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UNIVERSITY OF THE WITWATERSRAND, SCHOOL OF GEOGRAPHY,
ARCHAEOLOGY AND ENVIRONMENTAL STUDIES

Ethnoarchaeology of Pottery: Style and Technology Boundaries in Southeast Botswana

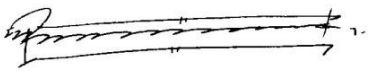
Phenyo Churchill Thebe

A thesis submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy

Declaration

I declare that this thesis is my own unaided work for submission for the degree of Doctor of Philosophy at the University of the Witwatersrand. The degree is by publication and my publications, submitted paper and contribution in co-authored papers are detailed in the text. The thesis has not been submitted before for any degree or examination at any other University.

Phenyo Churchill Thebe



Date 22 March 2017

Abstract

The notion that ceramic styles mark ethnic and linguistic groups is problematic. The notion perceives cultures as geographically discrete with distinct material and cultural traits. Research in the 1960s has demonstrated that social boundaries are a product of interaction and not isolation. Ethnoarchaeological research in the 1970s and 1980s adopted information exchange and social interaction models to understand stylistic boundaries. These studies show that material culture style does not always mark ethnic or linguistic boundaries and may not be prominent if there is no competition for resources. Depending on a number of factors, style variations in material culture may mark the style of an individual, a community of practice or social identity. Other factors are also relevant; the matter is complex.

To investigate this complexity, an ethnoarchaeological study was launched to study the products of 41 contemporary potters affiliated with different social, political and linguistic groups in south-eastern Botswana. This study demonstrates that variations in different parts of the process of manufacturing ceramics can mark different kinds of social boundaries. Clay sourcing strategies in south-eastern Botswana today show that the choice in the selection of potting clay is principally dictated by distance to the source. In contrast, in the forming and shaping of pots, boundaries are influenced more by teacher-learner networks than ethnic group and geographic location. Decoration styles also show strong association to learning networks. Geographic location is more influential in determining techniques of firing pots. Here, "community of practice" and mobility of potters present significant stylistic and technological boundaries. The *chaîne opératoire* of living pottery traditions may assist in the interpretation of pottery in the Iron Age of southern Africa, however, the connection between the past and present is complex.

Dedication

To my lovely parents, Tichara Elias Mmolawa Sr. (now with the Lord) and Ketsweletse Grace Thebe. You are my source of inspiration and you gave me life blue print. No words or writing can ever be enough to thank you.

Acknowledgment

My supervisor, Professor Karim Sadr graciously accepted me into the PhD program and this established a reconnection with my undergraduate studies. I thank Karim for everything: knowledge, encouragement and guidance throughout research, many hours of stimulating discussions in the office, café, field, via e mail and simply driving or walking. Occasionally when I did not believe in myself, Karim taught me to persevere. He would remind me of an analogy between conducting cutting edge research and borehole drilling in the Kalahari Desert. Here wellfields are deep and drilling deep can be rewarding. Drilling machines have to sink as deep as possible to reach high yielding aquifers. Most of the water from shallow depth is usually seepage; good yielding water strikes await the drill machine many metres deeper. Stopping too soon is never rewarding. Truly, like a master potter teaching a new apprentice how to make pots; I learned to write this thesis from my supervisor through many years of interaction, observation, participation, correction and feedback.

I thank the Universities of Botswana and Witwatersrand for financial and logistical support during the research process.

I am particularly grateful to the potters in south-eastern Botswana; they allowed me into their homesteads and took me to several sacred clay sources to document pottery making; they remain "emic" researchers of this research.

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I sincerely thank the following for the inspiring collegiality and friendship in no particular order: Horacious Ikgopoleng, Oteng Mahlala, Joseph Mosuku, Nugu Nkwe, Justice and Magret Sethibe, Thembi Makosha, Benedict Moeng, Alfred Tsheboeng, Phillip Segadika, Tutu Kerekang, Rock Baaitse, Kobinah and Lattifat Archer, Richard Arthey, Thuto Mahlanza, Nonofho Nkwe, Olorato Mosetlha, Gosamalamang Gakeinyatse, Desmond Molefe, Dinah Molosiwa, Onkarabile Gosupamang, Kesaolopa Marage and Gosiame Mahupeleng.

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To my kids, Laone and Lebone Jr. Thebe, the joy of my life, I love you very much "Lao" and "O'shima", you tolerated dad's frequent absence from home, you have earned yourself a boat cruise to the Portuguese Islands, I am proud of you.

Thato, my lovely wife, you ensured my post graduate studies journey, thank you for walking through the journey of life with me in this amazing world.

To avoid the risk of omitting others, I thank everyone, named and unnamed. And most importantly, I count my blessings and I thank God for everything!

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CHAPTER 1: INTRODUCTION

The identification of ethnic and linguistic groups in the archaeological record is one problem archaeologists have pursued for decades, and a wide range of literature has been produced (e.g. Mason 1952; Phillipson 1968, 1977; Huffman 1980, 1989, 2002, 2012, 2007; Maggs 1980; Denbow 1981, 1983, 1986; Evers 1988; Evers & Huffman 1988; Campbell *et al.* 1991). To date, many archaeologists still assume a one to one association between ethnic, linguistic groups and material culture. In their view, cultures are geographically distinct with unique material and cultural traits. This assumption has sparked scholarly debates because they are oversimplified and in most cases have not been adequately tested (e.g. Wright 1989; Schoeman 1997; Calabrese 2000, 2005; Esterhuysen 2008; Armstrong *et. al.* 2008; Fowler 2015).

Fredrik Barth (1969) is one of the early scholars to challenge the theoretical misconception between ethnic, linguistic groups and material culture. He emphasized that social boundaries were created through interaction and not isolation. Despite Barth's significant contribution to solve the problem of identifying archaeological 'cultures' by their material culture boundaries, the issue remained far from being resolved. A generation of archaeologist in the 1970s and subsequent years further pursued the subject of understanding material culture boundaries of ancient cultures by embracing information exchange and social interaction theories; (e.g. Friedrich 1970; David & Henning 1972; Crosby 1977; Hodder 1977, 1978, 1979, 1982, 1987, 1990; Wobst 1977; Stanislawski 1978; Hardin 1979; Wiessner 1983; Shanks & Tilley 1987; Plog 1980, 1983) agree that the challenge faced by ethnoarchaeologists studying style and material culture boundaries was

due to the lack of a coherent theory of stylistic behavior (information and social interaction theories).

Hodder's (1982) important research suggests that while material styles may reflect cultural and linguistic boundaries, they can also reflect social, economic, age, gender, class, political and administrative categories. The study suggests that material boundaries are not prominent if there is no competition for resources. Wiessner (1983) observes that modern San projectile points carry useful information about groups and boundaries because of their extensive social, economic, political and symbolic importance. However, there were several challenges to this stylistic interpretation based on the proposition that the attributes chosen for her study were probably the result of historical events as opposed to coherent operational principles.

Refinement of exchange and social interaction models was achieved by Pierre Lemonnier's (1986) ethnoarchaeological study in Papua New Guinea. Borrowing from Sackett's (1982) concept of isochrestic variation (passive style) and Leroi-Gourhan's (1964) concept of the *chaîne opératoire* (operational sequence), Pierre Lemonnier argues that technological choices should not be perceived as necessarily markers of social boundaries but are deeply rooted in technological style of a specific community of practice (see also Dietler & Herbich 1998; Wenger 1998; Gosselain 1992, 2000:193; Stark 1999). Leroi-Gourhan's (1964) argument is that technical behaviour can be seen as a social product. There is a general consensus that *chaîne opératoire* of pottery traditions can provide a wide range of information on the culture that produced it (e.g. Roux & Matarasso 1999; Roux 2007; Gosselain 2010; Livingstone Smith 2010, 2016).

Research on modern material culture provides information for archaeologists to understand ancient technology, economy, social organization and ceremonial practices. Material culture remains are important because they provide crucial information on subsistence strategies and for dating purposes (Rice 1981, 1984, 1987, 1996, 1999; Hodges 1989;

Livingstone Smith 2016). Artifact analysis provides guidance on pottery technology and manufacture covering five distinctive stages: digging the clay, preparing it, forming the pot, decoration, drying and firing (e.g. Matson, 1965; Rice 1981, 1984, 1999; Miller 1985; Skibo & Feinman 1999; Skibo & Schiffer 2001; Orton *et al.* 2013). Notably, pottery is one of the most ancient types of material culture in Africa dating to around 10,000 BCE (Haour 2003; Huysecom *et al.* 2009). In southern Africa, pottery arrived about 2000 years ago (Denbow 1981; Jacobson 2005; Sadr & Sampson 2006; Wilmsen *et. al.* 2009, 2016). Pottery is the most common and variable artifact in African Iron Age sites. Archaeological ceramics are often used as evidence for dating, trade, status, technology and function (Rice 1987; Hodges 1989; Orton *et al.* 2013). Pottery is seen by most archaeologists as a diagnostic chronological and stylistic indicator. In southern Africa, ceramics are often used as a marker of ethnic and linguistic groups (Laidler 1929, 1938; Caton-Thompson 1931; Schofield 1948; Lawton 1967). M. Hall (1984) critiques the use of style in this fashion because ceramic traditions are not always a series of periods of stylistic stability. Analysis of decorative style is the foundation for anthropological and archaeological inferences about social and economic interactions and artistic communication (Huffman 1980; Arnold 1985; Rice 1987, 1999, 2000; Bey & Pool 1992; Schiffer & Skibo 1997; Shennan & Wilkinson 2001).

