niet goed doet, en je bent dus nog niet vaardig, dan zie je dat bij stap twee en drie en vier helemaal. Dan is het gewoon geen evenwichtige pot.*

P3: Dat is een verschil met iemand die heel creatief is en hele mooie dingen maakt. Als je denkt aan de archeologie, dan zie je soms echt fantastische dingen. Als je dan kijkt naar de kwaliteit van hoe het gedraaid en gebruikt is, hoeft dat helemaal niet heel goed te zijn. Maar het is gewoon gemaakt door een heel fantasierijk mens. Maar je ziet ook hoe vaardig iemand is. Als je kijkt naar de Chinezen en Japanners, dan zie je dat zij urenurenuren hebben gemaakt en daar zit gewoon heel veel vaardigheid. Als je maar lang genoeg traint...

P4: Dat zie je ook aan een José Mariscal. Die heeft bijvoorbeeld aan de binnenkant nul draaiing. Dus die heeft de binnenkant helemaal glad. Er zit geen vinger in. Het is één mooie, gladde, dunne wand. Bizar.

P3: Die was drie toen hij begon.

P4: Daar mogen we ons niet mee vergelijken.

P3: Je ziet het in hoe iemand bezig is en in de objecten.

P4: En in de subtiliteit van de vorm. Ik kan dezelfde vorm maken als Jose Mariscal, ongeveer, maar hij heeft dan een heel elegante, mooie vaas en ik heb dan echt compleet iets anders. Een heel lompe pot. Mijn onderkant is misschien even breed, de bovenkant is even breed, hij is misschien even lang, maar het is een compleet andere kwaliteit pot. En dat merk je heel vaak. Dan denk je: oh, mooi! En dan: oh, okee, zo kan het ook.

De volgende vraag gaat over lesgeven, hebben jullie daar ervaring mee?

P4: Ik geef les.

Okee. De vraag luidt: wanneer je lesgeeft, van welke zintuigen verwacht je dat je leerling die gaat gebruiken en op welke manier?

P4: Dat is heel grappig. Ik geef heel weinig pottenbakles, omdat ik het niet leuk vind om les te geven. Ik ben lang niet zo geduldig als Elly. Ik wil dat ze luisteren en doen wat ik zeg, maar dat doen ze niet. Je merkt het al na een halfuur. Dan zitten ze helemaal in die pot. Dan zeg ik: je moet niet in die pot gaan zitten, hier is de wereld. Ze moeten rustig ademhalen, schouders moeten los, je moet ontspannen zijn. Ik ben alleen maar handen weg aan het trekken en mensen aan het vertellen dat ze moeten ontspannen. Soms ontstaat er error bij mensen. Je bent er zoveel vaardigheden in aan het *stampen. Dat vind ik de eerste les heel leuk. Dat is ook de les die ik geef. Maar in les vijf vind ik toch wel dat je ernstig naar me moet luisteren. Dan moet je begrijpen dat als je niet doet wat ik zeg, dat er dan geen potje uitkomt.*

P3: Dan zijn de oren eigenlijk het belangrijkst. Het gehoor.

P4: Haha, ja. Luisteren is het belangrijkste. En concentratie.

P3: Niets zo frustrerend als dat iemand niet luistert.

P4: Elly zegt het ook: je kan het twintig keer herhalen. Maar pas als je er klaar voor bent, dan neem je het in je op. Dat geduld heb ik dus blijkbaar niet. [...] Ik vind mezelf helemaal niet streng, maarja. Ik geef dus meer boetseerles en dan ik alles leuk en mooi. Je bent leuke dingen aan het maken en het is veel creatiever. Echt een heel andere tak van sport. Voor lesgeven in draaien moet je echt een heel geduldige persoon zijn.

Iets anders waarvan ik ook denk dat het belangrijk is, maar wat nog niemand heeft genoemd, is de vochtigheid van de klei. Hoe soepel en hoe hard de klei is, en of hij warm is. Verwachten jullie dat je leerling dat zelf oppakt of stimuleren jullie dat?

P4: Dat ligt echt aan het leerstadium. Je kan twintig keer tegen iemand zeggen dat ze moeten voelen hoe nat de klei is, maar soms hebben ze geen flauw idee. Op een gegeven moment maak je die connectie en snap je waarom je docent dat de hele tijd tegen je zegt. Zo werkt het heel erg. Dat moet je gaan voelen. Wat was de vraag ook alweer?

Wanneer je lesgeeft, van welke zintuigen verwacht je dat je leerling die gaat gebruiken en op welke manier?

P3: Hun gehoor omdat ze willen leren en natuurlijk hun tastzin en hun zicht. Reuk heb je niet nodig en smaak ook niet.

P4: [fluisterend] En talent. Mag ik dat zeggen? Sommige mensen willen heel graag, maar dat gaat hem gewoon niet worden. Sorry. Toch? [op normaal volume] Dat is ook niet leuk lesgeven.

Heb je dat weleens gehad?

P4: Ja, veel.

P3: Nu geef ik les aan vriendinnen en aan mensen die het even leuk vinden om te draaien. Ik vind het leuk om het even te doen. Het zijn heel verrassende mensen die echt luisteren. Die maken dan prachtige dingen. En houding.

P4: Dat is misschien wel een goede. Ik wil nooit met kinderen werken. Ze zijn weleens langsgekomen. Ik kreeg het pas door toen een vriendin van me langskwam. Ik was dingen aan het uitleggen en ze zat *echt zo [ze doet voor hoe haar vriendin haar met grote, oplettende ogen aankeek]. Ik dacht: ik weet dat we elkaar goed kennen, maar dit vind ik wel erg ongemakkelijk. En toen dacht ik opeens: verrek. Zij is ook heel creatief. Kinderen doen dat ook. Die luisteren. En dan: zo? Ja, zo. Volwassenen zitten van: oh, oh, oh, ik weet echt niet meer wat je zei.*

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Dat begrijp ik. Wat is jullie relatie met klei?

P4: Ik kan niet zonder.

P3: Ja, ik ook.

P4: Ik heb er mijn werk van gemaakt. Ik heb mijn baan opgezegd en ben gaan bedenken wat ik wilde gaan doen. Ik dacht: als ik elke ochtend wakker kon worden om de hele dag met klei te spelen, hoe fantastisch zou dat zijn? Dat heb ik gedaan.

P3: Bij mij eigenlijk ook. Ik heb een heel fijn vak gehad, maar ik heb altijd gezocht naar iets... Ik heb hout bewerkt, geprobeerd te tekenen, met stof gewerkt. Klei is eigenlijk gewoon het fijnste materiaal. Als je kleding maakt, is het proces hetzelfde. Iemand vertelde mij dat laatst. Dan ben je heel erg lekker aan het breien, en dan is het klaar, en dan denk je: dat ga ik echt nooit aandoen. Bij pottenbakken is dat anders. Als het niet is wat je fijn vindt, dan sla je het plat, ga je walken en kan je opnieuw met evenveel plezier. Maar heel vaak ben ik er heel blij mee.

P4: Ik heb ook weleens dat ik er even helemaal klaar mee ben. Dan ga ik wat anders doen en kom ik alweer gauw op Pinterest en zie ik allemaal dingen die ik wil maken. Voor je het weet, ben je weer bezig.

P3: Ja.

Jullie draaien thuis ook?

P4: Het is mijn werk. Maar daardoor merk ik wel dat ik geen zin heb om lang te blijven hangen om voor mezelf nog wat te maken.

P3: Ik doe het thuis.

P4: We gaan wel iets in de tuin neerzetten.

P3: Ik doe het ook in de tuin.

---[Minder relevant gespreksonderwerp tussendoor.]---

P4: Ik zit nu bij een kunstgenootschap en dat zijn vooral schilders. Er zijn dan exposities en zij hebben schilderijen hangen voor 300, 400, 4.000 euro. Dan sta ik daar met iets best wel moois, creatiefs voor 90 euro en dat vinden ze te duur. Ook zo een grote pot, weet je wel. Die kan je nu bij de Albert Heijn kopen voor 50 euro. Maar het kost wat jaren voordat je dat kan. Er zit ook heel wat geld in zo een pot. Maar mensen zien het niet. Je moet nog stom commercieel gaan denken ook wat dat betreft. Wat ga ik maken? Je vaardigheden ziet bijna niemand, behalve iemand die ook keramiek maakt. Dat zie je ook met de stookvormen. Dat zal er met de archeologie ook wel bijkomen.

Bedoel je gereduceerd en geoxideerd?

P4: Ja, maar ook raku-stoken, Japanse stook, bijvoorbeeld.

---[Minder relevant gespreksonderwerp tussendoor. Ik vertel over mijn scriptieonderwerp; het beroep van de metaalsmid in de Europese Bronstijd is zeer waarschijnlijk structureel overgewaardeerd in de archeologie. Mogelijk vindt het omgekeerde - structurele onderwaardering - nu ook plaats onder archeologen en misschien ook in samenlevingen in het verleden wat betreft het pottenbakken, ook al kan ik dit (nog) niet met zekerheid hardmaken en gaat mijn onderzoek hier ook niet over.]---

P4: Net als nu eigenlijk. Het grappige is dat als je je potten verkoopt, daar 21% BTW op zit. Voor kunst zit er 9% op. Ik heb dus een stukje geschreven daarover. Het eindigt met de vraag of de ambtenaar beslist of wat ik maak kunst of gebruiksgoed is. Ik ben dus dingen op de draaischijf gaan maken die je niet kan gebruiken. Dan kan het geen gebruiksgoed heten. Als een soort statement. We zijn echt dat kindje wat ertussen valt. Je kan je voorstellen dat het spul van Blokker massaproductie is. Tuurlijk, dat is gebruikswaar en dat is 21%. Maar dat is wat anders dan wat wij doen. Wat is het verschil? Dat maakt het zo frustrerend. Ook als je op een markt staat: heeft u dit o ok in het zwart? Ga dan naar Blokker ofzo. Maar grappig dat dat toen ook al een beetje een ondergeschoven kindje was.

Dat is een aanname. Ik heb er nog weinig over gevonden in artikelen. Het is wel het materiaal wat het meest voorkomt in archeologische opgravingen en het krijgt niet altijd de gedetailleerde aandacht die het misschien verdient. Daar zitten vaak ook heel praktische overwegingen achter.

P4: Ik zit even na te denken. De bakmethodes zijn ook een wezenlijk onderdeel van de keramiek. Dat is ook een wezenlijk verschil ten opzichte van Japanse of Chinese methoden. Een Afrikaans potje is ook weer heel anders.

C.2.1.4 Transcripts of interviews and demonstration with P5 (original in Dutch)

C.2.1.4.1 Transcript of first interview and demonstration with P5 (original in Dutch)

<u>Eerste interview met P5, 12-4-2025 (48 min)</u>

Hoe zie jij vaardigheid, of jouw vaardigheid?

In wat voor context?

Vooral in hoe je het beleeft, mentaal en fysiek.

Die verbinding.

Ja.

Vaardigheid is bij pottenbakken heel erg doendoendoen, echt vlieguren maken. Uiteindelijk verinnerlijk je dan bepaalde bewegingen. Dan krijg je ook dat spiergeheugen. En bepaalde gevoeligheid op bepaalde plekken die je normaal gesproken niet hebt. Bijvoorbeeld mijn vingertoppen. Het maakt niet uit wat ik doe, ik raak altijd. Ik hoef niet te kijken. P2 heeft dat ook; hij hoef te niet kijken. Hij weet hoeveel afstand er tussen zijn vingers zit. Dat zijn vaardigheden die je nodig hebt voor pottenbakken. Dat is denk ik wat ik bedoel als jij mij die vraag stelt.

Hoe is het om iets te draaien? Waar sta je bij stil, waar sta je niet bij stil?

Als ik iets wil maken, dan wil ik er een bepaalde snelheid in hebben. Dat is A) omdat ik het gewoon prettig vind om op die manier te werken, want ander duurt het eindeloos. En B) de klei vraagt dat ik door moet werken. Als ik te lang werk, dan zakt hij in, want dan wordt het te nat. Dat zijn afwegingen. En hoe voelt het dan om te draaien? ...het voelt prettig aan je handen. Het voelt heel aards. Je wordt er naartoe getrokken. Ik moet mijn aandacht bij de klei houden, anders gaat het gewoon niet.

Aan welke delen besteed je meer aandacht en aan welke minder?

Centreren is het allerbelangrijkste. Dat gaat heel automatisch, maar daar moet wel echt aandacht aan besteed worden. Het is niet meer heel bewust, maar het moet goed zijn. En of de vorm lijkt op *datgene wat ik voor ogen heb. Dat maakt ook dat je af en toe nog even kijkt. Dat zijn met name de stukken waar ik op let. En de dikte, maar dat is bijna een automatisme. Niet te dik, niet te dun.*

Je bent eigenlijk continu bezig met het eindresultaat, en misschien minder met hoe je er komt? Zeg ik dat goed?

Ja, niet meer. Voor mijn cursisten heb ik allemaal van die stappen. Die hangen hierboven. Dat zijn de stappen die ze in grote lijnen moeten maken om de basisvorm te maken. Dat zijn de vormen die ik eigenlijk ook nog steeds allemaal doe, alleen zie je ze bij mij niet meer. Bij mij gaat het ene over in het andere en dan is het er.

Dat vloeiende maakt het voor ons als onderzoekers lastig om in stukjes te hakken, maar het is wel waar je dan ook de vaart in kan vinden.

Dat maakt de vaart. De stappen zijn bijvoorbeeld: je trekt drie keer op. Of hier stap drie en vier, die doe ik in één stap. En omdat ik stap vier voldoende klei naar binnen haal, hoef ik stap vijf niet te zetten. En het optrekken hoef ik vaak maar twee keer te doen. Tegen cursisten zeg ik dat je dat maximaal drie keer mag doen. Bij mij stap zeven de tweede of derde optrek. In mijn laatste optrek maak ik stap zeven al. Heel veel dingen heb je al... het staat al.

Ik heb het bij P2 ook deels gecombineerd gezien, volgens mij.

Ja.

Hij zei ook dat hij het snel oppakte.

Hij pakt het heel snel op inderdaad. Eind les één was bij les drie. Volgens mij ligt dat er echt aan dat hij die vingergevoeligheid al heeft, doordat hij dat al vaker met klei gevoeld heeft. Hij weet al hoeveel afstand er tussen zijn vingers zit. Dat is denk ik één van de meest essentiële dingen om goed te kunnen draaien. Het weten waar de ene hand zit ten opzichte van de andere hand en hoeveel afstand daartussen zit.

In de archeologie kijken ze ook vaak naar wall thickness om skill te bepalen. Het wordt daar ook belangrijk gevonden om skill mee te bepalen. Welke zintuigen gebruik je het meest? Is dat vooral die vingergevoeligheid of speelt er meer mee?

Het grootste deel is inderdaad die vingergevoeligheid. En kijken een beetje. Maar heel veel kan je niet zien. Mijn cursisten zeggen weleens dat ze niet kunnen zien wat hun handen doen. Dan zeg ik dat ze ook helemaal niet hoeven te kijken. Je moet voelen. Ik denk dat dat het echt is.

(Ik vertel over een practitioner-researcher die geblinddoekt pottenbakken doceert.)

Hoe herken je vaardigheid in anderen, en een gebrek aan vaardigheid? Het is een gesplitste vraag; hoe zie je deze beide dingen in acties en in het eindproduct?

Het object is het makkelijkste. Negen van de tien keer kijk je naar het verschil in bovenin en onderin. Dat is heel belangrijk. Als hij gelijkmatig is, dan ben je al een stuk verder. En als de vorm klopt, ook weer zoiets vaags. Je hebt een bepaalde gulden snede; kun je die maken?

De gulden snede is per object afhankelijk?

Ja. Bij een kom is het redelijk makkelijk om te bedenken. Bij een kom is de basis een derde van de vorm. Als je begint, is de hoogte ongeveer even groot als de breedte. Dat is ongeveer de lijn. Bij een cilinder- of een vaasvorm wil je altijd een bepaalde hoogte. Die deel je dan ongeveer doormidden en net daarboven moet het breedste punt zitten. De bovenkant is net iets breder dan de basis en de rand is net iets breder dan de basis, niet smaller. Soms is dit anders, zoals bij die potten voor Openluchtmuseum Arnhem. Die heb ik bewust niet allemaal volgens een schema gedraaid. Maar bij die rechter kan bijvoorbeeld zie je dat die een beetje plomp is aan de onderkant. Dat komt omdat de onderkant breder is dan het smalste stuk. De bovendiameter is wel gelijk met de onderdiameter. Als je de bolling verdeelt, dan is het breedste deel van de bolling nagenoeg op het midden van de hele ronding. Dat maakt dat hij plomp is.

En bij die andere zit de bolling juist verder omhoog.