1.1 Rationale and Research Hypothesis

This thesis examines social boundaries in ceramic styles in southern Africa today. The issue has not received much attention in previous analyses in the region. The purpose of this study is to clarify the current relationship between ceramic style, technology and social boundaries in south-eastern Botswana. One can study pottery practices to make direct inferences about the past of an area - like linguists do with languages.The hope is that this information can provide useful analogies for archaeologists to construct their hypotheses. A key component

of this research is that traditional potting in the study area is not dying but changing. However, as in most parts of Africa, the tradition is no longer thriving as it used to be. It is important to document the work of living potters because they can assist us to understand archaeological ceramics. My study will test the relationship between pottery and ethnic group which is a foundation of archaeological interpretation in the Iron Age of southern Africa. To this end, the aim was to map stylistic and technical boundaries in ceramics among contemporary traditional potters from different social and cultural groups in south-eastern Botswana.

1.2 Aims and Objectives

The primary aim of this study is to document ethnoarchaeological observations on stylistic and technical boundaries amongst modern potters in south-eastern Botswana.

The specific aims were realized through an ethnoarchaeological study of ceramics produced by 41 modern potters from two different linguistic groups: Bakgalagadi and Batswana. In turn the Batswana come from different polities (*merafhe*) and dialects (Bakwena, Bangwaketse, Balete and Bakgatla).

Four parts of the process in the manufacture of pots were investigated:

- Sourcing and processing of clay for pottery production
- Vessel forming and shaping
- Pottery decoration
- Firing pots

1.3 Theory

The theoretical approach of this study is 'Middle Range Theory' (MRT) with the focus on ethnoarchaeology in order to make inferences on past behaviours (Binford 1977). MRT is a concept of intermediate theory between observed empirical data and general theories (Kramer 1985; Kosso 1991; David & Kramer 2001; Kehoe 2011). MRT attempts to connect the past and the present. Ethnoarchaeology is a sub-discipline of MRT. The definition of ethnoarchaeology used in this research is borrowed from David and Kramer 2001. They define ethnoarchaeology as an ethnographic study of a living culture from an archaeological perspective. They argue that ethnoarchaeology is neither a method nor a theory but a research strategy.

Although archaeological interpretation is founded on and ultimately depends upon ethnographic analogy, it is problematic to determine if the present can represent the past (Lane 1998: 177; Longacre 1991; Gosselain & Livingstone Smith 1995: 148; Hegmon 2000: 129; Neupert 2000: 252; David & Kramer 2001: 9; Stark 2003). This study further explores Hodder's 1982 agency and material culture theory that is concerned with empowerment of individual units in society. Material remains are a record of human agency that offers the social and historical uniqueness of each situation. Other theories that the research borrows from include concepts of ethnography, ethnicity, identity and historical records (e.g. Schapera 1938; McDonald 1940; Lawton 1967; Barth 1969; Major 2010).

The thesis further uses a theoretical framework of historical archaeology in order to understand why pots are still made and address the current questions of re-tradition (S. Hall 2006). This kind of study is crucial for the reconstruction of history. These theories assist to explain how pottery today is manipulated and elucidate its context. Future work will

examine these theories in detail. Thus, the study theorizes the relationship between the past and the present. Data from my study shows that past polities have an enduring effect in the cultural landscape and pottery traditions (for examples see Redmond & Spencer 2012; Livingstone Smith 2016). This information has been explored in light of the history of *intra* and inter *merafhe* (polity), potter's mobility and learning networks. Unpacking the issue of material culture and what objects can tell us about social formations in which they were produced is an essential part of the theoretical framework of this study (e.g. Deetz 1965; David & Henning 1972; Crosby 1977; Hodder 1978, 1979, 1982; Wiessner 1983; Shanks & Tilley 1987). The production of materials such as pottery is a mixture of technical and cultural considerations (Pfaffenberger 1992; Ndoro 1996; Rice 1996; Dobres 2000; Fowler 2008, 2011). However, exploring the roles of material and of cultural meaning in human life is complex (Appardurai 1986; Kopytoff 1986; Welsh & Terrel 1992; Wimmer 2008).

1.4 Method

In an attempt to deal with this complexity and dynamism, my study uses standard ethnoarchaeological methods including oral interviews, direct observation of *chaîne opératoire* of modern pottery traditions, potter mobility and *morafhe* history. This information makes it clear on how to deal with such complexity in my study. Consideration is given to social prohibitions and symbolism in pot making (Turner 1967, 1974; Herbert 1993; Tilley 1999; Aguilar 2007).

This variation is accessed through a detailed technological study of *chaîne opératoire* (Leroi-Gourhan 1964) or production sequences of pottery among 41 potters (Table 1.1). *Chaîne opératoire* is a powerful analytical tool because it imposes systematization in the collection of data. The term refers to the interrelated decisions made by people during the process of transforming the material world in technologically viable and culturally

acceptable ways. The approach acknowledges a variety of elements including location, actors, gestures, tools, raw materials, duration, organization, vocabulary, rituals and taboos. These are brought together in the conduct of technical activities. *Chaîne opératoire* allows for a systematic and comprehensive exploration of nature, and the relationship between the constitutive elements of technique (Gosselain 1994, 2011: 244; Song-Yong 2010).

Table 1.1: Data Base of Potters from South-Eastern Botswana

Potter ID	Village	*Morafhe*	Gender	Year of Birth	Learned pottery	Age at learning	Teacher ID	Single	Formal Education	Full Time	Christian
1	Kanye	Mongwaketse	F	1957	1974	17	43	X	X		
2	Kanye	Mongwaketse	F	1956	2008	52	1	X	X	X	
3	Letlhakeng	Mokgalagadi	M	1950	2007	57	6	X	X	X	X
4	Letlhakeng	Mokgalagadi	F	1973	2013	40	6	X	X	X	
5	Letlhakeng	Mokgalagadi	F	1972	2009	37	6		X	X	
6	Letlhakeng	Mokgalagadi	F	1969	1999	30	21		X	X	X
7	Letlhakeng	Mokgalagadi	F	1966	2003	37	6		X	X	X
8	Letlhakeng	Mokgalagadi	F	1963	2013	50	6	X	X	X	
9	Letlhakeng	Mokgalagadi	F	1941	2013	72	6		X	X	
10	Letlhakeng	Mokgalagadi	F	1975	2013	38	6		X	X	
11	Kgwarape	Mokgatla	F	1986	2001	15	15	X	X	X	X
12	Kgwarape	Mokgatla	F	1958	1987	29	15	X		X	
13	Kgwarape	Mokgatla	F	1947	1970	23	15			X	
14	Kgwarape	Mokgatla	F	1949	1970	21	15			X	
15	Kgwarape	Mokgatla	F	1937	2008	71	42	X			
16	Kgwarape	Mokgatla	F	1948	1986	38	15	X	X	X	X
17	Kgwarape	Mokgatla	F	1976	2000	24	15		X	X	
18	Molepolole	Mokwena	F	1985	2001	16	19	X	X	X	X
19	Molepolole	Mokwena	F	1951	1972	21	44		X	X	
20	Molepolole	Mokwena	F	1947	1969	22	44	X		X	
21	Molepolole	Mokwena	F	1944	1962	18	44		X	X	
22	Molepolole	Mokwena	M	1976	1999	23	21	X	X	X	X
23	Gonku	Motswapong	F	1962	2010	48	?	X	X	X	
24	Lotlhakane West	Mokgalagadi	F	1967	2007	40	41				
25	Lotlhakane West	Mokgalagadi	F	1953	2012	59	41				
26	Lotlhakane West	Mokgalagadi	F	1958	2009	51	41	X		X	
27	Lotlhakane West	Mokgalagadi	F	1952	1967	15	28				
28	Lotlhakane West	Mokgalagadi	F	1937	2009	72	41		X	X	
29	Lotlhakane West	Mokgalagadi	F	1936	?	?	41		X		
30	Lotlhakane West	Mokgalagadi	F	1970	2007	37	28	X	X	X	X
31	Lotlhakane West	Mokgalagadi	F	1938	1955	17	41	X	X		
32	Moshupa	Mokgatla	F	1966	2005	39	41		X		
33	Otse	Molete	M	1955	1992	37	46		X		X
34	Otse	Molete	F	1993	2013	20	33			X	X
35	Otse	Molete	M	1991	2010	19	33	X	X	X	
36	Otse	Molete	F	1959	1998	39	33	X	X		X
37	Otse	Molete	M	1996	2010	14	33	X	X	X	X
38	Gaborone	Molete	F	1958	2004	46	?		X		
39	Lotlhakane East	Mongwaketse	F	1951	1993	42	41		X	X	
40	Lotlhakane East	Mongwaketse	F	1949	1975	26	45	X	X	X	
41	Lotlhakane East	Mongwaketse	F	1943	1969	26	45	X	X	X	

Ethnographic information on stylitic and technological boundaries concerning the following stages of the *chaîne opératoire* was collected: (1) Clay sourcing and paste preparation, (2) Forming and shaping vessels, (3) Decoration of pots and (4) Firing. Details of various stylistic and technological stages of the *chaîne opératoire* used in this thesis are outlined in detail in specific chapters.

Data collection was informed by extensive structured standard oral interviews and direct observations of potters recorded in field notes, checklists, videos and photographs of previous pottery manufactures and methods in other parts of Africa (e.g. Gosselain & Livingstone Smith 1995; Major 2010) and focused on various topic areas: (1) biographic information (name, age, gender, *morafhe,* religion, literacy level), (2) socio-economic context of production, (3) geographic location and network (see Gosselain 2011; Livingstone Smith 2016), (4) social and technological boundaries (see Dietler & Herbich 1998; Livingstone Smith 2000; Mercader *et al*. 2000; Stark 2003; Gosselain 2010), (5) pottery schools (name of teacher, date of learning, time it took to learn, (6) historical context, (7) body gestures and (8) symbolic and ritual representation.

Analysis of data about potters involved both qualitative and quantitative methods. Each potter interviewed was given a unique code (e.g. Potter ID 1). Data generated from the study were statistically analysed using measurements of central tendency, frequency, and percentage displayed in bar charts with cross tabulations of the variables and multivariate analytic methods were employed.

Correspondence Analysis (CA) was used to search for meaningful patterns in the distribution of various attributes in pottery production sequences found in the different locations, the different *merafhe* and the different learning schools. CA models are effective in reducing large bodies of data into a few dimensions allowing for the visualisation of patterns for effective interpretation (Shennan 1988: chapter 13). Potter's data were examined visually and plotted by frequency of attributes used by different artisans onto a series of maps. Geographic location of the potters, their activity areas and clay source sites were provided. Distance travelled and modes of transport to clay sources used by potters were also drawn on maps and results presented for geo-spatial analysis and interpretation (see for example, Hodder & Orton 1976; Clarke 1977; Robertson *et. al.* 2006; Kowalewski 2008).

1.5 Thesis Structure

The work presented in this thesis comprises of a series of chapters based on my PhD Research (28/01/2012 to 24/03/2017). This thesis is submitted in accordance with the format for the Faculty of Science at the University of the Witwatersrand for the submission of a PhD by publication in the School of Geography, Archaeology and Environmental Studies. In this thesis, there are four papers included that are at various stages of publication: 1. Published (2), and 2. accepted for publication with corrections (2). Each of these papers is labelled as Chapters 3, 4, 5 and 6. These comprise of separate papers that discuss technological and stylistic boundaries concerning the four stages of pottery making. The four papers use geographic location (distribution of styles and technologies), language and ethnic affiliation and learning networks to determine the stylistic and technological boundaries in ceramic distribution that they reflect under different circumstances. Relevant rituals and social prohibitions are presented in each chapter.

The introduction and background provide detailed views in this thesis and link key issues examined. At the end of the thesis, a bibliography is presented that only covers chapters 1, 2 and 7.

What follows is an overview of thesis chapters.

Chapter 1 Introduction

Chapter 1 includes the introduction, rationale and research hypothesis, aims, objectives, theory and methods. The chapter also outlines the structure of this thesis, summarises key chapters and how they inter-link.

Chapter 2 Background

Chapter 2 provides a background and sets the foundation for the scope of work in this study. It contains literature review on key topics including a historical and an overview of social background on south-eastern Botswana and its potters, a brief history of ceramic analysis and ethnoarchaeology, pottery classification, ceramic style and ethnic groups. This chapter also includes a discussion of material culture theory and pottery technology (ethnoarchaeology). Background information appears in similar forms in several papers because it is part of structural requirements of the publications. Here, I incorporate scholarly debates on the use of "tribe". In this thesis, the word *morafhe* is used to define ethnolinguistic groups inhabiting the study area. In order to contextualize the research, several key terms are defined including clay, ceramics, classification, ethnoarchaeology and style. A brief review of the history of ceramic research in Africa, southern Africa and Botswana is then provided. The chapter ends by focusing on ceramic technology, style and social boundaries.

Chapter 3 Clay Sources

Chapter 3 begins by providing background scholarly research on raw material collection strategies for pottery making. The ethnoarchaeological approach makes reference to regional geology and geomorphology in order to explain occurrences in pottery raw materials. The chapter presents ethnoarchaeological results of raw material selection along with the processing and preparation stages of pottery making. The paper examines whether the specific clay chosen by the potter can inform us about her cultural identity. The role of geographic location, linguistic and ethnic affiliation, and membership of learning networks in the potter's decision to use this or that particular clay source is examined.

Thebe P. C. and Sadr K. 2017. *Clay Sources and Contemporary Potters in South-Eastern Botswana*

My Contribution: I initiated pottery research, identified potters and clay sites, conducted 80% of the analyses and wrote the majority of the manuscript. The co-author contributed to data analysis and on the writing of the paper.

Chapter 3 has been accepted for publication in the *South African Humanities*.

Chapter 4 Forming and Shaping Pottery

Chapter 4 presents and explains the results of boundaries in the forming and shaping stage of ceramic vessel manufacture in south-eastern Botswana. The idea is to explore how a lump of clay is transformed into a vessel and the cultural, technological and stylistic preferences involved in the process. It also explores the way forming and shaping of pots is learned by an apprentice from a teacher and associated gesture movements. Other

discussions focus on stylistic and technonlogical boundaries marked by *morafhe* and geographic location regarding the manufacturing stage. In studying forming and shaping techniques, teacher-learner and historical connections are presented in this chapter.

Thebe P. C. and Sadr K. 2017. Forming and Shaping Pottery Boundaries in Contemporary South-Eastern Botswana. *African Archaeological Review*, DOI: 10.1007/s10437-016-9238-7.

My Contribution: I initiated pottery research, identified potters and conducted field work, conducted 80% of the analyses and wrote the majority of the manuscript. The co-author contributed to data analysis and on the writing of the paper.

Chapter 5 Pottery Decoration

Chapter 5 describes, analyses and interprets decoration attributes of south-eastern Botswana affiliated with different social, political and linguistic groups to establish if decoration styles are sensitive markers of technological and stylistic boundaries. A brief review of the background, description of decoration motifs and surface treatment techniques is presented. A discussion of decoration tools is then provided. No analysis of the technological aspect of the *chaîne opératoire* of pottery decoration is provided. The study was opportunistic and relied on studying decoration motifs of pre-existing pots in a potter's yard at the time of fieldwork. In order to undertake a detailed study of the distribution of decorative styles, the study uses well-tested methods in archaeology based on attribute analysis (see for example: Adams & Adams 1990: 172-173). An in-depth analysis of decoration styles is undertaken through Correspondence Analysis (CA) to search for meaningful patterns in geographic location, *morafhe* and pottery schools.

Chapter 5: Thebe P. C. and Sadr K. 2017. *Pottery Decoration in Contemporary South-Eastern Botswana, Azania,* in press.

Chapter 5 has been published in *Azania: Archaeological Research in Africa*

My Contribution: I initiated pottery research, identified potters and conducted field work, conducted 80% of the analyses and wrote the majority of the manuscript. The co-author contributed to data analysis and on the writing of the paper.

Chapter 6 Firing Pots

Chapter 6 is under preparation. The paper presents an overview and interpretation of firing techniques used by potters in the study area. A brief overview of firing techniques and fuel types used to fire pots is provided. The idea is to explore technological and social boundaries marked by firing techniques in the study area. To achieve that, a data base comprising of various biographic information on potters, drying and firing of pots, post firing techniques and fuel types was created. Firing techniques were then correlated with social and technological boundaries. Rituals associated with firing and fuel types are presented in this chapter.