Ja. Hij is al vrij breed ten opzichte van de hoogte, maar je ziet dat hij eleganter oogt dan de kan die daar staat. Bij die linker kan zie je het helemaal, want daar zit die bolling lager. Hij is wat meer gedrongen. Dit zijn dan inderdaad de technische vaardigheden. Waaraan ik zie of iemand tijdens het proces vaardig is of niet, ligt heel erg in de houding. Hoe zit je, wat doe je op welk moment, hoe is de stand van je handen. Ik zeg altijd: je draait niet hiermee [leunt voorover, steunt met ellebogen op bovenbenen en beweegt de aangeduide onderarmen]. Je draait hiermee [duidt met gespreide handen het de gehele torso en romp aan]. Meestal als mensen beginnen, dan hebben ze heel veel spanning in hun armen. Maar dan blokkeer je je beweging en druk je door je potje heen. Dat zie je onderin dan altijd als te veel naar binnen gedrukt. Als je je core aanspant en je beweging vanuit je bekken maakt, zie je dat meteen in hoe je potje omhoog komt. Dat is ook logisch, want als je zo zit [voorovergeleund, ellebogen op bovenbenen], dan kan je niet verder met je handen. Dat gaat niet. Hier [rechtop zittend] heb je ruimte met je handen. Het enige waar ik op let als het hier niet goed gaat is dat je je buik aanspant en dat je goed rechtop zit, achter je zitknobbels. Ik blijf het roepen, iedere keer weer. Ze weten het ook allemaal wel.

En ze merken het natuurlijk heel snel als ze er doorheen drukken, want dat moeten ze opnieuw beginnen. Zijn er ook potjes waarbij je achteraf nog ziet dat er geen volledig vrije beweging is?

Onder dunner, boven dikker. Spelen met je draaisnelheid is ook zo een dingetje. Als dat niet goed gaat, dan zie je dat die scheef staat. Of je maakt een spiraal in je pot. Dan is je draaisnelheid te laag bij het optrekken en dan zie je dat hij niet een hele ronde op dezelfde hoogte blijft. Als gevolg daarvan zie je die pot scheef gaan en vaak zie je aan de binnenkant zelfs ook echt een spiraal lopen. Daar kan je het achteraf ook aan zien.

Ook als je het achteraf weer wegpoetst met een sponsje?

Dit valt niet weg te poetsen voor iemand die het herkent. Ik denk dat je het kan herkennen. Dat het bovenin heel dun is en onderin heel dik, dat kan je bijna niet weghalen, want dan ben je je vorm kwijt. En dat je bolling niet recht staat, dus dat hij aan de ene kant lager zit dan aan de andere kant. Dat is denk ik ook bijna standaard te zien en is ook niet te herstellen. Voor mij is dat zelfs heel erg lastig om te herstellen. Dan begin ik dus opnieuw als dat gebeurt. Bij cursisten probeer ik dat dan nog wel te herstellen en kan ik het er redelijk uithalen als nodig is, maar echt herstellen is bijna geen optie.

Ik kijk vaak filmpjes op Snapchat van een bepaald kanaal waarin volledige industriële of ambachtelijke productieprocessen worden gevolgd. Vrijwel alle ambachtslieden, ongeacht met welk materiaal ze werken, zeggen dat als er iets misgaat in een stap, je eigenlijk gewoon weer opnieuw moet beginnen. Ze denken ook wel eens in stukjes van het hele proces, maar ik denk dat je al keramist al heel snel het hele proces al moet overzien, omdat de vorm heel snel al staat. Je kan het niet ophakken in stukjes.

Nee, moeilijk. Het kan, maar heel moeilijk, bijna niet te doen. Het is namelijk een heel snel proces. Dat wat je daar hebt [mijn 'ingewikkeldere' voorbeeld] is binnen vijf minuten klaar.

Hoe is je relatie met klei?

Ik zeg altijd: klei is net als kinderen. Het houdt je 's nachts wakker, je moet er 's nachts je bed voor uit, kan niet tegen tocht, moet op het juiste moment op de juiste manier behandeld worden en anders luistert het niet... Zo is mijn relatie met klei, om de zweverigheid er een beetje in te houden. Ik vind het een heel fijn materiaal. Ik vind het heel aardend. Ik vind het gewoon een heel mooi materiaal, wat ook blijft bestaan. Het vergaat niet, tenzij het kapot gaat. Dan wordt het stukjes. Maar als klei eenmaal keramiek is, dan wordt het nooit meer klei. Dat vind ik een heel mooi principe.

Wanneer je klei oppakt en ermee gaat kleien, welke informatie verzamel je dan? En gedurende het proces?

Voordat ik klei oppak, moet ik weten welke klei ik moet hebben. Wat wil ik maken en wat wordt de functie daarna? Voor iets wat uiteindelijk warm gemaakt moet worden, of wat gebruikt gaat worden om in te koken, gebruik ik andere klei dan voor iets waar ik uit ga drinken. Vervolgens voel ik hoe de *hardheid van de klei is. En de homogeniteit. Moet ik daar iets mee? Ik voel de hoeveelheid, het gewicht.*

Wat bedoel je met hardheid?

Als mij klei te droog is, kan ik niet lekker draaien. Dan moet ik te veel energie erin stoppen.

Zijn plasticiteit en stijfheid daar synoniemen voor?

Plasticiteit wel, en hardheid. Een klei waar veel chamotte, steengruis, in zit, is van zichzelf al harder dan een gladde klei zonder chamotte. Daar zit een heel groot verschil tussen. Dat voel ik dus ook. Daar ben ik me dus ook bewust van. Wat voor klei heb ik in mijn handen? Okee, dan mag hij zo hard zijn.

Je hebt dus al een mentaal kader van de hardheid die je nodig hebt.

Ja. Als ik weet dat ik een bord ga maken, dan moet mijn klei veel zachter zijn. Dat heeft niets te maken met plasticiteit. Mijn klei moet dan zachter zijn dan wanneer ik een grote kan maak. Dat heeft niet eens met de chamotte te maken. Bij borden gebruik je zachtere klei, omdat je een andere handeling moet doen dan bij een kan, bijvoorbeeld. Voor de hoogte heb je een andere hardheid, stugheid, nodig dan bij een bord.

Dus je kiest dan een klei op basis van hoe het zich gedraagt tijdens het vormingsproces, en niet op basis van het eindresultaat.

Ja. Dan nu wat voor informatie ik verzamel tijdens het proces. Tijdens het proces voel ik of de klei doet wat ik wil. Raakt hij gecentreerd, bijvoorbeeld? Als ik hem niet kan centreren, dan weet ik dat er een luchtbel in zit. Die moet er dus eerst uit. Ik voel aan de klei of ik op het einde van de klei zit. Of de klei moe wordt, zoals je dat noemt ik vaktermen.

Wanneer wordt klei moe?

Klei wordt moet wanneer hij teveel op zijn donder heeft gehad. Ik vertel altijd: klei bestaat uit kleiplaatjes. Dat zijn kleine, platte, achthoekige plaatjes waar water tussen zit en daardoor kunnen ze over elkaar schuiven. Voordat je begint met het walken van je klei, liggen je kleiplaatjes alle kanten op. Met het walken probeer je ze dakpansgewijs te leggen. Met het centreren doe je dat weer. Tijdens het hele proces maak je gebruik van het feit dat zo over elkaar heen kan schuiven. Je probeert dus te voorkomen dat de kleiplaatjes te ver uit elkaar gaan en over elkaar heen gaan floppen. Dan stort het werk in elkaar, is het idee. Tijdens het proces kun je voelen of je klei zover is dat de klei A) heel slap wordt, maar ook dat hij B) heel flubberig wordt. Hij gaat dan wapperen onder je handen. Als hij dat gaat doen, dan weet ik dat ik op het einde van mijn klei zit. Dan kan ik niet meer zeggen dat ik nog door ga. Dan is het gewoon klaar. Dan kom je ook op de zachtheid van de klei. Hoe verzadigd met *water is hij dan? Dat is belangrijk. Dan weet ik ook of ik nog meer kan optrekken, of dat ik nog meer kan rollen. Dat voel je. Bij het afdraaien is het een heel lastige denk ik. Na verloop van tijd kan je tikken op de klei en dan voel je hoe dik die klei nog is. Je hoort en je voelt hoeveel je nog kan afdraaien, zonder dat je hem dan op hoeft te pakken.*

Tik je met je nagel?

Nee, met de binnenkant van je vinger.

Maar dat is vrij dof gevoel, toch?

Ja, het is een heel dof gevoel en een heel dof geluid. Die combinatie voel ik en hoor ik. Dat zal je misschien straks ook zien bij cursisten als ik ze vraag om te voelen hoe dik het is. Dan weten ze of ze wel of niet nog kunnen afdraaien.

En je verwacht ook van je studenten dat ze dat waarnemen?

Ik probeer ze dat wel mee te geven. Ik begin daar al mee op het moment dat ze hier net komen. Dat gaat ze dan ook echt nog niet lukken. Dat duurt denk ik ook echt wel een jaartje ofzo voordat je daar een beetje gevoel voor krijgt. Ik laat het ze ook horen en voelen. Uiteindelijk gaat het dan iedere keer weer op die manier. Aan het einde kijk ik of mijn vorm klopt met de vorm die ik voor ogen heb. Tijdens het proces voel je de dikte.

(Ik laat de afbeelding van de chaîne opératoire zien (Sofear in Bender et al. (eds), 2018, p.83)

Dat is wel een heel vlot proces hier, moet ik zeggen. In feite, ja. Ik snap wat je bedoelt. We hebben het nog helemaal niet gehad over het afstoken. Dat klopt wel. Daar zijn we ook veel mee bezig. Ook daar maak je stappen in en bedenk je wanneer je iets kan afbakken en wanneer niet.

Als in dat je eerst wacht tot iets droog genoeg is.

Ja, als ik iets te vroeg in de oven gooi, dan barst het uit elkaar, heel makkelijk. Dat is nog steeds heel ouderwets, maar werk dat klaar is, laat ik drogen op de rand van de oven. De oven werkt op hete lucht. Als de hete lucht erin gaat, dan wordt het damp. Damp zet uit en de klei krimpt. Het moet dus droog genoeg zijn. Als ik twijfel omdat iets bijvoorbeeld bovenin heel dun is en onderin heel dik, dan zal ik altijd nog steeds met mijn tong op het dikste stuk even voelen hoe droog hij is. Je voelt klammigheid. Als hij voelt als kroepoek, dus dat je tong eraan plakt, dan weet je dat hij droog genoeg is.

Dat doen archeologen ook weleens, haha.

[Elly pakt klei voor de demonstratie. Ze kleit na wat ik haar laat zien; de Friese kandelaar.]

Omwille van de tijd gaat het me niet lukken om het afdraaien ook te doen, maar ik kan wel de vorm maken.

[Elly snijdt klei af van een brood klei en walkt de klei een paar keer. Dan legt ze de homp op het midden van de draaischijf, schept met haar hand water over de homp en zet de draaischijf aan. Ze vouwt haar handen om de homp, sealt de homp onderaan met haar wijsvinger en begint de homp perfect in het midden te drukken tijdens het draaien.]

Ik ben linkshandig, maar ik draai rechtshandig.

En de ringen op de draaischijf zijn puur voor het centreren?

Ja, ik krijg hulp bij het centreren door de ringen.

[Elly heeft de homp netjes gecentreerd. De wanden staan een beetje schuin naar binnen en de homp is afgeplat aan de bovenkant.]

Als ik met weinig klei werk, dan open ik zo [duim recht van boven in de homp duwen]. Als ik met veel klei werk, dan open ik zo. Dan heb ik mijn hele hand en mijn lichaam om in te zetten. Hier [met weinig klei] moet ik het op handkracht doen.

[Elly trekt met een soepele, vloeiende beweging de pot op. Bij elke beweging waarbij ze vanbinnen en vanbuiten druk zet op de pot, raken haar handen elkaar. Door het spiergeheugen in haar handen kan ze zo schijnbaar moeiteloos de wanddikte inschatten. De wanden staan nu licht naar buiten. Ze spoelt haar handen af in de emmer water en wrijft ze af aan de rand van de emmer.]

Ik haal hier wat klei weg, want dat is te veel.

P2 zei dat hij heel goed van tevoren kon inschatten hoeveel klei hij nodig had.

Klopt. Ik weet nu al dat ik veel te veel heb.

[Elly prikt met een dun, metalen stokje voorzichtig door de wand, die door de draaibeweging van de schijf door het gehele potje heen snijdt. Ze haalt de losgekomen ring weg.]

'Van de mast draaien' betekent dat je alleen de bovenste hoeveelheid klei op de draaischijf gebruikt voor het potje. Als ik meer moeten maken van dit soort vormen, dan doe ik dat vaak.

P2 draait waarschijnlijk op knokkeltechniek. Ik heb aangeleerd om op duimtechniek te draaien.

[Elly laat de knokkeltechniek zien. Ze maakt een vuist en duwt met een gekromde, iets uitgestoken wijsvinger in de wand van de pot. Ze doet ook de duimtechniek voor, waarbij ze haar volledige duim tegen de wand van de pot duwt.]

Dit zijn de twee belangrijkste manieren om op te trekken. Bij heel zwaar werk wordt ook wel zo gewerkt. [Ze houdt een hand aan de binnenkant en de andere aan de buitenkant, vingers naar beneden en licht gekromd, alsof ze de klei omhoog schept.] Ik heb het zo aangeleerd ooit. Het nadeel van de duimtechniek is dat het gewricht bij mij nu gewoon versleten is daardoor. Ik vind het nog steeds makkelijk, omdat ik het zo geleerd heb. Maar mijn cursisten leer ik dus de knokkeltechniek. Zo het je veel minder last. Het duimgewricht is te complex. Het is bij mij nu heel instabiel geworden. Ik trek nu voor de tweede keer omhoog. Ik zorg dat ik echt mijn hele lichaam vanaf mijn stuitje meeneem in het optrekken. Veel cursisten zitten met hun ellebogen gesteund op hun bovenbenen. Ik zeg dan altijd: "Rechtop!", zodat ze hun bekken kantelen. Daarmee kan ik veel beter controleren wat ik doe.

Het is veel krampachtiger.

Klopt. De klei wil dan ook gewoon maar alle kanten opgaan.

[Elly snijdt opnieuw met een dun, metalen stokje de bovenste ring klei af.]

Als ik een vorm voor het eerst maak, dan snij ik ook vaak veel klei af. Uiteindelijk kan ik vooraf bedenken hoeveel klei ik nodig heb. Bij de volgende zit ik dan inderdaad op de juiste hoeveelheid.

Je bent ook continu aan het monitoren hoeveel water je nog nodig hebt.

Ja. En soms is het te veel. Als er een plasje in ligt, dan dep ik dat op met een sponsje. Plasjes zijn ook niet optimaal voor de klei.

[Elly pakt een klein sponsje en dept het plasje water onderin het potje op.]

Pianovingers.

[Elly duwt voorzichtig met de ene hand vanbinnen de wand naar buiten, terwijl ze met de vingers van haar andere hand de uitdijende vorm naar buiten begeleidt. De beweging gaat over in het afronden van de rand met de top van haar wijsvinger aan de buitenkant en de onderkant van haar andere wijsvinger aan de buitenkant, waardoor de rand afgerond wordt.]

Ik denk dat hij nog net even iets breder is.

[Elly drukt de pot nog een beetje verder naar buiten. Vervolgens duwt ze voorzichtig de voorkant van haar duimnagel een beetje in de wand, waardoor halverwege en rondom de pot een smalle richel ontstaat. Daarna duwt ze met een houten spatel op de draaischijf, steeds dichter tegen de pot aan. Zo haalt ze overtollige klei weg; dit noemen we afdraaien. Ik merk de richel later pas op.]

Je hebt zomaar opeens die richel gemaakt. Die had P2 niet.

Jaa, even zo. [Elly doet voor hoe ze haar duimnagel in de pot zou duwen.] Ik ga hem nog iets breder zetten, want hij is nog net een beetje te smal.

[Ze pakt een lomer en houdt de rechte kant van de lomer tegen de buitenkant van de pot. Ze begint onderaan en gaat in een vloeiende, kalme beweging twee keer omhoog, waardoor de gehele buitenkant van de pot gladgestreken wordt. Ze rond haar beweging af door de lomer bovenaan iets naar binnen te keren, waardoor ze de rand nog iets meer afrondt. Simultaan hieraan duwt ze met haar andere hand de pot een beetje van binnen naar buiten. Ze duwt de lomer ook over de zojuist gemaakte duimrichel, die hierdoor minder diep wordt. Met een sponsje haalt ze de overtollige klei op de draaischijf weg en met de houten spatel definieert ze de onderkant van de pot, de standring. De basisvorm van de pot staat nu. Hierna begeleidt ze met beide handen aan weerszijden van de pot de kleisnijder in een trage, beheerste beweging, zo dicht mogelijk over de draaischijf schuivend. Daarna tilt ze de kom met gevouwen handen op en zet het op een ander oppervlak. Het complete proces vanaf het walken tot aan optillen van de pot, inclusief het geven van commentaar en uitleg, duurde ongeveer tien minuten.]

Eigenlijk staat hij dan nu. Normaal zou ik nu wachten met verder vormen totdat de klei leerhard is, maar daar hebben we nu niet de tijd voor.

Dan denken we dat erbij.

Dat is goed.

Je draaisnelheid is eigenlijk ook heel belangrijk bij wat je doet.

Ja. Bij het centreren heb ik een hoge draaisnelheid. Naarmate de scherf [de wand] dunner wordt, wordt mijn snelheid lager. Zeker als ik met een lomer aan de gang ga en hem droogtrek, dan moet mijn snelheid wat lager worden. Anders gaat hij aan de wandel [zwabberen], wat er net ook eventjes gebeurde. Hier kan ik mee spelen als ik net iets niet goed heb gezet.