Chapter 6: Thebe P. C. and Sadr K. 2017. *Firing Pots in Contemporary South-Eastern Botswana,* has been accepted for publication in *Journal of Ethnoarchaeology*

My Contribution: I initiated pottery research, identified potters and conducted field work, conducted 80% of the analyses and wrote the majority of the manuscript. The co-author contributed to data analysis and on the writing of the paper.

Chapter 7: Discussion and Conclusion

In this final chapter I bring in together separate results, arguments and strands of my papers to make an overall assessment of what they collectively say in my answer to various research aims and objectives. The chapter looks at what pottery making phases amongst 41 potters in contemporary south-eastern Botswana mark. Here, I focus on the stylistic and technological aspect of pottery making and how it fits with or differs from the African context. The discussion and conclusion chapter also contains strands of the findings on: a) Sourcing and processing of clay, b) Forming and shaping pottery, c) Pottery decoration and d) Firing pots. Geographic location, *morafhe* and pottery school parameters are explored to establish technological and social boundaries with which they correlate for the above mentioned stages of pottery making. An evaluation of analytical procedures used in this thesis is provided in order to assess this study's contribution to a methodological and theoretical framework for ceramic ethnoarchaeology. This chapter concludes by identifying gaps in research that constitute a future research area. And most importantly, the main findings of this thesis are summarised and presented at the end this chapter. At the end of this thesis, I present a bibliography comprising of all references cited and are not included in published papers or papers in review.

Only tables and figures in the general introduction, background, discussion and conclusion are included in the list of captions at the beginning of the thesis. Other lists of captions are included at the end of specific chapters that are published or are under review.

CHAPTER 2: BACKGROUND

2.1 Geography of south-eastern Botswana and its potters

A large a scale study of social space, geographic land marks including rivers, mountains, lakes and mineral resources reveal their significant role in the shaping of cultures in an area (Gosselain 2010a; Livingstone Smith 2000). South-eastern Botswana covers an area of approximately 76 332km^2 comprising of major rivers, fertile soils, good clays, relatively good average annual precipitation of 500mm and a significant part of the country's population totalling 683.314 individuals. Climate of south-eastern Botswana is semi-arid and it is hot and dry most of the year. Most rainfall is received in summer from November to May. Yearly average temperature here is 19.8^{O}C (https://en.climate-data.org/country/115/) 2017.02.14.

Botswana has a dual system of statutory and customary tenure since independence (Griffiths 1997; Adams *et al*. 2003). Current land use in south-eastern Botswana is predominately agriculture and pastoral (Silitshena & McLeod 1998). Gaborone, the capital of Botswana, is situated in this south-eastern part of the country. The villages, towns and lands from which data are acquired for this study are Molepolole, Letlhakeng, Kanye, Lotlhakane East and West, Otse, Gaborone and Kgwarape. Distances and directions from Gaborone are: Molepolole, capital of the Tswana-speaking Bakwena-baga-Sechele, 57 km north; Letlhakeng, home of the Kgalagadi-speaking Bakgalagadi, 113 km north; Kanye, the capital of the Bangwaketse, 94 km west; Moshupa village of Bakgatla-baga-Mmaana, 65 km west; Lotlhakane West, 80km west, village of Bakgalagadi; Lotlhakane East, settlement of the Bangwaketse, 104 west, Otse, 66 km south; village of Balete and

Kgwarape, residence of the Tswana Bakgatla- baga-Kgafela, 25 km east (Fig. 2.1). All the villages are situated in the hardveld except for Letlhakeng which is located in the sandveld.

Two significant seasonal drainage systems are found in the area: Metsemotlhabe (sandy water) and Notwane Rivers. Both rivers flow into the Limpopo Basin drainage. The watershed between the Limpopo basin and the Kalahari forms a linguistic boundary between the Bakgalagadi speakers in the Kgalagadi and the Batswana-speakers in the Metsemotlhabe basin. Eighty percent of Botswana's population comprises of descendants of Tswana-speaking ethnic groups that fragmented due to warfare and droughts in the 15th and 16th centuries (Denbow & Thebe 2006). There are several small rivers on the north-western part of the study area that drain into the Kalahari Basin. Soils found in the area are generally sandy loam to sandy. Both primary and secondary clays are found in the study area. Dominant vegetation type in the area is bush savanna and a combination of broad leafed deciduous trees and acacia thorn-scrub. Surface water in the area is scarce (Weare & Yalala 1971; Silitshena, & McLeod 1998; Ekosse 2000).

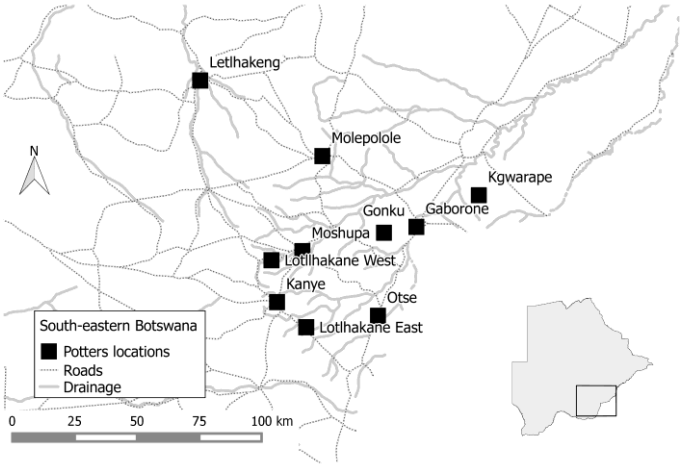


Figure 2.1: The Location of potters in south-eastern Botswana

South-eastern Botswana is one of the most densely populated regions of Botswana, but it is fragile and susceptible to droughts. Rlatively poor rainfall affects agricultural productivity in the region. Subsequently, migration to urban areas and main villages is one of the surviving strategies adopted by affected populations. Unemployment remains common and a significant number of people especially youth migrate to nearby cities to seek employment. Other parts of the rural population engage in arable and pastoral farming and other forms of livelihood including vendor projects, construction, welding, basket weaving, sculpture, jewellery, leather and tanning to complement income. The main sources of cereal crops in the study area include sorghum (*mabele*), maize (*mmidi*) and beans (*dinawa*) (Adams *et. al.* 2003). These products may be sold for cash or traded for other products including water, meat, milk and crafts. Several people in the study area have abandoned farming due to the decline in productivity in the sector to seek for alternative economic activities in cities and major towns. This massive migration is a result of drought faced in the agricultural sector, good infrastructure, services and employment opportunities in urban area and sometimes marriage. The Botswana Government has introduced several programs to curb economic challenges associated with rural lifestyle. Infrastructural developments have been introduced in south-eastern Botswana including schools, paved roads, modern transport and communication, wholesale and retail commerce and game reserves (Botswana Government 2002; 2014).

Pottery making has been noted as one of the economic strategies to meet household needs (Wilmsen *et al.* 2009, 2016; Thebe *et al.* 2010). Despite the economic benefit of modern pottery making, most people still hold the historical notion of pottery making as a 'backward tradition.' Notwithstanding the availability of ceramic substitutes such as metal, plastic and glass containers, people still use pottery for various purposes including cooking, ritual and decoration. Clay pots are also used in communal events including weddings and funerals and other celebrations. There is a general preference for clay pots as opposed to

enamel vessels for brewing traditional beer and water storage. There are some claims among elderly people that traditional beer tastes better and cooler in ceramic vessels than in metal pots.

Women of various age classes dominate the craft of pottery making but there are few cases of male potters in south-eastern Botswana. Most pots are sold and distributed to local clientele but some pots may be sold to major towns and centres and in trade fairs (Thebe & Sadr 2017). Small to medium scaled thin walled pots are occasionally sold to the tourism industry. However, pottery market remains tough in most of Africa (see Livingstone Smith 2016). Other artisans live near or at places where they were born but others move to new areas as a result of marriage and economic reasons. Potter mobility has created new pottery technology networks.

2.2 Language and Ethnicity

In the Tswana language (Setswana), *morafhe* (pl.: *merafhe*) can refer to an ethnic group or 'tribe' (Nyamnjoh 2007) but definitions vary (Schapera 1938; Wilmsen & MacAllister 1996; Bolaane & Mgadla 1997; Griffiths 1997). Schapera (1952) provides a detailed definition of the word 'tribe' as corresponding to the Setswana word *Sechaba* referring to effective political organization in a defined area ruled by a paramount *Kgosi* (*Kgosikgolo*). These territories were ruled through male lineage. The Tswana have been called 'a multi kingdom tribe' because they comprise of small to large autonomous polities of people who speak the same language with similar customs (Richards 1961; Schapera 1963). Schapera is ambiguous in defining pre-colonial 'tribes' because he ignores the heterogeneous and fluidity of social organization that is not ascribed at birth but is independently applied and granted (S. Hall 2011). In this thesis, the term 'tribe' is avoided and the concept of polity

is used to capture the meaning of *morafhe* as a politically organized community with a distinct social, historical, and sometimes linguistic identity (Louw & Finlayson 1990; Van der Spuy 1990).

The majority of the people in the study area speak Setswana which is one of the Sotho-Tswana languages. Apart from the dominant Tswana, Botswana is inhabited by other people who differ from them in language, history and culture (Fig. 2.2). The most widespread are the Bakgalagadi. They were formally regarded as culturally degraded Tswana, but their language has been shown to be distinct although a member of the Sotho-Tswana Group (Schapera 1938, 1952). The Bakgalagadi are divided into many groups including the Kgwatlheng, Ngologa and Phaleng, but most of the Bakgalagdi were subjects (*batlhanka*) of Tswana 'masters' (*barena*) groups. The Batswapong are a collection of groups who inhabit the Tswapong hills and for many years were subjects of the Bangwato (Sillery 1952; Mpulubisi 1992; Motzafi-Haller 1993). The Batswapong are culturally a "Pedi"or "Northern Sotho"group (Legassick 1969; Parsons 1973).

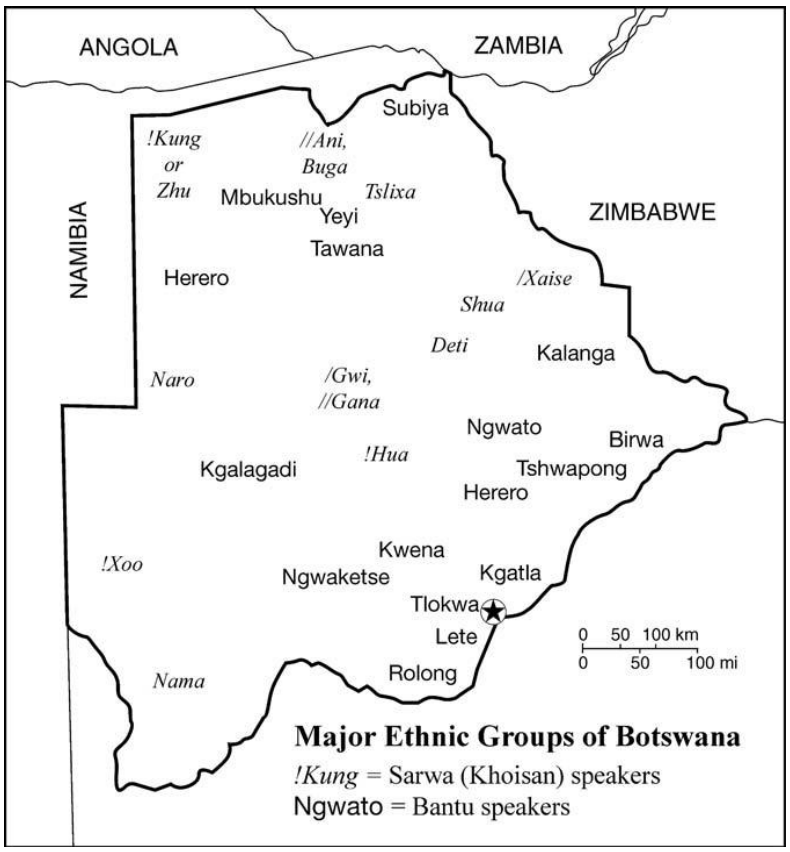


Figure 2.2: Major ethnic groups of Botswana. The star marks Gaborone, in the land of Batlokwa, the last Reserve to be established within the Protectorate (modified from Denbow & Thebe 2006).

2.3 Social Organization

Each political organization is governed by its own 'chief' (*kgosi*) who organises major public activities through age regiments (*mephato*). These are formed every few years when

young men are simultaneously initiated with a member of the royal family who is the recognized leader. There are also age regiments of women corresponding with men (Schapera 1952). Most *dikgosi* abandoned *mephato* when they became Christians, which is a common religion in Botswana. They did not want to be associated with rainmaking and other African traditional rituals. The western form of life largely displaced traditional ceremonies and rituals. Nowadays, there are several attempts to revive traditional forms of life in some Botswana *merafhe*, especially amongst the Bakgatla-gaba-Kgafela and the Balete who have resuscitated initiation ceremonies (Matemba 2003; Setlhabi 2014). Pottery making has also been revived in a number of villages where pots are used in traditional ceremonies. Economic and re-tradition concerns are the main force behind the revival of the craft (Thebe 2016).

Homestead clusters (*malwapa*) are the most important units of communication, production and consumption of social networks in chiefdoms (Kuper 1970, 1982; Maggs 1980; Huffman 2012). Within the *morafhe,* the most outstanding unit apart from the family and the household is the ward. This is a patrilineal but endogamous group of people living together in a single village or part of the village, organized into separate administrative units under the authority of a hereditary headman. Members of the ward are often related to one another by blood or marriage. But almost every ward contains people of alien origin. Most Tswana towns are typically large and politically organized. The Bakgalagadi are less politically organized and live in small settlements (Schapera 1952).

Traditionally, the Batswana are a patriarchal population that practise polygamy and cross cousin marriage (*ntsala*) in order to maintain wealth paid in form of 'bride price' (*bogad*i) within the family system (Schapera 1952, 1938). The majority of property and political office are inherited through the male line. The Bakgalagadi are politically and culturally similar to Batswana. Polygamy has declined in Botswana due to the introduction of

Christianity during the Protectorate Period (1885-1996) and most of the country's population lost an agrarian structure to be a cash based economy. Since independence most families are monogamous.

Both men and women participate in different social roles. Marriage is usually within the same village and married women are expected to stay with the in laws for a while until establishing their own homes. Females' domain space focuses on the domestic and agriculture. The male domain is largely pastoral herding and the public space (*kgotla*). However, these social domains may overlap. In both Batswana and Bakgalagadi linguistic groups, women engage in social exchange networks. During the Protectorate Period, both groups derived their income from the migrant labourers who worked in South Africa mines (Solway 1992).

2.4 Archaeology

The archaeology of south-eastern Botswana is a central component of this study. Despite its proximity to major research institutions in the country, there is limited archaeological research in south-eastern Botswana (Denbow 1981, 1986; Cohen 2009, 2010; Dichaba & Thebe 2016). However, the region has an archaeological occupation spanning from the Early Stone Age to present (Pahl 1971, 1974; Robbins 1985, 1986; Campbell & Main 2003; Myrer 2010). Archaeological surveys and excavations identified fossil stream valleys, Early, Middle and Late Stone Age tools, Iron Age ceramics, agro pastoralist sites, metallurgical debris, stone built enclosures, circular stone foundations and grain bin stands (van Waardern 1992; Labounty 1995; Pearson 1995; Lane 1996).

Archaeological records indicate that evidence of the Early Iron Age in south-eastern Botswana dates to A.D. 600 and is associated with two facies: Baratani and Broederstroom facies. Baratani facies are named after the Baratani hill and Broederstroom tradition is found at Magagarape near Molepolole. Both sites have evidence of iron working, agriculture and pastoralism (Campbell *et. al.* 1991; Sadr 2002). Middle Iron Age sites in south-eastern Botswana are represented by Eiland tradition at Moritshane and Broadhurst sites dating from A.D. 1000-1400 (Denbow 1981). Eiland sites are typically kraal sites located on hilltops (Caister 1982). Eland pottery noted in several places in western Botswana is often associated with the ancestors of the Bakgalagadi (Campbell 1998). The Late Iron Age in south-eastern Botswana appears around A.D. 1300 and is associated with Moloko pottery which has been "equated" with the Sotho Tswana and historic Batswana pottery (Campbell & Tlou 1987). The contemporary Bakwena pottery has some of the traits of Moloko tradition but further work needs to done on the link between Eiland tradition and Bakgalagadi pottery. However, it is debatable whether pottery style reflects linguistic or cultural identity (M. Hall 1984).

2.5 History

Oral history and archaeological data are the two key sources of information commonly used to unravel the past in Botswana. According to Schapera (1952), the Tswana are represented by three main divisions: a) Southern comprising Tlharo, Rolong, Tlhaping, Hurutshe, Ngwaketse, Kwena and Mmanaana, b) Northern comprising of Ngwato, Tawana, Kaa and Khurutshe, c) Eastern including Kgatla, Tlokwa and Malete speakers. Most of these groups share a common history, for example, the Bangwaketse and Bangwato were once wards under the Bakwena (Schapera 1942b). Oral history indicates that the Batswana and Bakgalagadi groups migrated from the Upper Limpopo, Notwane, Vaal and Molopo rivers in South Africa into what is now Botswana at different times. Most historical narratives

attribute population migration as a result of warfare, land conflicts, chieftainship crisis and drought (Campbell & Tlou 1987). The Bakwena-baga-Sechele are considered to be the most senior and first Tswana *morafhe* to settle in modern Botswana around 1720 (Schapera 1952). The Balete's cultural and historical affiliation can be traced to the Nguni but have been assimilated into Tswana culture. Political centralisation in southern Africa is not homogenous but a result of complex heterogeneous historical layering (S. Hall 2012).