Arme P2. Op de faculteit [waar ik de demonstratie van P2 had gepland] hebben we één elektrische draaischijf en die kan hard of zacht.

Dat is best lastig. Ik heb ook jaren op een schopschijf gewerkt. Die moet je zelf aanschoppen. Daar heb ik het op geleerd. Daar heb ik wel heel veel aan gehad, want ik leerde goed het tempo bepalen.

Er zijn net heel veel stappen gebeurd waar we niet bij stil hebben gestaan, die je wel hebt uitgevoerd. Ik weet niet of je het kan zien op de foto's.

Het gaat zo snel.

Zeker als je het ook nog eens in woorden moet vangen, moet je heel precies nadenken over wat er allemaal gebeurt. En je weet dat je dingen mist.

Ja. Ik heb er nu nog best wel veel bij gesproken. Normaal gesproken als ik een potje draai voor een demonstratie, dan draai ik er twaalf minuten over. Dan vertel ik heel veel - klei moet dit, klei moet dat. Maar dan heb je dus eigenlijk alles al staan. Het kost echt niet veel tijd. Decoratie moet je eigenlijk in één keer doen. Dat geldt voor alle decoratie, maar zeker voor die krulletjes [de golfjes op de pot die als voorbeeld waren aangeleverd]. Dat is echt alleen maar te doen als je hem op deze manier zet. Ik ken deze decoratie ook goed. Ik zet hem er vaak op voor mensen. Dat doe ik gewoon op de schijf. Ik heb mijn hand erin en ik draai hem gewoon alleen maar door. Ik stop bij voorkeur niet tussendoor, hooguit vastpakken en meteen doorgaan, nergens anders naar kijken op dat moment. Dan heb ik hem redelijk stabiel. Als ik dat niet doe, dan ga ik scheef, of is mijn boogje opeens heel anders. Dat is denk ik belangrijk om mee te nemen.

---[Minder relevant gespreksonderwerp tussendoor.]---

[Elly snijdt de pot dwars doormidden door met een kleisnijder dwars op de pot van boven naar beneden te gaan.]

Je ziet dat hij hier net iets dunner is [de wand tussen het midden van de pot en de onderkant]. Ik heb hier geen vlak stukje. Als je een vlak stukje hebt, dan is de spanningsboog veel minder sterk. Als je een kom draait, wil je zo een doorgaande lijn hebben, want dat is gewoon het sterkste.

C.2.1.4.2 Transcript of second interview with P5 (original in Dutch)

<u>Tweede interview met P5, 12-4-2025 (8 min)</u>

Welke zintuigelijk waarneembare aspecten van het productieproces zijn volgens jou het belangrijkst per stap in het vormingsproces?

Bij het centreren is het belangrijkst dat hij goed in het midden ligt. Dat is het eerste stuk. Bij het voorbereiden tot het optrekken is het dat hij goed de basisvorm heeft om goed op te kunnen trekken, dus de rechte lijnen en dat hij niet bol staat. Hij moet diagonaal staan.

Mag hij rechtop staan?

Nee, dan heb je teveel last van de middelpuntvliedende kracht. Als je hem hoog wil hebben, dan moet je een piramidevorm hebben. Want met de middelpuntvliedende kracht gaat hij bovenin uitstaan. Als je dan wanden dan rechtop staan, dan flopt de randen over. Als je hem dan terug wil krijgen, dan is de klei daar niet tevreden over. Dan klappen de kleiplaatjes over elkaar heen, in plaats van dat ze *netjes dakpansgewijs over elkaar blijven liggen. Je wil het dus continu naar binnen geduwd houden. Bij een cilinder of een kom, dan staat de homp als een bloempot. Hij mag niet al recht staan. Voor het optrekken is het belangrijkste dat hij tot de juiste dikte komt. Dat is vrij essentieel. Daarna is voor het afwerken het belangrijkste dat je hem zo afwerkt, dat hij makkelijk van de schijf getild kan worden. Dat betekent bijvoorbeeld goed lomen met een houten spatel, of in ieder geval wat je deed. Historisch gezien is de onderkant goed afgestoken. Ik denk dat dat voor dit deel van het proces een indeling zou kunnen zijn. Dit zijn de stappen die ik met mijn cursisten doorga. Als iemand net begint, accepteer ik iets veel dikkers of iets wat veel minder weggestoken is. Als je verder bent, accepteer ik dat niet meer. Dan moet hij beter staan als hij echt staat. Als je hem optrekt, wil ik dat hij ook echt gelijkmatig dun is. In de archeologie zie je natuurlijk altijd alleen maar het eindproduct, dus dat is dan moeilijk. Als je tussentijds zou moeten beoordelen, dan zijn dit de stappen waar ik hier naar kijk.*

Dat is inderdaad wel het lastige: herken je achteraf nog als je de basis niet goed doet? Je merkt het natuurlijk als hij niet goed gecentreerd is geweest, je merkt dat hij in gaat zakken als de middelpuntvliedende kracht te actief is geweest...

Ja, dus het conisch zetten kan je terug zien. Je kan gaan leren zien - ik denk dat dat voor mensen heel makkelijk te herkennen is - of de dikte goed opgetrokken is. De middelpuntvliedende kracht kan je goed zien. Niet alleen omdat hij dik is, maar ook of er drie keer over gedaan is of dat er tien keer over gedaan is. Als er tien keer over gedaan is, is de klei zwak en zakt hij in elkaar. Of het afsteken goed gedaan is, kan je ook zien, maar dat is lastig. Maar je kan zien of de middelpuntvliedende kracht goed gecompenseerd is. Ik denk dat je de tweede fase met het uitdunnen ook kan zien. Als hij daar niet goed uitgedund is, dan staat negen van de tien keer de bodem niet goed.

Wat gebeurt er dan met de bodem?

Bij een cilindervorm moet je echt een vlakke bodem hebben staan en daarna zet je je vorm. Het moet een behoorlijke 90-gradenhoek zijn. Als iemand niet goed gezet heeft, dus niet goed voorbereid heeft op het optrekken, dan zie je dat het vaak een beetje alle kanten op staat. Dan zie je aan de binnenkant van de bodemrand heel veel ronding zitten. De bodem aan de binnenkant is niet glad en het is niet in een vloeiende lijn. Als iemand dat later kan compenseren, dan heb je veel ervaring als pottenbakker. Dat betekent dat het iemand is die het gewoon kan. Dan is het gewoon luiheid. Maar daaraan kan je dus ook zien dat iemand niet zo vaardig is.

Wat is het afsteken eigenlijk precies? Ik heb het nu een paar keer gehoord, maar begrijp nog niet helemaal wat het is.

Dat is dat je met een houten spatel bijvoorbeeld de overtollige klei weghaalt. Het is belangrijk dat je dat doet, anders kan je de pot er niet goed aftillen. Dat is het lastige. Als je dat niet doet, dan zie je in *het eindresultaat dat hij minder gelijkmatig zal zijn. Maar dat is wel lastiger om te zien. Waar waarom ik daarnaar refereer: in het pottenbakken nu wordt er heel duidelijk afgestoken en daarna ook getrimd. Maar toentertijd werd er voornamelijk met een mes gesneden. Dus het afdraaien zoals wij dat nu gewend zijn, gebeurde niet. Dat is een moderne manier. Vroeger werd die houten spatel ook veel meer als mes ingezet, om ervoor te zorgen dat die onderrand al goed weg was. Dat scheelt je heel veel werk op een later tijdstip.*

C.2.1.4.3 Transcript of third interview with P5 (original in Dutch)

Derde interview met P5, 12-7-2025 (60 min)

We beginnen met het kiezen van de juiste klei met de juiste hardheid, had ik bedacht.

Ja.

Wat gebeurt er als het net wat te hard is voor de vorm die je wil maken?

Dan gaat het scheuren op het moment dat je de eerste bewerkingen doet en je krijgt het gewoon niet gecentreerd. Dat is stap één; je krijgt het gewoon niet op zijn plek.

Kan je uberhaupt wel werken met harde klei? Of eerder voor figuratief werk?

Eerder figuratief. Ik vertel cursisten altijd: "Pas je klei aan aan wat je wil maken." Centreren met een harde klei is moeilijk. Als je verder gaat met te harde klei, dan scheurt je werk tijdens het draaiproces al.

Is het dan te korte klei?

Ja. Negen van de tien keer is het te kort. Dan moet je water toevoegen. Maar dat water mengt niet goed, dus dat werkt niet.

Wat als klei te lang of te zacht is?

Dan zakt je werk in. Dan centreer je heel makkelijk, maar je drukt het zo van zijn plek. Het is ook plakkerig, waardoor je heel makkelijk blijft hangen met je handen en dan tordeert het.

Is plasticiteit iets anders dan hardheid?

Ja, er zit een verschil in. Harde klei noem je eerder stevige klei. Als je te plastische klei hebt, dan heb je bijvoorbeeld bij de hoogteopbouw moeite om de hoogte te halen. Bij plastische klei kun je wel weer beter de breedte in. Voor de hoogte pak je een stevigere klei. Hij kan zijn eigen gewicht niet dragen. Je hebt plastisch versus droog, en je hebt stevig versus zacht.

Stevig / zacht is kort / lang?

Nee. Kort / lang is plastisch en droog. Hij [wijst naar een cursist aan het werk] is momenteel aan het werk met een harde klei, waar vrij veel chamotte in zit. Die is moeilijker te centreren, moeilijker op te trekken, maar hij zakt heel moeilijk in. Porselein zit op het andere uiterste. Dat voelt heel erg zacht. Die centreer je heel makkelijk. Maar je hoeft er maar naar te kijken of hij zakt in. Je voelt hoe vochtig hij is. Op basis daarvan bepaal je of het een harde of plastische klei is.

Dan gaan we door naar de hoeveelheid klei. Hoe bepaal je de juiste hoeveelheid?

Dat voel je. Soms pak ik er ook gewoon een weegschaal bij. Ik heb ook lijsten hangen voor met hoeveel klei je wat kan maken. Dat is in principe de basis waar je vanuit gaat. Als voorbeeld: er staat voor dit kommetje 400 gram klei met een diameter van 10 centimeter, 9 centimeter hoog en een voet van 4,5 centimeter. Als je een klei hebt die je kent, dan zal je inderdaad beter kunnen zeggen dat je met een bepaalde hoeveelheid iets specifieks kan maken. Ik weet bijvoorbeeld dat ik voor hetzelfde bekertje van één bepaald type klei 250 gram nodig heb en van het andere type klei 300 gram. Dat weet ik, omdat ik dat zo vaak heb gedraaid. De ene klei is meer vergevingsgezind dan de ander, bij de ander raak ik meer klei kwijt, bij de één hoef ik niet weg te snijden, bij de ander moet ik altijd een randje boven wegsnijden, dat soort dingen. Dat heeft allemaal te maken met hoeveel klei je kiest.

En dat je klei bovenin kan weghalen, heeft ook weer te maken met hoe dik de wand is. Hoe steviger de wand is, hoe minder makkelijk je omhoog komt?

Sommige klei kan je makkelijker omhoog laten komen, maar het heeft ook te maken met of je steunklei nodig hebt. Steunklei draai je af. Dan weet je dat je meer klei moet laten staan en dat je meer verlies nodig hebt. Bij een bord is dat heel veel; ongeveer 30% verlies van het gewicht wat je neemt aan het begin. Ook als je een ervaren draaier bent en klei hebt die makkelijk centreert. Wat er vaak gebeurt wanneer je centreert met wat stevigere klei, dan gaat er heel veel klei verloren op de schijf. Die haal je weg, dus dan ben je heel veel klei kwijt. Dus je begint dan wel met 400 gram, maar je gaat pas optrekken met 350 gram.

Dat is iets wat je niet heel makkelijk kan compenseren. Je komt per definitie niet bij de uiteindelijke hoeveelheid klei uit.

De kleihoeveelheid kiezen is heel essentieel. Dat compenseer je heel beperkt, maar daar zitten heel veel keuzes in. Het is een heel belangrijk item. Het heeft te maken met je vaardigheid, met je vorm, met het type klei, met hoeveel je van het werk gaat maken. Is het de eerste of de laatste die je maakt, wanneer er al veel klei aan je handen zit? Het is heel belangrijk en mag best uitgebreid. In het kader van dit onderzoek is het belangrijk om te bedenken of je veel steunklei nodig hebt. Als je veel steunklei nodig hebt, dan weet je dat je meer nodig klei hebt. Als je minder klei hebt, dan heb je automatisch al minder steunklei nodig. Heb je een vorm die wat meer rechtop staat, dan heb je ook automatisch *minder steunklei nodig. Hoe breder je gaat, hoe meer steunklei. Hoe plastischer de klei, hoe meer steunklei.*

Dus als je, voor de vorm die je wil maken, net te weinig klei uitkiest, heb je te weinig steunklei.

Dan heb je te weinig steunklei, of je haalt de vorm gewoon niet.

Dan wordt hij lager of net niet helemaal netjes.

Dan wordt hij lager of zwabberig aan de bovenkant, omdat je hem te veel uit probeert te rekken.

En als je teveel klei uitkiest?

Dan moet je gaan snijden. Je hebt ook het risico op een zware voet. Dan is hij in het gebruik niet goed. Je moet dan ook meer afdraaien. Ik heb een hekel aan afdraaien - veel mensen vinden het geweldig - dus ik draai dun. Dan hoef ik zo min mogelijk af te werken daarna. Daar heb ik gewoon geen zin in.

We gaan nu door naar het walken. Ik had daar bedacht dat je vooral merkt hoe nat het is en hoe plastisch het is.

Met name die plasticiteit. Nattigheid voel je, maar heeft veel te maken met plasticiteit. Het vocht voeg je toe om het plastischer te krijgen.

Dus de vochtigheid gaat weg en alleen plasticiteit blijft over.

Ja, alleen plasticiteit.

Okee. Ik denk dat als klei minder plastisch is, dat hij dan eerder breekt en minder makkelijk vormt. Dan krijg je inderdaad problemen om die muur gevuld te krijgen en is het lastiger om het gelijkmatig uit te spreiden. Je bent heel hard aan het werk.

Met name dat. Het hard moeten werk is een heel belangrijke. Je handen worden moe. Als je één potje maakt, dan kan het vaak nog wel. Maar als je er 20 maakt, dan is het niet fijn voor je handen. Uiteindelijk raak je dan de controle over je vingers kwijt, druk je net even te ver, en weg is de vorm. Wat ik zelf altijd heel belangrijk vind is dat je voldoende tijd moet besteden om je klei goed te bewerken. Hij moet goed bewerkbaar zijn voor jou, en dat is per persoon verschillend. Ik werk graag zacht, en sommige mensen werken graag wat harder. Dat heeft denk ik voor een deel met vaardigheid te maken. Het heeft te maken met of je vingers gevoelig genoeg zijn om te kunnen voelen wat je kan doen of niet. Zacht is denk ik minder vergevingsgezind qua inzakken.

We gaan nu door naar het centreren. Hier wist ik het niet zo goed. Het draai natuurlijk om symmetrie. Maar je hebt ook die middelpuntvliedende kracht die aan het compenseren bent.

Je uitgangspunt is dat het perfect gecentreerd in het midden ligt. Het gebeurt heel vaak dat je een heel klein beetje asymmetrisch bent. De middelpuntvliedende krachten zijn pas verder echt van belang. Wat je bij het centreren voornamelijk doet is alle oneffenheden zo homogeen mogelijk op de schijf hebben liggen. Dat voel je.

Wat voor oneffenheden?

Bij het walken probeer je de klei homogeen te hebben, maar eigenlijk is die altijd nog beperkt homogeen. Er zitten altijd nog wat hardere en zachtere stukken in. Daar ontkom je niet aan. Dus eigenlijk is het laatste walken tijdens het centreren op de schijf.

Ik heb filmpjes gezien van mensen die gingen conen op de schijf. Ze keken dan naar de spiraal bovenin en dan wisten ze dat ze nog even door moesten gaan.

Dat is een andere methode; er zijn twee verschillende. Met die spiraal zie je makkelijker of hij gelijkmatig en homogeen is. Dat probeer je te compenseren. Hij moet overal hetzelfde gewicht hebben. Eventuele luchtbellen werk je eruit. Daarna ga je kijken of hij exact midden op de schijf ligt. Dan pas kijk je of hij gecentreerd wordt. Dus daar zit nog een stap tussen.

Ja, van het homogeniseren. Dat gebeurt dus deels tijdens het walken en deels tijdens het draaien. In de bijschrijvingen benoem ik vaak meerdere onderwerpen tegelijkertijd, omdat veel dingen doorlopen.

Het is inderdaad niet allemaal zo duidelijk.

Ik kan dus een kopje "Homogeniseren" maken, maar ik kan het homogeniseren ook verwerken in de bestaande kopjes.

Precies, dan zet je in de tekst dat dat een onderdeel van het centreren is.

Precies. In de literatuur missen ze het centreren eigenlijk altijd.

Ja klopt, bijna standaard. Ik snap het niet. Het is belangrijkste stap in het hele proces.

Dat vind ik interessant. Ik ga daar in mijn discussie nog verder op in, maar het vormproces wordt meestal als één hokje behandeld. Terwijl daar de meest essentiële stappen gebeuren, want anders kom je niet naar een vorm. Verder zijn er weinig andere dingen waar ik vanuit mijn onderzoek veel over kan zeggen, omdat het niet meer universeel is. Er zijn zoveel stookmethodes en afwegingen... Daar ga ik mijn vingers niet aan branden.

Zou ik inderdaad niet doen.

En wat betreft het extraheren van klei uit de natuur is het ook weer heel variabel... Ken je limieten.

Ja, precies.

Toen kwam ik uit bij iets wat ik heel interessant vond. [P1] liet me de instructieplaten zien over hoe je een basisvorm maakt. Dat ben ik nergens in de literatuur tegengekomen. Ik heb enkele tientallen bronnen doorgenomen en er was er één die aangaf dat je een vaardige pottenbakker eraan kon herkennen dat er aanwezigheid was van "preforming". Ik snapte niet goed wat ze daarmee bedoelden en vond het gek dat de rest dit dus mist. Iedere pottenbakker doet dit, maar de literatuur vermeld het niet. Het verdwijnt natuurlijk in de rest van de stappen, maar het bepaalt wel hoe je vervolgens omgaat met de rest van de vorm.

Dat klopt.

Ik denk dat middelpuntvliedende kracht hier meer een ding is dan bij centreren, klopt dat?

Ik denk dat het niet de middelpuntvliedende kracht is waar je mee werkt. Je hebt de drie basisvormen: de cilinder, de kom en het bord. Voor het bord maak je die disc, voor een cilinder maak je een bijenkorfje, en voor de kom maak je meer een flauwe pot op zijn kop. Een rechte hoek is niet handig. Het is bijna altijd een afgeronde hoek. Achter een scherpe hoek blijf je heel makkelijk hangen met je handen en dat kost klei. Een hand kan veel natuurlijker om een ronde vorm heen. Alles is gebaseerd op die drie vormen, wat je ook maakt.

Is het kenmerkende aspect van deze stap dan meer de vorm?

Ja. Het is de vorm die je zet om daarna te kunnen vormen. De basisvorm van je bol is het uitgangspunt voor de volgende stap.

Dus je zou kunnen zeggen: "Op basis van de vorm die je kiest, bereid je je voor op hoe de klei zich zometeen gaat gedragen." Hoe de klei zich verder gaat gedragen, hangt voor een groot deel af wat je doet, maar ook van die middelpuntvliedende kracht?

Ja. In de stap daarna heb je wel heel erg te maken met middelpuntvliedende krachten. In de vorm van deze stap probeer je er al voor te zorgen dat je daar de goede kant mee op gaat. Bij een cilinder wil je zo min mogelijk naar buiten. Je wil hem smal houden, dus je begint al in die vorm. Bij een kom wil je uiteindelijk naar buiten, dus dan mag hij al wat rechter staan. Dus dit is een voorbereiding op dat de middelpuntvliedende kracht straks gaat werken.

Voor de volgende stap sla ik het openen van de vorm over. Het is wel een stap, maar ik noem hem bij het zetten van de bodem. Je gaat dan met de vinger erin tot de juiste diepte, iets hoger dan je eigenlijk zou willen zodat je extra klei overhoudt, en duwt de klei naar buiten. Dan ben je direct al de bodem aan het leggen.

Klopt, je bodem zetten.

Ik dacht dat het ging om de hoeveelheid klei die je eruit duwt, wat samenhangt met hoe dik je die bodem maakt. Het gaat ook om de snelheid waarmee je dat doet.

Ja, maar snelheid is minder interessant. Hoe ver je naar buiten gaat is heel belangrijk. Die is behoorlijk essentieel. Het heeft ook weer te maken met de vorm die je daarna gaat maken, zoals een kom of een bord.

Ik heb het idee dat je die basis ook eigenlijk maar één keer kan leggen.

Het grootste deel wel, ja. Het belangrijkste heb je dan gedaan.

[Elly laat doorsnedes zien van potten in verschillende stadia van het vormen.]

Je zet altijd eerst de bodem voordat je omhoog gaat, of je nou een ervaren pottenbakker bent of niet. Het onderste begin van de wand is altijd dunner dan de klei erboven die je aan het optrekken bent. Als het verschil te groot is, gaat het zwabberen. Dat is vanwege de middelpuntvliedende kracht. Als hij ook maar iets gaat zwabberen, breekt hij beneden in de wand door. Als het te dun is, breekt het dus sneller door. Dus die verhouding moet een beetje bij elkaar in de buurt zitten.

En de verhouding is...?

...gevoel.

Gevoel. Perfect. Je glijdt er ook heel snel doorheen denk ik.

Ja. De meeste mensen pakken hem voor, op 12 uur. Niet met twee handen, want dan moet je twee handen controleren. Maar als je zo voelt, weet je hoeveel er tussen de twee vingers zit. Ik kan ook zien hoeveel er hier zit. Vanaf daar ga ik naar boven.

De hoeveelheid klei die je optrekt is misschien ook heel erg afhankelijk van hoe groot je hand is en wat makkelijk past.

Ook, maar goed, als ik acht kilo klei heb liggen, dan vouw ik mijn handen anders. Als mijn bulk heel groot is, dan ga ik er met mijn arm in. Dat weet ik ook wat de afstand is. Maar de hoeveelheid maakt niet uit, want je doet hetzelfde. Ik zorg altijd dat ik een dikke worst heb staan, die geschikt is om daarna op te trekken. Daar ga ik naartoe. De wand moet zo dik zijn dat ik hem drie keer kan optrekken.

P3 beschreef het als opscheppen; zo heb ik het vertaald.

Klopt, dat doe je ook.

Ik zag ook een filmpje online waarin ze een soort S-vorm beschreven tijdens het optrekken. Ze duwden het van onderaf van binnen naar buiten, en van bovenaf van buiten naar binnen. Dus ze duwden het van boven weer terug.

Dat klopt. Het is essentieel hoeveel er hier staat. Dat is weer de voorbereiding voor de volgende stap. Bij de kom wil je direct al een ronde lijn [spanningsboog] hebben.

Daar komen we zo. Ik heb soms dingen onder verschillende kopjes gezet, omdat ze in meerdere stappen plaatsvinden.

Het zijn wel twee verschillende manieren van optrekken. Als ik te weinig naar buiten ga, dan heb ik hier een hele berg klei staan. Dat is steunklei. Die krijg ik dan niet meer omhoog. Die verlies ik dus. Als ik hier te weinig steunklei heb, dan kan hij zijn gewicht niet dragen en dan zakt hij weg. Het is dus best essentieel om te zien hoe ver je naar buiten gaat. Als de vingers van buiten en van binnen bijna boven elkaar staan, dan neemt de buitenkant het over. Ik bepaal met het vormen van de bodem hoeveel rand ik heb en daarmee besluit ik wat ik daarna kan doen.

Ik heb dat op een andere manier opgeschreven en ik heb daar ook echt een fout gemaakt. Ik wist niet dat het twee verschillende manieren van optrekken waren.

Ze komen bij elkaar in de buurt, maar het zijn wezenlijk verschillende dingen. Bij een bord is het weer anders.

Ik heb online gezien dat iemand een dikke discusvorm had liggen, die hij uitwreef met een vuist. Dat was niet een bord zoals ik het in gedachten had, maar zo werkte het ook. Ik had verwacht dat je hem misschien van onderaf kon pakken en dan zo heel wijd omhoog zou ging, maar dat lijkt me ook een beetje instabiel.

De methode met de vuist opzij is een methode die veel gebruikt wordt bij een bord zonder uitstaande bordrand veel gebruikt wordt. Voor een bord met een klassieke rand, grijp ik de rand goed vast en trek ik hem naar buiten. Ik comprimeer hem de hele tijd en ik werk hem zo naar buiten als het ware. Ik zet met beide handen veel druk om hem naar buiten te krijgen. Het zijn drie aparte vormen, drie aparte grepen, drie aparte hoeveelheden steunklei, drie aparte manieren om de wand op te trekken.

Ik heb hier wat dingen verkeerd begrepen, maar dat is goed. Ik ga daar even goed over nadenken. Dan moet er ook gesleuteld worden aan het volgende stukje over de spanningsboog. Ik heb het vertaald als "tension arch", maar ik ben het nog nergens tegengekomen in de literatuur. Ik had bedacht dat als die te klein is, de wand niet stabiel genoeg is. Dan is de spanningsboog afgeplat. Als hij te groot is, dus niet diep genoeg uitstaat naar buiten, dan heb je geen mooie bodem.

De lijn wordt anders in dat geval.

Wat niet perse verkeerd hoeft te zijn.

Nee. Vanuit de basis van het openen kan je verschillende kanten op, zolang die boog er maar in blijft staan. Het is wel echt erg op de kom van toepassing. De spanningsboog klopt wel in een later stadium bij het vormen, en dan kan het ook bij een cilinder zo zijn. Omdat de wand bij een kom zichzelf goed moet kunnen dragen, moet je de kracht naar het middelpunt hebben. Hij moet niet omklappen. Dus het klopt wat je zegt, maar het is echt alleen voor de kom.

Voor de kom maak je eigenlijk altijd een hyperbool.

Altijd. Als je dat niet hebt, heb je geen kom. Dan heb je óf een bord, of een cilinder. Stiekem is een bord een combinatie van een cilinderbodem en een komwand. Een cilinder heeft altijd een vlakke bodem en een kom heeft altijd een kromming. Een bord heeft een vlakke bodem, maar niet de scherpe overgang van een cilinder.

[We praten nog even over hoe ik dit op ga nemen in mijn werk.]

Het volgende is het optrekken van de wand. Daar heb ik vrij veel over geschreven, omdat daar vrij veel samenkomt. Wat ik eruit heb gehaald is dat vooral belangrijk zijn: de snelheid waarmee je het doet, de afstand tussen je vingers, en je postuur, zodat je de vorm niet indrukt.

Het gaat om de snelheid van de schijf ten opzichte van de optreksnelheid. Die combinatie is essentieel. Je kan heel langzaam optrekken, maar dan moet de schijf ook heel langzaam draaien. Dan wordt je houding inderdaad erg belangrijk. Als je niet stabiel zit, kun je niet goed optrekken. Als je je snelheid omhoog brengt, en de klei kan dat aan omdat de middelpuntvliedende kracht wat minder is omdat de wanddikte groter is, dan kan je verder gaan. Als de wand dunner wordt, moet je draaisnelheid omlaag. Dat betekent dat je optreksnelheid omlaag moet. Als je dat niet doet, dan krijg je tordering in je wand.

Ik noem dat spiraal in mijn werk.

Dat is ook goed. Spiraal of tordering is in feite hetzelfde.

Ik had iemand gevonden online die het had over "to marry the speed of the hands to the speed of the turning wheel".

Ja.

Ik had ook bedacht dat de wand een constante dikte moest hebben. Voor het postuur ging ik ervan uit dat het ideale is dat je vooral ontspannen bent en in een soort massagebeweging meegaat. Zo beschreven P3 en P4 dit.

Het is wel het masseren van klei. Die snap ik en daar ben ik het mee eens. Maar er is een verschil. Je buik is aangespannen, want daar moet de kracht vandaan komen. Dat is je centrum waar je kracht zit.

Je core.

Ja, het is puur core. Je kan eigenlijk wel bedenken wat er gebeurt als je daar geen spanning hebt. Dan ga je mee met je armen als de klei uit het lood gaat. Op het moment dat spanning in je core hebt, kun je je schrap zetten op je lichaam. Als je core heen en weer gaat, gaan de armen ook los.

Het wordt dan een soort ankerpunt.

Ja. Daarom is de core heel belangrijk. Die is gespannen, de rest is ontspannen.

Dit verklaart denk ik waarom sommige mensen meer moeite hebben dan andere.

Juist. Je hoort mij ook heel vaak zeggen: "Je zit niet goed, hier [wijst naar buik] moet de spanning zitten." En daarom mogen mensen bij mij ook vaak niet met de armen op de benen zitten. Dan is het niet ontspannen. Verklaart dit iets?

Dit verklaart een intuïtief gevoel. Maar goed, de literatuur heeft het hier niet over. Ze weten het niet. Frustrerend, wel heel interessant. Van het optrekken gaan we naar het optrekken naar een bepaalde vorm. Dat gaat ook weer gepaard met die snelheden ten opzichte van elkaar, en opnieuw de afstand tussen je vingers.

Mee eens.

Fijn. Ik heb onderscheid gemaakt tussen te dik en te dun op verschillende momenten in het optrekken. Als het aan de onderkant te dun is, zakt het daar ook in. Als het bovenin te dun is, wordt het flubberig.

En als hij onderin te dun is, wordt hij bovenin ook flubberig. Dus een te dunne wand zakt in en gaat zwabberen.

En dat kan je ook zien in het uiteindelijke stuk.

Ja. Vaak zie je dat aan spiraalstrepen erin staan.

Omdat hij is gaan flapperen?

Ja. Vaak heb je dan net te weinig water en kan hij weinig hebben. Dan wil je vormen optrekken, maar dan is de remkracht met je hand op de klei te groot. Dan verschuift de pot mee. Dus je houdt de bovenkant tegen, maar de onderkant draait door. Omdat hij zo dus is, houd je heel makkelijk de bovenkant tegen. Hij maakt een draai ten opzichte van zichzelf.

Dus de onderkant en bovenkant maken een draai ten opzichte van elkaar en daar zit ook weer extra rek in, als het ware.

Ja.

Interessant.

Het is dus niet wat je wil. Je wil het juist voorkomen.

Hebbes. We hadden het er al over dat je continu bezig bent met waar je heen wil. Ik heb het hier over balans in de pot, esthetiek, de gouden ratio in de pot. Ik benoem hier ook dat je de vorm herhaaldelijk hervormt met een lomer en dat je niet te lang door moet gaan, omdat je anders de stabiliteit niet ten goede komt.

Dat klopt.

Dan kunnen we nu door naar de rand. Hier wist ik niet zo goed wat ik ermee moest, omdat het zo verschillend kan zijn.

Je hebt functie en die is inderdaad heel erg belangrijk, dat is waar. Het is vooral erg belangrijk of hij rond of hoekig is. Dat bepaalt heel erg wat het doet.

Wat doet het als het erg hoekig is?

Als het rond is, dan drinkt het fijn. Als het hoekig is, drinkt het niet fijn, maar het schenkt beter. Als het rond is, loopt de vloeistof erlangs. Een hoekige vorm snijdt de vloeistofkolom door, als het ware.

Vandaar dat schenktuiten ook best wel scherp zijn soms.

Juist.

Maar je wil niet dat schenktuiten hoekig zijn, want dat is minder esthetisch.

Meestal wel. Maar je moet ook weer opletten op dat hij niet te hoekig wordt, want anders gaat het chippen.

En als je dat allemaal gedaan hebt, is het tijd om het te laten drogen. Hier zit ook het verhaal van het laten drogen tot een leerharde staat, waarin je eventueel kan trimmen. Gek genoeg kwam dit niet terug in de interviews, dus ik heb gisteren bedacht dat ik hier een stap miste tussen het vormen en stoken. Ik had bedacht dat het er hier vooral om draait hoe nat het stuk nog is. Ik vraag me nog af wat er gebeurt als je wil gaan trimmen als het net iets te nat of net iets te droog is.

Als het te droog is, dan breekt het. Dan kan je ook heel moeilijk trimmen. Als het te nat is, dan zakt het in. Dan kan je het niet vastzetten, dan plakt je ijzer vast, dan plakt je aftreksel eraan vast. Dan heb je heel veel extra werk.

Veel gedoe, dus.

Ja. Je wil echt het juiste moment afwachten.

En het juiste moment bepaal je door te voelen?

Ja, en dat is ook weer persoonlijk. De één vindt het fijner als het wat harder is. Dan kan je hem wat steviger vasthouden en wat groter draaien. De ander wil hem liever wat zachter vasthouden, zet zijn ijzer er tegenaan en klaar.

Ik heb ook wel mensen gezien die met een metalen schraper langs een volledig droge pot gingen om er bijvoorbeeld een achthoek in te schrapen. Toen was het echt zacht en helemaal droog. Het viel er als een soort stof af.

Dan is het porselein geweest. Dan doet het type klei weer mee.

Is porselein heel kleine kleiplaatjes?

Porselein is vrij grote kleiplaatjes. Het is primaire in plaats secundaire klei. Daardoor is hij zo niet vergevingsgezind. Daarom is hij zo zacht, zeperig bijna.

Want de kleiplaatjes glijden makkelijk over elkaar heen. Het is ook een lange klei.

Ja, het is een heel lange klei.

En als de klei helemaal goed droog is, dan kan je gaan stoken en eventueel gaan glazuren.

Ja. Vroeger werd geglazuurd werk één keer gestookt, of twee keer als het een duurder werk was. Dus eerst de biscuitstook om de klei te harden. Daarna is de klei minder kwetsbaar om te glazuren voor de tweede stook. Vroeger had je een één-bak-procedé. Als het bijna droog was, ging het glazuur erop en dan werd het gestookt. Bij het twee-bak-procedé ga je één keer helemaal droog tot 1000 graden. Dan is je klei geen klei meer, maar keramiek. De chemische samenstelling is dan wezenlijk veranderd. Je hebt dan veel minder risico dat het werk instort als je hem glazuurt. Met duurdere stukken gebeurde dat vaker.

Voor de zekerheid.

Ja. In de pottersvuren langs de Vecht heb je dat ook heel duidelijk staan. Bepaalde vormen, met name de grote, platte vormen, hadden heel veel risico om in te zakken. Dat waren de duurdere vormen, die dus ook in twee fases gebrand werden.