Members of a 'tribe' (*morafhe*) tend to settle in large villages. The Tswana are further divided into totemic groups, all endogamous, which cut across political divisions into a tribe. The Bakwena totem is a crocodile (*kwena*) and share it with the Bangwaketse who are their off shoot. All Bakgatla groups venerate monkey (*kgabo*) as totem (Schapera 1942a, 1980; Matemba 2003). Historical documents are silent on totem(s) of Bakgalagadi because they sometimes use their 'masters'(*barena*) icon. Some sources identify *tlou* (elephant) as the totem.The Balete use buffalo (*nare*) as totem, a clear testimony to their Nguni origin (Schapera 1938).

The Bakgalagadi are one of the first iron working groups to arrive in the area now called Botswana and they interacted with hunter-gathers they found in the Kgalagadi Desert around the fifteenth century (Stow 1905; Okihiro 1976). On the contrary, contact between the Bakgalagadi and hunter-gatherers involved assimilation (Mautle 1986). Bakgalagadi in Lotlhakane West and Lotlhakeng prefer to consider themselves to be part of ethnic groups of Bakgwatlheng, Babolaongwe and Bangologa. Due to population pressure, the Bakgwapeng and Bashaga groups of Bakgalagadi moved north of Molopo River and settled west of Dithejwane, Dithubaruba (Campbell 1998). The Bakgalagadi were further 'pushed' west to the Kgalagadi Desert by aggressive Batswana groups.

Historical and anthropological studies among Bakgalagadi (Bangologa) have been conducted from a variety of perspectives (Silberbauer & Kuper 1966; Kuper 1970; Mautle 1986). Tlou and Campbell (1987) account for the origins of Bakgalagadi and their relationships with other Tswana groups which involved wars. The Tswana raided cattle of the Bakgalagadi. Most of the Bakgalagadi history is full of accounts of subjugation (*bolata*, a Tswana form of slavery), payment of tribute (*sehuba*) and denial of political representation of the Bakgalagadi by the Batswana (Ngcongco 1977; Mautle 1986; Ramsey 1991). Consequently, the Bakgalagadi avoided contact with the Bakwena and other Tswana *merafhe* (Okihiro 1976). However, these groups are today of little importance in terms of national politics (Scharepa 1957; Wilmsen 1989, 2002). With the declaration of Botswana as a Protectorate in 1885 tensions between the Bakgalakagi and Batswana were reduced. The Bakgalaagdi were given property rights and freedom to run their tribal affairs. Today in south-eastern Botswana, the Batswana and Bakgalagadi are engaged in a pottery network through knowledge transmission and sharing of clay sources.

During the Protectorate Era, the *dikgosi* lost political power and prestige. In the 1840s, David Livingstone, perhaps the most celebrated missionary of all times in Africa, established a mission school amongst the Bakwena at Kolebeng about 25km west of Gaborone. He introduced Christianity in the area and numerous European goods including guns that guaranteed the Bakwena protection against Boer expansion (Ramsay 1991). The Bakwena provided ivory and ostrich egg shells to the network. Kgosi Sechele I of the Bakwena was one of the first Christian coverts at Kolobeng (Okihiri 1976; Shepperson 1998).

Botswana gained independence from Britain in 1966. The country adopted an administrative framework with a democratic parliamentary republic system where the state controlled *dikgosi*. Subsequently, *dikgosi* lost further political power and prestige. Traditional initiation schools called *bogwera* for boys and *bojale* for girls, traditional

games, puzzles, riddles teaching social responsibility and rain making ceremonies were abandoned. Most *dikgosi* and their *merafhe* became Christians (Denbow & Thebe 2006). However, tribal administration still plays an important role in the country where the majority of people still live in rural areas. *Dikgosi* run all customary courts in the entire area: maintaining peace and stability as well as preserving culture and customs. Old patriarchal customs in Botswana are also changing allowing women to rule *merafhe*. For example: the Balete, with their headquarters at Ramotswa, are ruled by a female traditional leader, Kgosi Mosadi Seboko (Matemba 2005).

In this study, it has been observed that potters with deep political ties and social networks share clays sources. Historically, the Bakwena considered the Bakgalagadi as their subjects. Tensions existed between the two *merafhe* until the Bakgalagadi were considered 'independent' after the declaration of the Protectorate in 1885 and further with the establishment of a democratic government at independence in 1966. Even now the Bakgalagadi are administratively and politically under the Bakwena in the Kweneng District or under the Bangwaketse in the Southern District. The creation of these administrative and political boundaries has produced a network in the use of clay sources. We have seen an element of cultural supremacy in clay sourcing boundaries. The Setswana-speaking potters from Kanye use a local source to get their clay but scoff at the thought of sharing the equally distant sources with the Bakgalakgadi-speaking potters from Letlhakeng West. This is because historically the Bakgalakgadi people were serfs (*batlhanka*) of the Batswana. Historically, serfs could even adopt surnames and totems of their masters.The Bangwaketse as masters would not lower their position by using clay sources of their former serfs. The Bangwaketse are however willing to allow the Bakgalakgadi-speaking potters to ask for clay. In the same way, the Setswana-speaking artisans in Molepolole allow the Bakgalakgadi-speaking potters from Letlhakeng to use their superior clay. It is interesting to note that despite these close links the Bangwaketse and Bakwena potters do not share clay sources. Distance is probably a restricting factor and the potters stay in

different administrative districts. There are potters who have relocated from their place of birth because of economic or post marital reasons. Some of these relocations have created anomalies in pottery patterns in Kgwarape, Moshupa and Gonku. Some of these potters have their own local clay sources, and as subsequent overall assessment shows, they do not share forming and shaping pottery techniques, decoration styles and firing methods.

Ceramic data probably indicates this loss of traditional lifestyle, political power and prestige in Botswana during colonial and post-colonial era. (1) pots are no longer made in large quantities as in the past (2) thin walled pottery targeting the tourism industry is produced (3) there is a significant use of modern enamel paint and plastic utensils in replacement of pottery vessels (4) enamel paint an polish glazes are increasingly replacing ochre based paints to decorate pots (5) modern clay items including candle and pen holders have been introduced and (6) most ritual prohibitions concerning pottery making have been abandoned due to the introduction of Christianity.

2.8 Pottery Studies in Africa

Ceramic making is an ancient craft in Africa. For many centuries, clay has been one of the most abundant and cheap raw materials that has been utilised. Some of the oldest pottery remains were found in Niger in West Africa dating to around 10,000 BCE ((Haour 2003; Huysecom *et al.* 2009). Pottery, the most common artifact in African Iron Age sites, arrived in southern Africa about 2000 years ago (Huffman 1980, 1989, 2002, 2007, 2012; Denbow 1981; Jacobson 2005). Later Stone Age ceramics predate Iron Age wares by as much as four centuries. Thick walled pottery in South Africa is more recent while thin walled pottery may have been invented independently in the region (Sadr & Sampson 2006). Despite its antiquity, the craft of pottery production is still alive in many parts of the

continent (Gosselain 1992, 2008, 2010; Gosselain & Livingstone Smith 1995; Fowler 2008).

2.9 Brief History of Ceramic Analysis

There were a number of early attempts to understand ceramic identity, style and technology (e.g. Laidler 1929, 1938; Caton-Thompson 1931; Schofield 1948; Shepard 1956; Renfrew & Bahn 2008; David & Kramer 2001). Ceramic studies are relatively recent in southern African archaeology with two main approaches: technical and stylistic methods (Sadr 2008:104). There was 'ethnographic' interest in southern African traditional pottery since the early 17th century; however, systematic ceramic research in the archaeology of the subcontinent only began in the late 1920s. Getrude Caton-Thompson is well known for an interdisciplinary survey and excavation project at Great Zimbabwe. Her excavations in 1929 confirmed that the site represented a major culture of African origin (Caton-Thompson 1931). In 1929, P.W. Laidler published the first comprehensive archaeological and ethnographic classification of southern African pottery (Laidler 1929, see also 1938). Schofield (1948) made another major attempt to classify pottery from southern Africa. He associated ceramic wares with different population groups. The idea of associating pottery traditions with ethnolinguistic groups has been critiqued by several ethnoarchaeological studies (Lindahl & Matenga 1995; Gosselain 1999, 2000, 2011; Pikirayi 2007; Smith 2009; Lindahl & Pikirayi 2010; Livingstone Smith 2010; Livingstone Smith & Visseyrias 2010; Mayor 2010; Pikirayi & Lindahl 2013; Mubaya & Mawere 2015). Other studies of southern African Iron Age ceramics focussed on stylistic attributes (Mason 1952; Phillipson 1968, 1977; Huffman 1980; Maggs 1980; Denbow 1981).