Zou je het in drie fases kunnen branden?

Ja, of vier, of vijf. Celendons bijvoorbeeld. Chinees aardewerk werd vaak vijf, zes, zeven keer gebrand. Je krijgt dan een heel dikke, bijna transparante glazuurlaag. Na elke keer branden wordt er een laag glazuur bij gezet. Dan krijg je een heel dikke laag glazuur, die je er normaal gesproken nooit op zou kunnen zetten. Celedon is een type glazuur. Tegenwoordig is het ook een kleur en een techniek, maar het is eigenlijk een type glazuur.

Dan heb ik nog een laatste vraag: wat bedoelde je in het interview de vorige keer met pianovingers? Ik dacht dat ik daar wel uit zou komen, maar ik kwam er niet uit.

Als mensen gaan draaien, zie je vaak dat mensen hun hand zo [vier vingers dicht tegen elkaar aan] op de vorm zetten. Maar je hebt je gevoel op de vingertoppen, niet langs je kootjes. Dus ik zeg dat je moet werken met pianovingers [vingers gespreid en licht gekromd], alsof je piano speelt. Omdat het zachte deel van je vingertoppen het gevoeligst is. Als je draait met het uiterste puntje van je vingertoppen, dan heb je het risico dat je je nagels meeneemt en dat is niet handig. Dan moet je weer krassen wegwerken. Met pianovingers kan je ook de hele vorm voelen. Bovenaan voel ik wat er is gebeurd en onderaan wat er gaat gebeuren. Het is heel soepeltjes.

En als je hem optrekt? Ik kan me voorstellen dat je dan wel graag een groot plakkaat wil vormen.

Klopt. Je doet het met een klein stukje vinger zodat je weinig remkracht hebt. Je duwt het dan vanbinnen een beetje plat in je vorm. Je doet eigenlijk dit [doet het voor: gestrekte vingers, middelvinger een beetje naar binnen en wijsvinger er schuin achter]. Sommige pottenbakkers doen het met de zijkant van hun opgerolde wijsvinger als het heel zwaar is. Dan hoeft je nog niet subtiel te zijn. Je werkt dan met de zijkant van het tweede kootje van je wijsvinger.

C.2.2 Interview and demonstration transcripts (translated into English)

C.2.2.1 Transcript of interview with P1 (translated into English)

<u>Interview with P1, 12-4-2025 (17 min)</u>

How do you view skill in pottery?

I am no longer a beginner, because I already understand the technique of centering, pulling up, and making different shapes, but I am certainly not an advanced person either. I would like to place myself somewhere in the middle.

You are now describing the level of your skill. How do you notice that you are becoming skilled?

I notice that I am increasingly able to make the shape that I have in mind. What I still find difficult is that, for example, I have thought of a number of centimeters for the height and width and that it does not work. But a ball or cylinder works; the shapes are already going reasonably well.

How does the process of arriving at a certain shape go?

I notice that I really notice that I want to arrive at a certain shape. At first I had not yet thought about what shape I wanted to make. I was mainly concerned with pulling up the clay. Now I already have a much better shape in mind and then you start in a different way. Then you take other steps in between.

What other steps do you take?

I am now learning the difference between a bowl shape and a cylinder. You really open it in a different way and pull it up in a different way.

And where is the difference?

For a bowl, you start with just a point in the middle and from there you go to the side and you have to think more of a flower pot shape. That is also how you pull it up. With a cylinder, it is straight and you are also constantly trying to get the clay back to the middle to maintain that straight shape. If you ultimately want a bowl, then it should stand outwards.

And you pull that outwards too?

You pull it up in a diagonal line outwards.

How do you experience making ceramics in general?

Super relaxing. You are completely occupied with your body. Of course, you have to think about the techniques in your head for a while, how you should hold your hands or do this or that, but at a certain point that also becomes more automatic. You notice that when you get stuck, so you make mistakes and you really have to think again. How come that happened? What's more, things are just very much about your body and your feelings. I work with my head a lot, so I really like that I can really find complete relaxation and peace.

Do you notice that you are busy with something in your head? Or is it really your body that is *doing something?*

You are somewhat busy in your head in the sense of thinking about what shape you are going to make. Sometimes you really have to adopt certain positions with your hands that you have to think about. I think that when you are advanced, you don't have to think about that anymore. A lot comes from your body then.

Which senses do you use?

Your hands. You feel how dry or wet the clay is, where there are bumps in the clay that you have to do something with. Your eyes too. You can see whether the clay rolls outwards or not, whether it is straight in the middle. You should actually feel all that too, you know. I also know people who are blind who can do all that, but I still have to see it.

You now mainly mention the sense of touch and being able to estimate thickness, so the distance between your hands.

That's right. You want that wall to be completely equal in thickness. If you have a thinner part somewhere, you want to correct that. Otherwise that becomes a weak spot, so you have to be able to feel that in terms of thickness. Sometimes you haven't walked it properly and then air bubbles get in. You have to learn to recognize that, otherwise you can't continue.

How do you recognize skill in others, in their actions and the object they produce?

In actions I see whether you are doing the basics well. Are you able to center it well? That is the first step. Are you able to pull it open and keep it stable? What I notice very much in actions with myself, but also with others, is that the more skilled you become, the more clay you can pull up with the first pull-up movement. In principle, you do three pull-ups. The first time I started, not much had happened yet. Now I notice that I am able to get higher and higher.

Where do you notice a lack of skill? Do you notice that you are able to pull up less in your first pull-up movement?

Yes, and that the wall on the side is not equally thick everywhere, that it is skewed to the side and not symmetrical, that you are actually using incorrect techniques.

What incorrect techniques do you mean?

How you pull up, which way you pull - right or left, but also how your hands are positioned. Are they hanging along your body? And how your back is positioned, how your lower back is positioned. You use your entire body from your butt all the way up.

How can you see such an incorrect technique in the final pot?

You don't necessarily see which wrong technique was used, but I do see that the pot is not right. Then it has a very thick bottom, for example. What I'm learning recently is this. This pot is mine (points to pot). The bottom is very thick and at the top it has a little arch to the outside. You can see from small things like that how someone is working on their design, for example with the edge. You can turn it inwards, you can curl it or straighten it. That you can do specific things with it is something you see *with advanced students. If you're really starting out, you don't see that. For example, this is a beginner's pot (shows beginner's pot). It's not a real circle. You can see that the bottom is not straight and that you see a point. You see the finger flow.*

"Finger flow"? I don't know that word.

It's a strange word. I made it up myself. With your finger you should pull this (the point in the middle of the bottom on the inside) outwards. But you can see a loose finger here, and there.

It looks like the whole thing just sank down.

Yes, and it doesn't look right on the outside either. I'll grab another one that I made. Here you can see that finger again. You can see a bump there. And a finger there. You don't really want that. You want it to be smooth in one go. You don't want a spiral at the bottom of your pot. And you don't want it to sink along the edge there.

I hear people talking about a tension arc in the pot. Is that a term you use a lot?

I don't... Another thing you can see from a pot is whether someone has made a base ring or not. This one (the beginner's pot) probably won't have that. You can also feel that it is very heavy. That is actually still much too heavy. You can't necessarily see it on the outside, but there is actually still much too much clay in this.

You can disguise it as firmness.

It doesn't matter in a vase, because it's just on the table. But it's not nice if it's a teacup that you drink from.

You don't yet teach, of course, but if you were to teach, which senses do you expect your students to use and how?

Especially feeling. I might have them throw blind, so blindfolded.

(I tell Diede about the research of a potter who blindfolded herself, started throwing pots, and guided her students in pottery while she was blindfolded herself.)

You also feel the distance of the clay between your fingers. I didn't feel that at all at first. You also feel the firmness of the clay between your fingers. That tells you whether there is a lot of clay or very little and whether it is about to collapse.

When you pick up clay and start working with it, what information do you collect? And during the process?

In that respect, it's easy for me. I know that the clay that Elly takes has to be fired at a certain temperature. If I were to start my own studio, I would have to know that myself. And I would have to know if the glaze I want to use matches the temperature at which the glaze can be fired. Porcelain is very difficult, because it is very soft. You also want to know the final color (points to various fired and unfired pots to show that clay changes color when it is fired). You first fire it low, then put glaze over it, and then you fire it high. You can use a glaze so that you actually don't see the color of the clay at all. The color of the clay does make a big difference to how the color that is under the glaze comes out.

What steps do you think are in the production process?

Rolling, so kneading the clay so that you knead the air out of it in a certain way. Weighing, because you have to know how much clay you are going to need. Then you have to put it on the disc and seal it to the disc. Then you run a wet finger along the side so that no air gets underneath. Then you're going to center the lump so that it's nicely in the middle. Then you have to open the ball, so create a hole in the middle. It's straight at first, but then it's more like a triangle downwards. You have to open it up in such a way that the side is about the same thickness on all sides. Then you have a kind of ring with a bottom and then you make sure that this ring is about the same thickness everywhere. You then have to pull that ring up. Then you have to shape it

(P1 shows me the laminated instructions for the steps, see Figure 55)

(I explain that in archaeology we use a chaîne opératoire to describe a production process. But such a process is very fluid and we try to chop it up into pieces, which is why there is a lot of criticism about it. The laminated instructions I see now are much more detailed than what is evident from the chaîne opératoire that I know, and you need that level of detail to understand what you are looking at when you only see the end result.)

If you make a mistake very early in the process, then the rest is actually no longer possible. It also seems difficult to me to divide this process into steps later.

C.2.2.1.1 Picture of step-by-step instructions for throwing a narrow bowl shape

Figure 55:Figure 54, repeated first time. The step-by-step instructions for throwing a narrow bowl shape that P5 keeps in the workshop for teaching purposes.

C.2.2.1 Notes of interviews and demonstration with P2 (translated into English)

C.2.2.1.1 Notes of first interview with P2 (translated into English)

First interview with P2, 6-3-2025 (45 min)

How do you view (your) skill?

It is an automatism when you make something, where you do not think much consciously. The pot you want to make is there, or in your head. I do not see it, but I know what I want. It is second nature. I know how much clay I need approximately. You do this and that and then you end up where you want. You do not have to use all your senses to make something. In the studio we have a very good blind potter. I myself sometimes look around when I am throwing. You do not have to be extremely focused on it. You have to do it a lot and then it will automatically become part of your fingers. According to my teacher I had a very steep learning curve. That is possible, because I had studied pottery for 10 years and knew what it should look like. You also have to learn that as a potter: you have to hold the pot and know how thick the walls are. You have to know how much clay you need and what you can still remove. Yes, and that is also the tricky thing about skill: some things are just your thing. I can imagine the thickness. The pot is in my head. I know what it should look like. My hands only have to do something. It is easier to make something that you already know.

How do you experience making ceramics in general? Which senses do you use?

Sight, but it can also be done without. Especially touch. Smell is not essential when throwing. Perhaps when baking in a fire-fired oven, but I have no experience with that. You can also hear when it is dry, but only later in the production process. But usually you do not knock, but you feel.

How do you recognize skill in others? And a lack of skill? (Action and object!)

You notice a lack of skill because people start complaining themselves: “My pot is not as beautiful as yours.” Aesthetics is a tricky one here. You can see it in the pot that it is crooked or irregular. Then people have been too impatient. Or you can see it in clay that has too many air bubbles; then they have done something wrong with the throwing. On the potter's wheel you then pierce it with a needle and then you fill it up again by continuing. When you start throwing again, you automatically push clay back into the hole. You can see in the finish, whether or not someone has applied decoration, or glaze or not. Regularity in the decoration only counts if it was a conscious choice to do it regularly.

When you teach, which senses do you expect your student to use and in what way(s)?

I have given some one-off workshops. These were aimed at reproducing a form or a technique. For such a one-off course you want to send people home with a good feeling. So if their clay has dried out, you give them new. With industrial clay you know exactly what you are getting. Clay from nature *is much softer and less firm because of algae, for example. You don't know what is in it and therefore also not how it bakes.*

What is your relationship with clay?

Most people start because they like it. I studied ceramics for 10 years. Then I wanted to do it myself. I started from the scientific angle and mainly started to copy Roman stuff.

When you pick up clay and start to play with it, what information do you collect?

- *Moisture (you will notice this while walking)*
- *Weight compared to what you want to make (practice makes perfect with better estimation).*
- *Color a bit, but says little about the end product*
- *Inclusions are very hard to feel when walking (you push the grains of sand in), but you will notice them well when throwing*

C.2.2.1.2 Notes of second interview and demonstration with P2 (translated into English)

<u>Second interview + demonstration with P2, 13-3-2025 (60 min)</u>

The operating chain and possible topics for perceptive categories:

Source raw materials

- Raw clay
    - Feel softness (silt) + stickiness -> more silt is more sticky
    - Make a ring: does it crack? -> elasticity, has to do with inclusions
- Procure temper -> depends on the purpose. Cooking pot preferably coarsely leaned, tableware not. In the past: availability + culturally determined
- Procure fuel -> some types of wood are more or less suitable, burn at a different speed (there is research on this). Not relevant for modern kilns

Transformation to potter’s clay

- Wedge clay
    - Feel elasticity (what happens but you don’t notice it right away: clay plates get oriented in the same position)
    - What you notice: **plasticity**
        - Water that disappears. First it stays on the table, then it sticks together more and more

- Too much walking: too dry (then more water, then becomes less formable) or too much air (air bubbles that form, if they are not repaired, you will notice that during firing)
- Too little you will notice: microscopically you can see that the plates are going to lie in the same direction. So then less with less walking. But difficult to see afterwards

- Considerations for what to wedge on: drywall plate absorbs less moisture and clay sticks less to it than to wood. Hit the clay together on the board to prevent air bubbles. Slight dragging to walk the clay, not just rolling. Add water: cut off a slice with a cutting iron, press holes in the slice with thumbs, drip water between each slice. Type
- PERCEPTIVE CATEGORIES:
  - Moisture: “too little”, enough, “too much”
  - Plasticity: rough
- (Add temper, if applicable
  - Feel/SEE grain size inside of clay (Usually not feel, but look)
  - Feel amount of temper inside of clay)
- Sealing the bottom – finger along the bottom. Dab moisture under the lump of clay, otherwise it will start sliding away
- Press hands against it from the outside
- Press down with a flat hand
- Goal: centre clay on the disk and make a compact, round shape
- Cupping of the hands to make the shape narrower
- Open clay: press thumb in the middle and pinch the outside. Useful to know what kind of pot you are making so that you know how deep you have to go. Keep clay at the bottom (save for foot). You can pull up a maximum of 3 times, 4 is not desirable (too unstable). After each pull up, push inwards again with the flat hand on the outside. Because clay wants to move outwards due to centrifugal force. Rounding from the outside after each pull up stabilizes the shape
- You also add water after each pull up. If you do it too often, it becomes too wet and too thin and you create weak points. Hands try to touch each other continuously for more control and stability in the shape
- Pulling or throwing too quickly: irregular distribution of clay and irregular shape
- Tension arc can be gone ("that rounding on the inside")

- Tension arc is gone: then the clay collapses. Has to do with gravity and distribution of the forces (think of vector arrows). Making grooves loosens the arc shape.

- Remove an edge of clay with a needle (awl)
- Two hands: push out from the inside against the outer hand
- With a lomer you can scrape off the clay on the outside and make the clay a little drier
- Make a groove with a wooden spatula
- On the wheel: only remove extra supporting clay when the pot is a bit drier and more stable
- Cut the pot loose with a cutting iron, place it on a piece of newspaper
- The pot is now dry enough to form angular shapes in it. Then you don't want to turn it anymore -> as little as possible in general so as not to loosen the tension arc
- If the clay is too dry, it will stick to your fingers. If the clay is too wet: loss of firmness, unstable pot. Too plastic

  ------throwing pots from only the upper part of the clay on the wheel is called “throwing from the mast”------
- Second easier option: clay was either spinning too quickly, or uncentered. Walls not quite
- equal thickness due to not being perfectly centred
- You can already start decorating while throwing
- Tension arc: you can let it slacken, then it can fold over itself
- Remove with cutting iron: can be done in a straight motion, can also be done zigzagging. Then you get round arches
- Turn in leather-hard clay (demonstration with clay that is still too wet, so fix it on the turntable with pieces of clay. With a hole tool you can remove the leather-hard clay in worms and you can also make a stand ring from it. With a lomer you can smooth things out again and pull the inclusions along, with a sponge you can straighten that out again

- Some steps are very clear, others are much more fluid and can be done at different moments in the process

- Pull ear: wet enough, must slide well.
  - Too wet: does not stick well to the pot, shape slackens.
  - Too dry: does not slide
- Pulling the ear: wet enough, must slide well.
  - Too wet: does not stick well to the pot, shape slackens.

    - Too dry: does not slide well and may tear off.
- Pulling the ear is the strongest. Coil is not strong, pressing is possible, has been done in some periods. Position of fingers: want to make a good shape
- Cut off the handle with a wet knife. Moisten the handle and the pot wall, round off the handle. Press the ear against the pot, smear/rub the ear against the pot wall with your thumb. Also smear the bottom against the pot + smear in 1 movement and pinch off the remaining piece of clay with your thumb + a little dovetail for extra strength

C.2.2.3 Transcript of interview with P3 and P4 (translated into English)

<u>Interview with P3 and P4, 12-4-2025 (36 min)</u>

How do you view your skill in pottery? And skill in general?