There are a number of ethnographic and archaeological studies that were undertaken in south-eastern Botswana that assumed that pottery style reflects linguistic or cultural identity (Caister 1982; Horner 1986; Gollifer 1986; Segobye 1987; Campbell *et al.* 1991; Labounty 1995; van Waarden 1999). Other studies in Botswana provide ethnographic baselines of Tswana pottery making technology from clay collection to firing (McDonald 1940; Lawton 1967).

2.10 Brief History of Ethnoarchaeology

The term "ethnoarchaeologist" was coined 100 years ago by Jesse Fewkes (David & Kramer 2001:7). The formal emergence of ethnoarchaeology as a discipline dates back to 1956 when a paper by Maxine Kleindienst and Patty Jo Watson entitled 'Action Archaeology: the archaeological inventory of living communities' was produced (cited in David & Kramer 2001:8). Ethnoarchaeology developed in order to provide better ethnographic analogies to assist in the interpretation of archaeological data (Yellen 1977; Kent 1987; Johnson 1999).

Ethnoarchaeology involves a range of approaches to understand the relationship of material culture as a whole, both living context as it enters the archaeological record and the use of such understanding in order to inform archaeological concepts and improve interpretation (Hegmon 2000; Gosselain & Livingstone Smith 1995:148; Lane 1998:177; Neupert, 2000:252; David & Kramer 2001:9). Archaeological interpretation is founded on and ultimately depends upon analogy. Ethnographic analogy is one of the common research tools of archaeological interpretation. Analogies can be observed and replicated (Longacre 1991; Stark 2003). Binford (1967:1) defines analogy as the term used to designate a particular type of inferential argument.

Kent (1987) defines ethnoarchaeology as the formulation and testing of archaeologically oriented and/or derived methods, hypotheses, models and theories with ethnographic data. This definition is clearly restrictive and processual in approach (Livingstone Smith 2000). Ethnoarchaeology should not restrict itself to testing of models relating to variability of human behavior to material traces. As Archaeologists conduct ethnographic studies to benefit archaeological interpretations, they adapted many ethnographic techniques of gathering data (Skibo *et al.* 1989).

The ultimate objective of ethnoarchaeology is to utilise observations about the present in order to formulate ways of identifying operation of comparable processes and causes of variation in material patterning of the past (Lane 1998:178). There are a number of ethnoarchaeological studies that provide useful insights into understanding learning patterns involved in pottery making (see also Nicklin 1971; Herbich 1987; Gosselain 2011). Other related studies place emphasis on pottery *chaîne opératoires* by examining how pottery technology is applied (Livingstone Smith & Van der Veken 2009; Wilmsen *et al*. 2009; Livingstone Smith & Visseyrias 2010).

2.11 Pottery Classification

Classifications are an important part of ceramics studies (Adams & Adams 1990). Classification refers to any system for grouping objects together (Hayden 1984). It does not necessarily relate artifact categories to their makers. Hayden (1984) refers to *emic* as the way indigenous groups classify objects and behaviour. It is commonly referred to as "ethnographic" classifications. On the other hand, *etic* refers to the way "scientists" (in this case archaeologists) classify objects or behaviour to solve specific problems, or find

specific types of information. Ethnoarchaeologists have the best of both worlds and can collect *emic* data and analyse *etic* information. Hayden (1984) concluded that both native groups and archaeologists have specific and varied reasons for grouping objects. The reasons archaeologists may be interested in grouping objects may correspond in whole or in part to native reasons or they may not correspond at all. Where there is an overlap, archaeologists have a good chance to increase their understanding by studying native typologies. On the contrary, where there is little or no overlap, archaeologists stand to gain little (Hayden 1984:83).

Huffman (1980) provided ground-breaking work on ceramic classification and Iron Age entities in southern Africa. He developed a standardized procedure for classifying ceramics that is now used in the region to measure Iron Age archaeological identity through pottery. Huffman (1980) obtained macro scale control samples from five linguistically separate groups (with distinct ceramic styles) of southern Africa: Tonga, Ndau, Korekore, Venda and Pedi. Each of the five groups studied has separate identities and their ceramics styles were distinct (Huffman 1980: 123). My study attempts to detect social and technological boundaries at micro scale. Huffman's model of the relationship between ceramics and group identity comes in for criticism through the 500 Year Initiative (FYI). This project combines methods of history and anthropology to focus on the creation of South African identities over the last 500 years (Esterhuysen 2008; S. Hall 2006).

2.12 Ceramics Styles and Ethnic Identity

It is important to define style and discuss where it resides, how it is produced, its function and medium of information exchange (Huffman 1980; Hodder 1982; Wiessner 1983; Levi-Strauss 1988; Gosselain 2000; David & Kramer 2001). Style as part of culture, is learned

and possessed within groups and the correlation between design style and groups of people is well known (Plog 1980). Style is the form and structure which lies behind all social functions and all information flow (Conkey 1990). Style is also defined as a highly specific and characteristic manner of doing something that is always peculiar (Sterner 1989).

All variations in form and behavior which are non-functional can be called 'stylistic'. Huffman (1980) observes that ceramic styles can be used to establish Iron Age entities. He considers three aspects of southern African ceramic style system; (1) profile, (2) design area and (3) decoration (Huffman 1980: 124). Similar observations on style are shared with Evers (1988) who defines style as repetitive codes of non-verbal cultural symbols. In his view, there are two important dimensions in determining types: vessel form and motif.

Style is also seen as the referral of an individual event to a general way of doing (Hodder 1990: 45). Hodder (1982) investigated what material 'cultures' (geographical areas with recurring associations of artifacts) represented and related to in a living context. It is clear that material cultures do not always reflect ethnic or linguistic units. Hodder emphasised that symbols do not 'reflect' but they play an active part in forming and giving meaning to social behaviour (also see Gosselain 1999). Sackett's (1985) isochrestic variation identifies technological and school of learning or community of practice as key components of style. Wiessner (1985) cautions that an artifact only has style when it has acquired social meaning. Wiessner (1983) defines style as formal variation in material culture that transmits information about personal and social identity. The definition of style that I use in this thesis is borrowed from Wiessner (1983).

Hodder (1982) observes that the role of artifact styles in symbolizing group identity is significant when tensions and economic competition exist between groups. Styles are not fixed and static entities, they are dynamic and important personal elements in long term perspectives. Emblemic is used to express objective social attributes of identity (Zavalloni

1973: 253). Assertive style is formal variation in material culture which is personally based and which carries information supporting individual identity, by separating persons from similar others as well as by giving personal translations of membership in various groups (Deetz 1965; Plog 1980; Wiessner 1982).

2.13 Learning and Cultural Transmission

The topic of learning and cultural transmission has resonated amongst anthropologists in the last three decades (Cavalli-Sforza & Feldman 1981; Lave & Wenger 1991; Bisin & Verdier 2001). Anthropological perspectives on cultural transmission and culture dynamics have been influenced by biological and cultural evolution (Lumsden & Wilson 1981; O'Brien & Hollard 1992; Boyd & Richerson 2005; Gosselain 2011; Mesoudi *et al.* 2006). Archaeological research on learning and cultural transmission point to several directions including situated learner theory emphasizing on the social context of learning and that knowledge is derived from people's participation in daily life (Hewlett & Cavalli-Sforza 1986; Strak *et al.* 2000). Cultural transmission is driven by individual decision to imitate other individuals and other possible biases (Jordan & Shennan 2003; Gosselain 2008). Historical connections may also affect learning and cultural transmission (Tehrani & Collard 2002).

The transmission of knowledge in pottery making in Africa is not a visible activity (see also Nicklin 1971; Herbich 1987). In most of the continent, the skill of pottery making is often only acquired from one teacher in a specific geographic location and at a particular time. Training of an apprentice is often transmitted by close relatives including biological mothers and grandparents and seldom learners can acquire skills from sisters, cousins, aunts and nieces. Of all the stages of pottery production, technological skills and gestures learnt

in forming and shaping pots are at the centre of knowledge transmission (Gosselain 2008; 2011). The actual learning of pottery making is based on mastering the skill of forming and shaping pots. As a result, shaping and forming phase of pottery provides the best marker of stylistic and technological boundaries. The apprentice learns how to make pots by starting with the manufacture of small pots that mimic those of the teacher. Learning can last from a few to several months. Prior to engaging in this stage, learners participate in communal activities of pottery production as assigned by the master potter including clay extraction and fuel collection.

CHAPTER 3: CLAY SOURCES

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Clay Sources and Contemporary Potters in South-Eastern Botswana

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Country and region discussed: south-eastern Botswana.