P4: So what level are you at?

Yes, but also more abstractly. Is skill something that is separate from you, is it in you, is it something that comes from you, is it something that is yours.

P3: For me, it is in me. I have always worked with my hands. It is a form of working with my hands. It is a part of me. I also see it as a talent that you can make things with your hands and I had that in my work too. I was an ophthalmologist and operated a lot. So it is in line with that that I do things very easily with my hands. It is an absolute extension of myself.

It just presents itself in a different way.

P3: Yes. For example, I cannot draw, but I can very easily make or do what I want to do with those hands, without having to think about it.

P4: I recently made a pear, a beautiful pear. My sister makes a pear, and then... I wonder how I can actually make a pear. Apparently I can.

P3: Can you draw too?

P4: Not very much.

P3: I haven't really tried it with real existing shapes, so I also find proportions difficult. But when I'm working, it comes naturally.

P4: More that intuitive thing. I just learned Japanese painting. At least, two hours, sumi-e. But with that calmness, there's a kind of swing in it. You put it down like that and take it away like that. That's more of a technique. It's not like: make a Rembrandt painting. I can't do that. But learning that technique... I could do it.

P3: Did you do that with Caroline?

P4: Yes.

P3: Yes, I did that last year. It was very difficult, but now I saw that roll and I thought: oh, they're really nice!

P4: That's really the technique, isn't it?

P3: Yes.

P4: Yes. But if you're really talking about skill, like with doctors... Or playing the guitar, or driving a car. That's really that hand-eye coordination. It's really cool to develop that.

P3: It's also a real talent, but you have to develop it through technology. The funny thing is that music is another part of your brain, in my experience. I can't do anything with it.

P4: It's just like here. If I have a bad day, then I know: my brain has learned something today. Nothing came out of my hands, but my brain. My hands now know where the boundaries are and what I shouldn't do anymore. You develop that a lot. And you have to be doing-doing-doing. Speaking of skill: at the age of ninety I still can't make a good bowl, I think. One day I can, the next day I can't. It's bizarre. You keep learning. I'm working on porcelain now and I'm so frustrated. I'm like a beginner again.

You've been working in this field for quite some time now. It really looked pretty good.

P4: I had absolutely no control today.

P3: But when you see the things you made today...

P4: Yeah, but we made those with Jose. It's really like starting over. It's new clay. In terms of skill: it's really fun when you can work with that clay, but with porcelain you start over again. Then there's a new technique. I don't think we will be finished learning at the age of ninety even.

How do you experience making ceramics in general? And which senses do you use?

P4: Feeling.

P3: Feeling, but also looking.

P4: Yes, that's more when you're copying something.

P3: Yes, but also a shape like that. You feel it, but you do check it with your eyes. And which shape you wanted to go for. You also check that a lot with your eyes.

P3: That's one of them too. You have to think in advance about what you want to make, otherwise the clay will take you in a direction you don't want.

P3: The primary thing is feeling.

P4: You could do it blindly. What do you feel then?

P3: What you intend to feel. You feel that you are taking that clay with you. You feel the shape, the texture.

P4: I think of that softness, that [makes slush and slurp sounds]. That flowing, that sloping of that clay. If you can do that at a certain moment... And he [Jose] does that very well. He really goes in with his fingers. And then it comes up, and then a fist in it, and then it comes up, and then you are already there. It is a kind of massaging of the clay. Sometimes that goes very well, sometimes not.

P3: That is not from moment one.

P4: No. But it is a kind of wave movement.

P3: Yes, varying from complete ecstasy to complete frustration.

P4: I think you feel that very much when it's going well. It flows from this to that. Then you're actually done within four minutes. Then it has to be there. If you just keep going and it just won't work... with one hand this, and your elbow, and...

I also just heard some things about your whole body participating. Is it really true that you completely go along with the massage movement?

P3: If it's going well, yes. If it's not going well, you stiffen up.

P4: I've fallen off my stool once. I was going to turn like this, and then [demonstrates how she stiffened in her movement and almost falls to the side].

P3: It also sometimes happens that you stand up straight in concentration [from behind the potter's wheel] so as not to knock anything over.

P4: The potter's walk.

How do you recognize skill and non-skill in others? In their actions and in what they produce?

P3: How they are working. There's a girl there [in the studio]. Her father and grandfather also have lessons here. She's been coming here for a while now and doesn't have that much experience with throwing. But you can just see that she has talent.

P4: I think it's the peace and quiet that's in it and the balance of building it up. You need all the basics to get further. You have to be able to wedge the clay well to have nice clay to throw with. If you don't have that, it quickly becomes nothing. You have to be able to center. If you can't do that, it quickly becomes nothing. You can see if someone takes the time and effort to do that. You have to build up *solidly, so that it stands well, and then do that last action. Those are the steps, how you make them. If you don't do those initial steps well, and you're not skilled yet, then you really see that in steps two and three and four. Then it's just not a balanced pot.*

P3: That's a difference with someone who is very creative and makes very beautiful things. If you think about archaeology, then you sometimes see really fantastic things. If you look at the quality of how it is thrown and used, it doesn't have to be very good at all. But it is simply made by a very imaginative person. But you also see how skilled someone is. If you look at the Chinese and Japanese, you see that they have worked for hours and hours and there is simply a lot of skill in that. If you just train long enough...

P4: You can also see that in a José Mariscal. For example, he has zero rotation on the inside. So he has the inside completely smooth. There is no finger in it. It is one beautiful, smooth, thin wall. Bizarre.

P3: He was three when he started.

P4: We should not compare ourselves to that.

P3: You see it in how someone is working and in the objects.

P4: And in the subtlety of the shape. I can make the same shape as Jose Mariscal, more or less, but he has a very elegant, beautiful vase and I have something completely different. A very clumsy pot. My bottom may be just as wide, the top may be just as wide, it may be just as long, but it is a completely different quality pot. And you notice that very often. Then you think: oh, great! And then: oh, okay, that's also possible.

The next question is about teaching, do you have any experience with that?

P4: I teach.

Okay. The question is: when you teach, which senses do you expect your student to use and in what way?

P4: That's really funny. I teach very few pottery lessons, because I don't like teaching. I'm not nearly as patient as Elly. I want them to listen and do what I say, but they don't. You notice it after half an hour. Then they're completely in that pot. Then I say: you shouldn't sit in that pot, this is the world. They have to breathe calmly, shoulders have to be loose, you have to be relaxed. I'm just pulling hands away and telling people to relax. Sometimes people get into an error. You're cramming so many skills into them. I really like that in the first lesson. That's also the lesson I teach. But in lesson five I think you have to listen to me seriously. Then you have to understand that if you don't do what I say, no pot will come out.

P3: Then the ears are actually the most important. Hearing.

P4: Haha, yes. Listening is the most important. And concentration.

P3: Nothing is as frustrating as someone not listening.

P4: Elly says it too: you can repeat it twenty times. But only when you are ready for it, then you absorb it. So apparently I don't have that patience. [...] I don't think I am strict at all, but oh well. So I teach more sculpting lessons and then I find everything fun and beautiful. You are making fun things and it is much more creative. Really a completely different discipline. To teach throwing, you really have to be a very patient person.

Something else that I also think is important, but that no one has mentioned yet, is the moisture of the clay. How flexible and how hard the clay is, and whether it is warm. Do you expect your students to pick that up themselves or do you encourage that?

P4: That really depends on the stage of learning. You can tell someone twenty times that they have to feel how wet the clay is, but sometimes they have no idea. At some point you make that connection, and you understand why your teacher keeps telling you that. That is how it works. You have to start feeling that. What was the question again?

When you teach, which senses do you expect your student to use and how?

P3: Their hearing because they want to learn and of course their sense of touch and their sense of sight. You don't need smell, and you don't need taste either.

P4: [whispering] And talent. Can I say that? Some people really want to, but that's just not going to happen. Sorry. Right? [at normal volume] That's not fun teaching either.

Have you ever had that?

P4: Yes, a lot.

P3: Now I teach friends and people who just like to throw. I like to do it for a while. They are very surprising people who really listen. They make beautiful things. And attitude.

P4: That might be a good one. I never want to work with children. They have come over sometimes. I only realized it when a friend of mine came over. I was explaining things and she was really sitting like this [she demonstrates how her friend looked at her with big, attentive eyes]. I thought: I know we know each other well, but I find this really awkward. And then I suddenly thought: damn. She's also very creative. Children do that too. They listen. And then: like this? Yes, like this. Adults sit like: oh, oh, oh, I really don't remember what you said. Still, that listening. I have two pottery wheels at home. When people come to sculpt, they can also throw. I don't teach them anymore. I walk around and will sometimes correct something, but then I still sometimes think: you've been coming here for three years... I can't handle that very well.

I understand that. What is your relationship with clay?

P4: I can't live without it.

P3: Yes, me too.

P4: I made it my job. I quit my job and started thinking about what I wanted to do. I thought: if I could wake up every morning and play with clay all day, how fantastic would that be? That's what I did.

P3: Actually, the same for me. I had a really nice job, but I was always looking for something... I worked with wood, tried to draw, worked with fabric. Clay is actually just the best material. When you make clothes, the process is the same. Someone told me that recently. Then you're knitting really nicely, and then it's done, and then you think: I'm never going to wear that. With pottery, it's different. If it's not what you like, you flatten it, go for a walk and you can do it again with just as much pleasure. But very often I'm very happy with it.

P4: I also sometimes have times when I'm completely done with it. Then I go do something else and I quickly go to Pinterest and see all kinds of things that I want to make. Before you know it, you're busy again.

P3: Yes.

You also throw at home?

P4: It's my job. But because of that I notice that I don't feel like hanging around for a long time to make something for myself.

P3: I do it at home.

P4: We'll put something in the garden.

P3: I do it in the garden too.

---[Less relevant conversation topic in between.]---

P4: I'm now a member of an art society and they are mainly painters. There are exhibitions and they have paintings hanging for 300, 400, 4,000 euros. Then I stand there with something quite beautiful, creative for 90 euros and they think that's too expensive. Also such a big pot, you know. You can buy that at Albert Heijn now for 50 euros. But it takes a few years before you can do that. There is also a lot of money in such a pot. But people do not see it. You still have to start thinking stupidly commercially in that respect. What am I going to make? Almost no one sees your skills, except *someone who also makes ceramics. You also see that with the firing forms. That will also come to feature in archaeology.*

Do you mean reduced and oxidized?

P4: Yes, but also raku firing, Japanese firing, for example.

---[Less relevant conversation topic in between. I am talking about my thesis subject; the profession of the metalsmith in the European Bronze Age is very likely structurally overvalued in archaeology. The reverse - structural undervaluation - may also occur among archaeologists and perhaps also in societies in the past with regard to pottery, even though I cannot (yet) prove this with certainty and my research is not about this either.]---

P4: Just like now actually. The funny thing is that if you sell your pots, there is 21% VAT on them. For art there is 9%. So I wrote a piece about that. It ends with the question of whether the civil servant decides whether what I make is art or consumer goods. So I started making things on the potter's wheel that you can't use. Then it can't be called consumer goods. As a kind of statement. We really are that little child that falls in between. You can imagine that the stuff from Blokker is mass-produced. Of course, that's consumer goods and that's 21%. But that's different from what we do. What's the difference? That's what makes it so frustrating. Even if you're at a market: do you also have this in black? Then go to Blokker or something. But it's funny that that was already a bit of a neglected child back then.

That's an assumption. I haven't found much about it in articles yet. It is the material that is most commonly found in archaeological excavations and it doesn't always get the detailed attention that it perhaps deserves. There are often very practical considerations behind that.

P4: I'm thinking for a moment. The firing methods are also an essential part of ceramics. That is also a significant difference compared to Japanese or Chinese methods. An African pot is also very different.

C.2.2.4 Transcripts of interviews and demonstration with P5 (translated into English)

C.2.2.4.1 Transcript of first interview and demonstration with P5 (translated into English)

First interview and demonstration with P5, 12-4-2025 (60 min)

How do you view skill, or your skill?

In what context?

Especially in how you experience it, mentally and physically.

That connection.

Yes.

Skill in pottery is very much doing-doing-doing, really getting flying hours. Eventually you internalize certain movements. Then you also get that muscle memory. And certain sensitivity in certain places that you normally don't have. For example my fingertips. It doesn't matter what I do, I always touch. I don't have to look. P2 has that too; he doesn't have to look. He knows how much distance there is between his fingers. Those are skills that you need for pottery. I think that's what I mean when you ask me that question.

What is it like to throw something? What do you think about, what don't you think about?

If I want to make something, I want to have a certain speed in it. That is A) because I simply like working that way, because otherwise it takes forever. And B) the clay asks me to keep working. If I work too long, it will collapse, because it will become too wet. These are considerations. And how does it feel to throw? ...it feels nice in your hands. It feels very earthy. You are drawn to it. I have to keep my attention on the clay, otherwise it simply won't work.

Which parts do you pay more attention to and which less?

Centering is the most important thing. That happens very automatically, but it really has to be paid attention to. It is no longer very conscious, but it has to be good. And whether the shape resembles what I have in mind. That also means that you occasionally take a look. Those are mainly the parts that I pay attention to. And the thickness, but that is almost automatic. Not too thick, not too thin.

You are actually constantly working on the end result, and perhaps less on how you get there? Am I saying that correctly?

Yes, not anymore. I have all those steps for my students. They are hanging over there. These are the steps they have to take in broad outline to create the basic shape. These are the shapes that I actually still do, only you don't see them anymore. With me, one thing flows into the other and then it's there.

That flowing makes it difficult for us as researchers to chop it up into pieces, but it's where you can find the speed.

That creates the speed. The steps are, for example: you pull up three times. Or here step three and four, I do those in one step. And because I get enough clay in step four, I don't have to do step five. And I often only have to do the pull up twice. I tell students that you can do that a maximum of three times. With me, step seven is the second or third pull up. In my last pull up, I already do step seven. You already have a lot of things... it's already there.

I also saw it partly combined with P2, I think.

Yes.

He also said that he picked it up quickly.

He picks it up very quickly indeed. At the end of lesson one, he was at lesson three. I think that really depends on the fact that he already has that finger sensitivity, because he has felt it with clay before. He already knows how much distance there is between his fingers. I think that is one of the most essential things to be able to throw well. Knowing where one hand is in relation to the other hand and how much distance there is between them.

In archaeology they also oftentimes look at wall thickness to determine skill. It is also considered important there to determine skill. Which senses do you use the most? Is that mainly that haptic sensitivity or is more at play there?

The largest part is indeed that finger sensitivity. And looking a little. But you can't see a lot. My students sometimes say that they can't see what their hands are doing. Then I tell them that they don't have to look at all. You have to feel. I think that's really it.

(I tell about a practitioner-researcher who teaches pottery blindfolded.) How do you recognize skill in others, and a lack of skill? It is a split question; how do you see both of these things in actions and in the end product?

The object is the easiest. Nine times out of ten you look at the difference between top and bottom. That is very important. If it is even, then you are well on your way already. And if the shape is right, again something vague. You have a certain golden ratio; can you make that?

The golden ratio depends on the object?

Yes. With a bowl it is fairly easy to think of. With a bowl the base is a third of the shape. When you start, the height is about the same as the width. That is approximately the line. With a cylinder or a vase shape you always want a certain height. You then divide that approximately in half and the widest point should be just above that. The top is just a little wider than the base and the rim is just a little wider than the base, not narrower. Sometimes this is different, like with those pots for the Arnhem Open Air Museum. I deliberately did not throw them all according to a scheme. But with the right pot, for example, you can see that it is a little plump at the bottom. That is because the bottom is wider than the narrowest part. The top diameter is the same as the bottom diameter. If you divide the curvature, then the widest part of the curvature is almost in the middle of the entire curve. That makes it plump.

And with that other one, the curvature sits further upward.

Yes. It is already quite wide in relation to the height, but you can see that it looks more elegant than the jug that is there. With that left jug, you can see it completely, because the curvature is lower there. It is a bit more compact. These are indeed the technical skills. What I can see whether someone is skilled or not during the process depends very much on their posture. How are you sitting, what are you doing at what moment, what is the position of your hands. I always say: you do not throw with this [leans forward, supports with elbows on thighs and moves the indicated forearms]. You throw with this [indicates the entire torso and trunk with spread hands]. Usually when people start, they have a lot of tension in their arms. But then you block your movement and push through your pot. You always see that at the bottom as too much pressed inward. If you tense your core and make your movement from your pelvis, you can see that immediately in how your pot comes up. That also makes sense, because when you sit like that [leaning forward, elbows on thighs], you can't go any further with your hands. That's not possible. Here [sitting upright] you have space with your hands. The only thing I pay attention to when it doesn't go well here is that you tense your stomach and that you sit up straight, behind your sitting bones. I keep shouting it, every time. They all know it too.

And, of course, they notice it very quickly when they push through it, because they have to start again. Are there also pots where you can see afterwards that there is no completely free movement?

Thinner at the bottom, thicker at the top. Playing with your rotation speed is also such a thing. If that doesn't go well, you can see that it is crooked. Or you make a spiral in your pot. Then your rotation speed is too low when pulling up and then you see that it doesn't stay at the same height for a whole round. As a result, you see that pot go crooked and often you can even see a real spiral on the inside. You can see it afterwards.

Even if you polish it away afterwards with a sponge?

This cannot be polished away for someone who recognizes it. I think you can recognize it. That it is very thin at the top and very thick at the bottom, you can hardly remove that, because then you lose your shape. And that your curvature is not straight, so that it is lower on one side than on the other. I think that is also almost standard and cannot be repaired. For me that is even very difficult to repair. Then I start over when that happens. With students I still try to repair it and I can get it out reasonably well if necessary, but really repairing it is almost not an option.

I often watch videos on Snapchat from a certain channel in which complete industrial or artisanal production processes are followed. Almost all craftsmen, regardless of the material they work with, say that if something goes wrong in a step, you actually just have to start over again. They also sometimes think in pieces of the whole process, but I think that as a ceramist you have to see

the whole process very quickly, because the shape is already there very quickly. You can't chop it up into pieces.

No, that's difficult. It is possible, but very difficult, almost impossible to do. It is a very fast process. What you have there [my 'more complicated' example] is ready within five minutes.

What is your relationship with clay like?

I always say: clay is like children. It keeps you awake at night, you have to get out of bed for it at night, it can't stand draughts, has to be treated in the right way at the right time or else it won't listen... That's my relationship with clay, to keep the vagueness in it a bit. I think it's a very nice material. I find it very grounding. I just think it's a very beautiful material, which also lasts. It doesn't perish, unless it breaks. Then it becomes pieces. But once clay is ceramic, it will never be clay again. I think that is a very nice principle.

When you pick up clay and start to work with it, what information do you collect? And during the process?

Before I pick up clay, I have to know which clay I need. What do I want to make and what will be its function afterwards? For something that eventually has to be heated, or that is going to be used for cooking, I use a different clay than for something that I am going to drink from. Then I feel how hard the clay is. And the homogeneity. Do I have to do something with that? I feel the quantity, the weight.

What do you mean by hardness?

If my clay is too dry, I can't throw it properly. Then I have to put too much energy into it.

Are plasticity and stiffness synonyms for that?

Plasticity is, and hardness. A clay that contains a lot of chamotte, stone dust, is harder in itself than a smooth clay without chamotte. There is a huge difference between them. I feel that too. I am also aware of that. What kind of clay do I have in my hands? Okay, then it can be that hard.

So you already have a mental framework of the hardness you need.

Yes. If I know that I am going to make a plate, then my clay has to be much softer. That has nothing to do with plasticity. My clay has to be softer than when I make a large jug. That doesn't even have to do with the chamotte. You use softer clay for plates, because you have to perform a different action than with a jug, for example. For the height you need a different hardness, stiffness, than for a plate.

So you choose a clay based on how it behaves during the forming process, and not based on the end result.

Yes. Now what kind of information I collect during the process. During the process I feel whether the clay does what I want. Does it get centered, for example? If I can't center it, then I know there is an air bubble in it. So that has to come out first. I feel the clay whether I am at the end of the clay. Whether the clay is getting tired, as you call it in technical terms.

When does clay get tired?

Clay gets tired when it has been through too much. I always say: clay consists of clay plates. These are small, flat, octagonal plates with water between them and that is why they can slide over each other. Before you start walking your clay, your clay plates are lying in all directions. When walking you try to lay them like roof tiles. When centering you do that again. During the entire process you make use of the fact that it can slide over each other. So you try to prevent the clay plates from getting too far apart and flopping over each other. Then the work collapses, is the idea. During the process you can feel whether your clay is at the point where A) the clay becomes very soft, but also that it becomes B) very floppy. It then starts to flutter under your hands. If it starts to do that, then I know that I am at the end of my clay. Then I can no longer say that I am going to continue. Then it is simply finished. Then you also get to the softness of the clay. How saturated with water is it then? That is important. Then I also know whether I can pull up more, or whether I can roll more. You feel that. When throwing it off, it is a very difficult one I think. After a while you can tap the clay and then you feel how thick it still is. You hear and feel how much you can still throw off, without having to pick it up.

Do you tap with your nail?

No, with the inside of your finger.

But that's quite a dull feeling, isn't it?

Yes, it's a very dull feeling and a very dull sound. I feel and hear that combination. You may see that later with students when I ask them to feel how thick it is. Then they know whether or not they can still throw it off.

And you expect your students to observe that?

I do try to teach them that. I start doing that when they first arrive here. They really won't succeed then. I think it will take a year or so before you get a feel for it. I also let them hear and feel it. In the end, it goes that way every time. At the end, I check whether my shape matches the shape I have in mind. You feel the thickness during the process.

(I show the image of the chaîne opératoire (Sofear in Bender et al. (eds), 2018, p.83)

That is a very smooth process here, I must say. In fact, yes. I understand what you mean. We have not talked about firing at all. That is correct. We are also very busy with that. You also make steps there and you think about when you can fire something and when you cannot.

As in that you first wait until something is dry enough.

Yes, if I throw something in the oven too early, it bursts apart, very easily. It is still very old-fashioned, but I let finished work dry on the edge of the oven. The oven works on hot air. When the hot air goes in, it becomes vapour. Vapour expands and the clay shrinks. So it has to be dry enough. If I have doubts because something is very thin at the top and very thick at the bottom, for example, I will always put my tongue on the thickest part for a moment to feel how dry it is. You feel when it is clammy. If it feels like prawn crackers, so that your tongue sticks to it, then you know it is dry enough.

Archaeologists do that sometimes too, haha.

[Elly takes clay for the demonstration. She copies what I show her; the Frisian candleholder.]

Because of time, I won't be able to do the forming afterwards as well, but I can make the shape.

[Elly cuts clay from a loaf of clay and rolls the clay a few times. Then she places the lump on the middle of the potter's wheel, scoops water over the lump with her hand and turns the potter's wheel on. She folds her hands around the lump, seals the lump at the bottom with her index finger and starts to press the lump perfectly into the middle while throwing.]

I am left-handed, but I throw right-handed.

And the rings on the potter's wheel are purely for centering?

Yes, I get help with centering through the rings.

[Elly has centered the lump neatly. The walls are slightly slanted inwards and the lump is flattened at the top.]

When I work with little clay, I open like this [push thumb straight into the lump from above]. When I work with a lot of clay, I open like this. Then I have my whole hand and body to use. Here [with little clay] I have to do it by hand strength.

[Elly pulls the pot up with a smooth, flowing movement. With every movement in which she puts pressure on the pot from the inside and outside, her hands touch each other. Because of the muscle memory in her hands, she can estimate the wall thickness seemingly effortlessly. The walls are now slightly outwards. She rinses her hands in the bucket of water and rubs them once off the edge of the bucket.]

I'm taking some clay away here, because that's too much.

P2 said that he could estimate very well in advance how much clay he needed.

That's right. I already know that I have far too much.

[Elly carefully pokes through the wall with a thin metal stick, which cuts through the entire pot due to the rotation of the disc. She removes the loosened ring.]

'Throwing off the mast' means that you only use the top amount of clay on the potter's disc for the pot. If I have to make more of these kinds of shapes, I often do that. P2 probably throws using the knuckle technique. I have learned to throw using the thumb technique.

[Elly demonstrates the knuckle technique. She makes a fist and pushes into the wall of the pot with a curved, slightly extended index finger. She also demonstrates the thumb technique, in which she pushes her entire thumb against the wall of the pot.]

These are the two main ways to pull up. This is also done for very heavy work.

[She holds one hand on the inside and the other on the outside, fingers down and slightly bent, as if she is scooping up the clay.]

I learned it this way first. The disadvantage of the thumb technique is that the joint is now simply worn out. I still find it easy, because I learned it this way. But I teach my students the knuckle technique. That way it is much less difficult. The thumb joint is too complex. It has now become very unstable for me. I am now pulling up for the second time. I make sure that I really take my entire body from my tailbone into the pull-up. Many students sit with their elbows supported on their thighs. I always say: "Sit up straight!", so that they tilt their pelvis. That way I can control what I am doing much better.

It is much more cramped.

That is correct. The clay then just wants to go in all directions.

[Elly cuts off the top ring of clay again with a thin metal stick.]

When I make a shape for the first time, I often cut off a lot of clay. Eventually, I can figure out in advance how much clay I need. Then, for the next one, I will indeed have the right amount.

You are also constantly monitoring how much water you still need.

Yes. And sometimes it is too much. If there is a puddle in it, I dab it up with a sponge. Puddles are also not ideal for the clay.

[Elly takes a small sponge and dabs up the puddle of water at the bottom of the pot.]

Piano fingers.

[Elly carefully pushes the wall outwards from the inside with one hand, while she guides the expanding shape outwards with the fingers of her other hand. The movement changes to rounding off the edge with the tip of her index finger on the outside and the bottom of her other index finger on the outside, rounding off the edge.]

I think it's just a little bit wider.

[Elly pushes the pot a little further out. Then she carefully pushes the front of her thumbnail a little into the wall, creating a narrow ridge halfway and around the pot. Then she pushes a wooden spatula on the potter's wheel, closer and closer to the pot. In this way she removes excess clay; we call this slimming. I only notice the ridge later.]

You suddenly made that ridge. P2 didn't have that.

Yeah, just like that.

[Elly demonstrates how she would push her thumbnail into the pot.]

I'm going to make it a little wider, because it's just a little bit too narrow.

[She takes a lomer and holds the straight side of the lomer against the outside of the pot. She starts at the bottom and moves up twice in a smooth, calm motion, smoothing the entire outside of the pot. She finishes her movement by turning the lomer slightly inward at the top, rounding off the edge a little more. At the same time, she pushes the pot a little from the inside out with her other hand. She also pushes the lomer over the thumb ridge she just made, making it less deep. With a sponge she removes the excess clay on the pottery wheel and with the wooden spatula she defines the bottom of the pot, the base ring. The basic shape of the pot is now in place. After this, she guides the clay cutter with both hands on either side of the pot in a slow, controlled motion, sliding it as close as possible over the pottery wheel. Then she lifts the bowl with her hands folded and places it on another surface. The entire process from walking to lifting the pot, including giving comments and explanations, took about ten minutes.]

Actually, the basic shape is there now. Normally I would wait with further shaping until the clay is leather-hard, but we don't have time for that now.

Then we imagine that.

Alright.

Your rotation speed is actually also very important in what you do.

Yes. When centering, I have a high rotation speed. As the shard [the wall] becomes thinner, my speed decreases. Especially when I start working with a lomer and dry it, then my speed has to be a bit lower. Otherwise it starts to walk [wobble], which also happened briefly just now. I can play with this if I haven't centred it right.

Poor P2. At the faculty [where I had planned P2's demonstration] we have one electric potter's wheel and it can be put on hard or soft.

That's quite difficult. I also worked on a kicking wheel for years. You kick it yourself. That's where I learned it. That was very useful to me, because I learned to determine the tempo well.

A lot of steps have just happened that we didn't think about, but that you did perform. I don't know if you can see it in the photos.

It goes so quickly.

Especially if you also have to capture it in words, you have to think very precisely about everything that happens. And you know that you miss things.

Yes. I have talked quite a lot about it now. Normally when I throw a pot for a demonstration, I throw it for twelve minutes. Then I talk a lot - clay has to do this, clay has to do that. But then you actually have everything ready. It really doesn't take much time. You actually have to do the decoration in one go. That applies to all decoration, but certainly to those curls [the waves on the pot that were provided as an example]. That is really only possible if you put it up like this. I know this decoration well too. I often put it up for people. I just do that on the disc. I have my hand in it and I just keep turning it. I prefer not to stop in between, at most I grab it and continue straight away, not looking at anything else at that moment. Then I have it reasonably stable. If I don't do that, I go crooked, or my arch is suddenly completely different. I think that's important to take into account.

---[Less relevant conversation topic in between.]---

[Elly cuts the pot in half by going across the pot from top to bottom with a clay cutter.]

You can see that it's just a little thinner here [the wall between the middle of the pot and the bottom]. I don't have a flat part here. If you have a flat part, the tension arch is much less strong. When you throw a bowl, you want to have a continuous line like that, because that's just the strongest.

C.2.2.4.2 Transcript of second interview with P5 (translated into English)

<u>Second interview with P5, 12-4-2025 (8 min)</u>

Which sensory perceptible aspects of the production process do you think are the most important per step in the forming process?

When centering, it is most important that it is properly in the middle. That is the first part. When preparing for pulling up, it is important that it has the right basic shape to be able to pull up properly, so the straight lines and that it is not convex. It must be diagonal.

Can it stand upright?

No, then you will suffer too much from the centrifugal force. If you want it to be high, then you must have a pyramid shape. Because with the centrifugal force it will stand out at the top. If you then put the walls upright, then the edges will flop over. If you then want to get it back, then the clay is not happy with that. Then the clay plates will flip over each other, instead of staying neatly overlapping each other like roof tiles. So you want to keep it pushed inwards continuously. With a cylinder or a bowl, then the lump will stand like a flower pot. It should not be standing upright. The most important thing for pulling it up is that it gets to the right thickness. That is quite essential. Then the most important thing for finishing it up is that you finish it in such a way that it can be easily lifted off the disc. That means, for example, doing a good job of lamming it with a wooden spatula, or at least what you did before. Historically, the bottom has been cleaned up well. I think that could be a classification for this part of the process. These are the steps that I go through with my students. When someone is just starting out, I accept something much thicker or something that is much less cleaned up. When you are further along, I no longer accept that. Then it has to stand better when it really stands. When you pull it up, I also want it to be really evenly thin. In archaeology, of course, you only ever see the end product, so that is difficult. If you had to assess it in the meantime, these are the steps that I look at here.

That is indeed the tricky part: can you still recognize it afterwards if you have not done the base properly?

Of course you notice if it has not been centered properly, you notice that it will sag if the centrifugal force has been too active... Yes, so you can see the conical setting. You can learn to see - I think that that is very easy for people to recognize - whether the thickness has been pulled up properly. You can see the centrifugal force well. Not only because it is thick, but also whether it has been done three times or ten times. If it has been done ten times, the clay is weak and it will sag. You can also see whether the cutting has been done properly, but that is difficult. But you can see whether the centrifugal force has been compensated properly. I think you can also see the second phase with the thinning out. If it has not been thinned out properly there, nine times out of ten the bottom is not in the right position

What happens to the bottom then?

With a cylindrical shape you really need to have a flat bottom and then you set your shape. It has to be a decent 90-degree angle. If someone has not centred properly, so has not prepared well for the pulling up, then you often see that it is a bit all over the place. Then you see a lot of rounding on the inside of the bottom edge. The bottom on the inside is not smooth and it is not in a flowing line. If someone can compensate for that later, then you have a lot of experience as a potter. That means that it is someone who can do it. Then it is just laziness. But that is also how you can see that someone is not that skilled.

What exactly is cleaning up? I have heard it a few times now, but I still don't fully understand what it is.

That is that you remove the excess clay with a wooden spatula, for example. It is important that you do that, otherwise you cannot lift the pot off properly. That is the tricky part. If you don't do that, then you will see in the end result that it will be less even. But that is more difficult to see. Why I refer to that: in pottery now, there is very clear cleaning up and then also trimming. But back then, cutting was mainly done with a knife. So taking it off as we are used to now, did not happen. That is a modern way. In the past, that wooden spatula was also used much more as a knife, to ensure that the bottom edge was already well gone. That saves you a lot of work at a later time.

C.2.2.4.3 Transcript of third interview with P5 (translated into English)

<u>Third interview with P5, 12-7-2025 (60 min)</u>

I thought we'd start by choosing the right clay with the right hardness.

Yes.

What happens if it's just a tad too hard for the shape you want to create?

Then it starts to crack when you first start working with it, and you just can't center it. That's step one; you just can't get it in place.

Can you even work with hard clay? Or is it more suitable for figurative work?

More suitable for figurative work. I always tell students: "Adapt your clay to what you want to create." Centering with hard clay is difficult. If you continue with clay that's too hard, your work will crack during the turning process.

Is the clay too short then?

Yes. Nine times out of ten, it's too short. Then you have to add water. But that water doesn't mix well, so that doesn't work.

What if the clay is too long or too soft?

Then your work will sag. It's very easy to center, but you'll easily push it out of place. It's also sticky, so your hands get stuck and it twists.

Is plasticity different from hardness?

Yes, there's a difference. Hard clay is more likely to be called firm clay. If your clay is too plastic, then you'll have trouble building up the height, for example. With plastic clay, you're better off building up the width. For height, you use a firmer clay. It can't support its own weight. There's plastic versus dry, and there's firm versus soft.

Firm / soft is short / long?

No. Short / long is plastic and dry. He [points to a student working] is currently working with a hard clay that contains quite a lot of fireclay. It's harder to center, harder to pull up, but it sags very slowly. Porcelain is at the other extreme. It feels very soft. You can center it very easily. But you only have to look at it to see if it sinks. You feel how moist it is. Based on that, you determine whether it's a hard or plastic clay.

Then we move on to the amount of clay. How do you determine the right amount?

You can feel it. Sometimes I just use a scale. I also have lists of how much clay you can make something with. That's basically the basis from which you start. For example: for this bowl, it says 400 grams of clay with a diameter of 10 centimeters, 9 centimeters high, and a base of 4.5 centimeters. If you have a clay you're familiar with, you'll indeed be able to say more clearly that you can make something specific with a certain amount. For example, I know that for the same cup, I need 250 grams of one type of clay and 300 grams of another. I know this because I've made it so often. Some clays are more forgiving than others. With others, I lose more clay. With some, I don't have to cut away, with others, I always have to cut away a small edge, that sort of thing. It all depends on how much clay you choose.

And the fact that you can remove clay from the top also depends on the thickness of the wall. The firmer the wall, the harder it is to lift?

Some clays are easier to lift, but it also depends on whether you need support clay. You turn support clay. Then you know you need to leave more clay and that you need more weight loss. With a plate, that's a significant amount; about a 30% loss of the initial weight. Even if you're an experienced turner and have clay that centers easily. What often happens when you center with firmer clay is that a lot of clay is lost on the disc. You remove that, so you lose a lot of clay. So you start with 400 grams, but you only start with 350 grams.

That's something you can't easily compensate for. By definition, you won't reach the final clay weight.

Choosing the amount of clay is crucial. You can compensate for that to a very limited extent, but there are many choices. It's a very important factor. It has to do with your skill, your shape, the type of clay, and how much of the piece you're going to make. Is it the first or the last one you make, when there's already a lot of clay on your hands? It's very important and can be quite extensive. In the context of this research, it's important to consider whether you need a lot of support clay. If you need a lot of support clay, you know you need more clay. If you have less clay, you automatically need less support clay. If your shape is more upright, you automatically need less support clay. The wider you go, the more support clay you need. The more pliable the clay, the more support clay you need.

So, if you choose just a little too little clay for the shape you want to make, you'll have too little support clay.

Then you'll have too little support clay, or you'll simply not achieve the shape.

Then it will be lower or not quite perfect.

Then it becomes lower or wobbly at the top because you're trying to stretch it too much.

And if you choose too much clay?

Then you have to cut it. You also run the risk of a heavy base. Then it won't be good to use. You also have to turn it more. I hate turning it—many people love it—so I turn it thinly. That way I have to do as little finishing as possible afterward. I just don't feel like doing that.

Now we move on to the walking. I figured that's where you really notice how wet it is and how plastic it is.

Especially that plasticity. You feel moisture, but it has a lot to do with plasticity. You add moisture to make it more plastic.

So the moisture disappears, and only plasticity remains.

Yes, only plasticity.

Okay. I think that if clay is less plastic, it breaks more easily and is harder to shape. Then you do indeed have problems filling that wall, and it's harder to spread it evenly. You're working very hard.

Especially that. Having to work hard is a very important thing. Your hands get tired. If you make one pot, it's often still manageable. But if you make 20, it's not pleasant for your hands. Eventually, you lose control of your fingers, you press just a little too hard, and the shape is gone. What I always find *very important is that you have to spend enough time working your clay properly. It has to be easy to work with, and that varies from person to person. I like to work softly, and some people like to work a bit harder. I think that partly has to do with skill. It has to do with whether your fingers are sensitive enough to sense what you can or cannot do. Soft, I think, is less forgiving in terms of sinking.*

Now we move on to centering. I wasn't quite sure about this. It's all about symmetry, of course. But you also have that centrifugal force compensating for that.

Your starting point is that it's perfectly centered in the middle. It often happens that you're slightly asymmetrical. The centrifugal forces only really matter after that. What you're mainly doing when centering is having all the irregularities as homogeneously as possible on the disc. You can feel that.

What kind of irregularities?

When you're milling, you try to have the clay homogeneous, but in reality, it's always still only partially homogeneous. There are always some harder and softer parts in it. You can't avoid that. So, the final milling is actually done while centering on the disc.

I've seen videos of people coning on the disk. They'd look at the spiral at the top and know they needed to keep going.

That's a different method; there are two different ones. With the spiral, it's easier to see if it's even and homogeneous. You try to compensate for that. It needs to have the same weight everywhere. You remove any air bubbles. Then you check if it's exactly centered on the disk. Only then do you check if it's centered. So there's another step in between.

Yes, the homogenization process. That happens partly during the walking and partly during the turning. In the descriptions, I often mention several topics at once because many things are continuous.

It's not all that clear, indeed.

So I could create a heading "Homogenization," but I could also incorporate homogenization into the existing headings.

Exactly, then you'd state in the text that that's part of centering.

Exactly. Centering is almost always omitted in the literature.

Yes, that's right, almost standard. I don't get it. It's the most important step in the entire process.

I find that interesting. I'll elaborate on that in my discussion, but the shaping process is usually treated as a single box. While that's where the most essential steps take place, otherwise you wouldn't arrive at a shape. Furthermore, there aren't many other things I can say much about

based on my research, because it's no longer universal. There are so many firing methods and considerations... I wouldn't get involved in that.

I certainly wouldn't.

And as for extracting clay from nature, it's also very variable... Know your limits.

Yes, exactly.

Then I came across something I found very interesting. [P1] showed me the instructional plates on how to make a basic shape. I haven't found that anywhere in the literature. I read through several dozen sources, and one indicated that you could recognize a skilled potter by the presence of "preforming." I didn't quite understand what they meant by that and thought it odd that the others seem to miss it. Every potter does this, but the literature doesn't mention it. Of course, it disappears in the other steps, but it does determine how you subsequently handle the rest of the shape.

That's right.

I think centrifugal force is more of an issue here than with centering, is that right?

I don't think it's centrifugal force you're working with. You have the three basic shapes: the cylinder, the bowl, and the plate. For the plate, you make that disc, for a cylinder you make a beehive, and for the bowl, you make more of a shallow, upside-down pot. A right angle isn't practical. It's almost always a rounded corner. It's very easy to get your hands stuck behind a sharp corner, and that uses up clay. A hand can wrap around a round shape much more naturally. Everything you create is based on those three shapes.

Is the defining aspect of this step more the shape?

Yes. It's the shape you create so you can then shape it. The basic shape of your sphere is the starting point for the next step.

So you could say: "Based on the shape you choose, you're preparing for how the clay will behave later." How the clay will behave further depends largely on what you do, but also on that centrifugal force?

Yes. In the next step, you're dealing with centrifugal forces quite a bit. In the shape of this step, you're already trying to ensure you're going in the right direction. With a cylinder, you want to extend outward as little as possible. You want to keep it narrow, so you start with that shape. With a bowl, you ultimately want to extend outward, so it can be a bit more upright. So this is preparation for the centrifugal force that will come into play later.

For the next step, I'm skipping opening the mold. It's a step, but I'll mention it when setting the base. You then insert your finger to the correct depth, a little higher than you'd like so you have extra clay, and push the clay out. Then you're already laying the base.

Right, laying your base.

I thought it was about the amount of clay you push out, which is related to how thick you make the base. It's also about the speed at which you do that.

Yes, but speed is less important. How far you push out is very important. That's quite essential. It also has to do with the shape you're going to make afterward, like a bowl or a plate.

I think you can really only lay that base once.

Most of it, yes. You've done the most important thing then.

[Elly shows cross-sections of pots in various stages of shaping.]

You always lay the base first before you go up, whether you're an experienced potter or not. The bottom edge of the wall is always thinner than the clay above it that you're pulling up. If the difference is too great, it will wobble. That's because of centrifugal force. If it wobbles even slightly, it'll break through the wall at the bottom. If it's too thin, it'll break through faster. So that ratio should be close.

And the ratio is...?

...feel.

Feel. Perfect. You'll slide through it very quickly, I think.

Yes. Most people grab it at the front, at 12 o'clock. Not with both hands, because then you have to check both hands. But if you feel like that, you know how much is between your two fingers. I can also see how much is here. From there, I go up.

The amount of clay you pull up might also depend heavily on the size of your hand and what fits easily.

Also, anyway, if I have eight kilos of clay lying around, I fold my hands differently. If my weight is very large, I put my arm in. I know the distance then. But the amount doesn't matter, because you do the same thing. I always make sure I have a thick sausage ready, suitable for pulling up afterward. That's where I go. The wall has to be thick enough that I can pull it up three times.

P3 described it as scooping; that's how I translated it.

Right, that's what you do.

I also saw a video online where they described a sort of S-shape while pulling up. They pushed it from the bottom, from the inside out, and from the top, from the outside in. So they pushed it back in from the top.

That's right. The amount of clay there is crucial. That's preparation for the next step. For the bowl, you want a straight line [tension arc].

We'll get to that in a moment. I sometimes put things under different headings because they happen in multiple steps.

They are two different ways of pulling up. If I don't go out enough, I'll have a whole pile of clay here. That's support clay. I won't be able to lift it up anymore. So I lose it. If I don't have enough support clay here, it can't support its weight and it sinks. So it's pretty crucial to see how far out you go. If the fingers on the outside and inside are almost on top of each other, the outside takes over. By shaping the base, I determine how much edge I have and that's how I decide what to do next.

I wrote that down differently, and I definitely made a mistake there. I didn't realize they were two different ways of pulling up.

They're close, but they're essentially different things. With a plate, it's different again.

I saw online that someone had a thick discus shape lying around, which they were rubbing out with their fist. It wasn't the kind of board I had in mind, but that's how it worked. I expected you might be able to grab it from below and then lift it up very wide, but that seems a bit unstable to me as well.

The fist-side-out method is often used for boards without a protruding edge. For a board with a classic edge, I grip the edge firmly and pull it outward. I compress it constantly, working it outward, so to speak. I apply a lot of pressure with both hands to get it outward. It's three separate shapes, three separate grips, three separate amounts of support clay, three separate ways of pulling the wall up.

I misunderstood a few things here, but that's okay. I'll think about it carefully. Then the next part about the tension arc also needs some work. I've translated it as "tension arch," but I haven't seen it anywhere in the literature yet. I figured that if it's too small, the wall isn't stable enough. Then the tension arc is flattened. If it's too large, meaning it doesn't extend deep enough outward, you don't have a good base.

The line will be different in that case.

Which isn't necessarily a bad thing.

No. From the base of the opening, you can go in different directions, as long as that arc remains in place. It really does apply to the bowl. The tension arc does become correct later in the forming process, and then it can also be the case with a cylinder. Because the wall of a bowl needs to be able to support itself well, the force must be directed towards the center. It shouldn't collapse. So what you say is correct, but it really only applies to the bowl.

For the bowl, you always create a hyperbola.

Always. If you don't have that, you don't have a bowl. Then you either have a plate or a cylinder. A plate is actually a combination of a cylinder base and a bowl wall. A cylinder always has a flat base, and a bowl always has a curve. A plate has a flat base, but not the sharp transition of a cylinder.

[We'll talk a bit more about how I'm going to incorporate this into my work.]

Next is the wall pull-up. I've written quite a bit about that, because it's where so many things come together. What I've learned is that the most important things are the speed at which you do it, the distance between your fingers, and your posture, so you don't compress the shape.

It's about the speed of the plate relative to the pull-up speed. That combination is essential. You can pull up very slowly, but then the plate also has to rotate very slowly. Then your posture becomes very important. If you're not stable, you can't pull up properly. If you increase your speed, and the clay can handle that because the centrifugal force is somewhat less due to the greater wall thickness, then you can proceed further. If the wall gets thinner, your rotational speed must decrease. That means your acceleration speed must decrease. If you don't, you'll get twisting in your wall.

I call that spiraling in my work.

That's fine too. Spiraling and twisting are essentially the same thing.

I found someone online who talked about "marrying the speed of the hands to the speed of the turning wheel."

Yes, that's right. They have to come together. I think it's a nice description.

I also figured the wall had to have a consistent thickness. For the posture, I assumed the ideal was to be relaxed and go along with a kind of massage movement. That's how P3 and P4 described it.

It's like massaging clay. I understand that and agree with it. But there's a difference. Your abdomen is tensed, because that's where the strength should come from. That's your center where your strength lies.

Your core.

Yes, it's purely core. You can actually imagine what happens if you don't have any tension there. Then your arms will follow when the clay goes out of alignment. When you have tension in your core, you can brace yourself against your body. When your core moves back and forth, your arms also loosen.

It then becomes a kind of anchor point.

Yes. That's why the core is so important. It's tense, the rest is relaxed.

I think this explains why some people struggle more than others.

Exactly. You often hear me say: "You're not sitting properly, this is where [points to stomach] the tension should be." And that's why people are often not allowed to sit with their arms on their legs. Then it's not relaxed. Does this explain anything?

This explains an intuitive feeling. Anyway, the literature doesn't mention this. They don't know. Frustrating, but very interesting. From pull-ups, we go to pulling up to a specific form. This also involves those relative speeds, and again, the distance between your fingers.

Agreed.

Great. I've distinguished between too thick and too thin at different points in the pull-up. If it's too thin at the bottom, it will also sag there. If it's too thin at the top, it will become flabby.

And if it's too thin at the bottom, it will also become flabby at the top. So a wall that's too thin will sag and wobble.

And you can see that in the final piece.

Yes. You can often see this in the spiral lines.

Because it's started flapping?

Yes. Often, you don't have enough water, and it can't handle much. Then you want to pull up shapes, but the braking force of your hand on the clay is too great. Then the pot shifts along with it. So you hold the top back, but the bottom keeps spinning. Because it's like this, you can easily hold the top back. It rotates relative to itself.

So the bottom and top rotate relative to each other, and that also creates extra stretch, so to speak.

Yes.

Interesting.

So it's not what you want. You actually want to prevent it.

Gotcha. We already talked about constantly working towards where you want to go. I'm talking about balance in the pot, aesthetics, the golden ratio in the pot. I also mention here that you repeatedly reshape the shape with a lumber and that you shouldn't continue for too long, otherwise you'll compromise the stability.

That's right.

Now we can move on to the edge. I wasn't quite sure what to do with this, because it can be so different.

There's function, and that's indeed very important, that's true. It's especially important whether it's round or angular. That largely determines its function.

What does it do if it's very angular?

If it's round, it drinks well. If it's angular, it doesn't drink well, but it pours better. If it's round, the liquid runs along it. An angular shape cuts through the liquid column, so to speak.

That's why pour spouts can sometimes be quite sharp.

Right.

But you don't want pour spouts to be angular, because that's less aesthetically pleasing.

Usually, yes. But you also have to be careful not to make it too angular, otherwise it will chip.

And once you've done all that, it's time to let it dry. This also involves letting it dry to a leather-hard state, at which point you can trim it if necessary. Oddly enough, this didn't come up in the interviews, so yesterday I realized I was missing a step between shaping and firing. I figured it mainly depends on how wet the piece is. I'm still wondering what happens if you want to trim it when it's just a little too wet or a little too dry.

If it's too dry, it breaks. Then it's also very difficult to trim. If it's too wet, it collapses. Then you can't secure it, your iron sticks, and your infusion sticks to it. Then you have a lot of extra work.

A lot of hassle, then.

Yes. You really want to wait for the right moment.

And you determine the right moment by feel?

Yes, and that's also a personal thing. Some people prefer it a bit harder. Then you can hold it a bit more firmly and turn it a bit wider. Others prefer a softer grip, just put their iron against it, and that's it.

I've also seen people take a metal scraper to a completely dry pot, scraping an octagon into it, for example. Then it was really soft and completely dry. It fell off like dust.

That's the porcelain. Then the type of clay comes into play again.

Does porcelain consist of very small clay plates?

Porcelain is quite large clay plates. It's primary rather than secondary clay. That's why it's so unforgiving. That's why it's so soft, almost soapy.

Because the clay plates slide easily over each other. It's also a long clay.

Yes, it's a very long clay.

And once the clay is completely dry, you can fire it and possibly glaze it.

Yes. In the past, glazed work was fired once, or twice if it was a more expensive piece. So first the biscuit firing to harden the clay. After that, the clay is less vulnerable to glazing for the second firing. In the past, there was a single-firing process. When it was almost dry, the glaze was applied and then it was fired. With the two-firing process, you dry it completely once, to 1000 degrees Celsius. Then your clay is no longer clay, but ceramic. The chemical composition has then changed significantly. There's much less risk of the work collapsing when you glaze it. This happened more often with more expensive pieces.

Just to be sure.

Yes. The potter's fires along the Vecht River clearly show this. Certain shapes, especially the large, flat ones, were very prone to collapsing. These were the more expensive shapes, which were also fired in two phases.

Could it be fired in three phases?

Yes, or four, or five. Celedon, for example. Chinese pottery was often fired five, six, or seven times. This results in a very thick, almost transparent glaze. After each firing, a layer of glaze is added. This results in a very thick layer of glaze, which you would normally never be able to apply. Celedon is a type of glaze. These days, it's also a colour and a technique, but it's essentially a type of glaze.

One last question: what did you mean in the last interview about piano fingers? I thought I'd figure it out, but I couldn't.

When people start turning, you often see them place their hand like this [four fingers close together] on the form. But you have your feeling on your fingertips, not along your phalanges. So I say you should work with piano fingers [fingers spread and slightly bent], as if you were playing the piano. Because the soft part of your fingertips is the most sensitive. If you turn with the very tip of your *fingertips, you run the risk of dragging your nails along, which isn't ideal. Then you have to remove scratches. With piano fingers, you can also feel the entire shape. At the top, I feel what's happened, and at the bottom, what's about to happen. It's very smooth.*

And if you pull it up? I can imagine you'd like to form a large plaque.

That's right. You do it with a small piece of your finger so you don't have much braking force. You then flatten it a bit from the inside into your shape. You basically do this [demonstrate: fingers extended, middle finger slightly inward, and index finger angled behind it]. Some potters do it with the side of their curled index finger if it's very heavy. Then you don't have to be subtle. You work with the side of the second joint of your index finger.