ABSTRACT

In this paper, we ask what factors influence the potter's choice of clay and temper. We used an ethnoarchaeological approach and examined the role of factors such as geographic location, potter's linguistic and ethnic affiliation, and their membership of learning

networks in each potter's decision to use a particular clay source. Our study included 41 contemporary potters in south-eastern Botswana. The results indicated that the selection of potting clay here is principally dictated by distance to the source; all else being equal, potters get their clay from the nearest source. Their cultural, political and linguistic affiliations or membership of particular learning networks played, at best, a secondary role in the choice of potting raw materials.

Key words: sourcing, clay, temper, pottery; ethnoarchaeology; social boundaries; Botswana.

INTRODUCTION

Pottery in the Sahara is over 10,000 years old (Haour 2003; Huysecom et al. 2009), but in southern Africa the first ceramic vessels appeared only in the last few centuries BCE, a little over 2000 years ago (Sadr & Sampson 2006). The craft of making ceramic pots is still practiced in southern Africa (e.g., Fowler 2008; Wilmsen et al. 2009; Pikirayi & Lindahl 2013; Thebe 2017) and contemporary potters can be a useful source of information for better understanding ancient ceramics (David & Kramer 2001; Gosselain & Livingstone Smith 2005; Livingstone Smith 2010; Livingstone Smith & Visseyrias 2010) .

Ancient pottery is often used as a stylistic marker to identify a particular archaeological culture (e.g., Sadr & Sampson 1999; Huffman 2007). There have been many studies on how style is produced, and how it might reflect the ethnicity of the producer (e.g., Sackett 1982; Wiessner 1983; David et al. 1988; Major 2010). Craft learning networks have been

shown to be important in shaping stylistic boundaries in material culture (e.g., Arnold 1985; Gosselain 1992, 1998, 2011, 2016; Leroi-Gourhan 1964; Herbich 1987; Dietler & Herbich 1989, 1998; Thebe & Sadr 2016). However, stylistic variations in material culture can also mark boundaries other than 'cultural' ones, such as between age groups, gender, class, political, economic and other groupings of people (for examples see Hodder 1982). Barth (1969) cautioned against advocating a simplistic relationship between ethnicity and material culture. There is much diversity in what a style can signal, so the simple equation in southern African archaeology of 'pots = people,' is ripe for re-assessment (see Stahl 1991; Cruz 2011).

The extraction of raw materials is the first important technical procedure for making pots (Grim 1953: Hodges 1995; Rice 1987). Often, the study of raw material selection has focused on materials analysis (e.g., Arnold 1985; Arnold et. al. 1991; Schiffer et al. 1994), but the studies have focused more on the cultural aspects of raw material procurement and preparation (e.g., Dietler & Herbich 1998; Gosselain and Livingstone Smith 2005; Livingstone Smith 2010). In this paper, we consider whether the potters' choice of raw material sources can indicate their affiliations to ethnic, linguistic, political or learning networks or whether the choice is purely pragmatic and based on a least cost calculation.

BACKGROUND

Geographically, south-eastern Botswana covers an area of over 76,000 square kilometres. It is characterized by two major physiographic divisions: the hardveld with its fertile soils and the Kalahari (or *Kgalagadi*) sandveld (Aldiss et at. 1989; Thomas & Shaw 1991; Silitshena & McLeod 1998). A watershed defines their boundary. There are many ephemeral rivers on

the rocky south-eastern slope that flow into the Limpopo River and a few fossil streambeds on the sandy north-western slope drain into the Kalahari Basin (Weare & Yalala 1971; Ekosse 1994, 2000). South-eastern Botswana is the most densely populated region of the country, and unemployment is common as a significant number of people, especially youth, migrate here to seek employment. The rural population engages in arable and pastoral farming and other forms of livelihood including pot making, construction, welding, basket weaving, sculpture, and leather working and tanning.

The local population of this area can be broadly divided in two language groups: the Bakgalagadi and the Batswana. The former are one of the first iron working groups to arrive in this area (Stow 1905; Campbell 1998). Most of the Bakgalagadi became subjects of Batswana groups who arrived later and who were politically stronger and richer (Schapera 1963, 1980; Ngcongco 1979; Mautle 1986; Ramsey 1991). Culturally, the Batswana and the Bakgalagadi are similar insofar as they follow certain totems under a chief in a village, are patriarchal, organized according to age regiments, marry cross cousins, practice bride wealth and live in homesteads (Schapera 1952).

The Batswana can be further subdivided in a number of *merafhe*, such as the Bakwena, Bangwaketse, Balete, Bakgatla and Batswapong. In the Tswana language a *morafhe* (pl.:*merafhe*) can refer to an ethnic group or tribe (Nyamnjoh 2007) but definitions vary (Schapera 1938, 1942a,b, 1952; Wilmsen & MacAllister 1996; Bolaane & Mgadla 1997; Griffiths 1997). In this paper, we use the concept of polity to capture the meaning of *morafhe* as a politically organized community with a distinct social, historical identity.

The 41 potters in south-eastern Botswana come from different age, gender, skill groups, social classes, religious background and *merafhe* (Fig.1). Information about them and their pots was collected through standard ethnoarchaeological methods including oral interviews and direct observations. Data collected included potter's biographic information, geographic location of their houses and clay and temper sources, membership of polity (*morafhe*), mode of raw material collection and transport, methods of clay preparation and the learning networks where they learnt their craft. Investigations also focused on the tools used for raw material extraction and processing, use of temper, knowledge transmission, rituals and taboos (Table 1).

Four types of clay procurement were observed: 1) individual collection, where a potter goes on her/his own to collect raw materials; 2) group collection by an association of potters; 3) family collection, where the collection of clay is done by the nuclear or extended family; 4) clay obtained indirectly through exchange for water, wood, grain or money. Clay collection is most often undertaken collectively. During wet seasons, access to clay sources located in river banks can be difficult; therefore the general practice is to collect clay during the dry season (May-September). Potters normally collect enough clay in a single trip to last for the whole season. The mode of transport and tools used in the extraction of clay sources are generally similar among our potters. Raw materials from nearby sources are usually transported on a collector's head in 20 litre enamel or plastic containers, or with a wheelbarrow. Shovels, hoes and picks are used for digging. Walking distances vary, and potters prefer to use other modes of transport including donkey carts and vehicles when distances are large. Generally for distances over 1 km donkey carts are used; beyond 8 km motorized transport is preferred (see also Rice 1987: 116-118; Arnold 2000).

Some of the clays that the potters use are primary clays which were formed in situ from the parent rock, and some are secondary clays found in alluvial or colluvial deposits, as well as in termite hills. Most clay sources serve a number of potters from different villages. Often, the extraction of clay is attended with symbolic rites and prohibitions including exclusions for menstruation, sexual intercourse, pregnancy, mourning, illness, anger and rain (e.g., Stark 2003; Armstrong et al. 2008; Fredriksen 2011; Wilmsen et. al. 2016). However, today most of the potters in south-eastern Botswana have abandoned traditional social prohibitions in pottery making. Few of their choices for clay sourcing are religious; most are economic. But the digging of clay is still considered something of a sacred activity, *tiro ya Modimo*. Most potters looking for *mmu wa Modimo* (God's soil) or *mmu wa Badimo* (ancestral soil) do so with respect and reverence. For example, they do not argue or gossip when searching for and extracting raw materials. Prayers or rituals may be performed at clay mines. Here, most potters will talk in soft voices and tenderly sing traditional songs or Christian hymns, usually directed by an elderly person or teacher. Clay sources inside villages and other public places are often avoided and considered to be polluted, *di raletswe*, because even people who are ritually unclean pass by them. Lotlhakane East artisans remove shoes before entering raw material pits. They throw *Mohatlha* wild camphor bush (*Tarchonanthus camphoratus*) or *Mosiane* (the right one) sand paper cordia (*Cordia ovalis*) branches into clay and temper sources *go hatlholola*, which is to purify the site before extracting raw materials. Similarly, during funerals, *Mosiane* is mixed with water and burial attendants wash their hands with the solution before entering the deceased's place. *Mosiane* solution is also sprinkled on visitors who come to the potter's house during raw material preparation and pottery manufacture.

The actual digging of clay is often delegated to apprentice potters since it is hard labour and the master potters are elderly. Nevertheless, the expert potters are particularly concerned about the quality of clay so they often go to sourcing sites to advise. Clay extraction zones

are often located along river banks, back waters, alluvial plains or hillsides, and at different depths from the ground surface. Not just any clay will do; its plasticity, texture, colour and even scent must suit the artisan's personal requirements. Many clay sources in south-eastern Botswana are on public land and open to anyone who wants to use them (but see Thebe et al. 2017). However, they may be overseen by some community members in close proximity to them. But they are not 'owned' by individuals, families or groups. None of the raw material sources have been officially allocated. Nevertheless, outsiders and newcomers have to seek permission to access the sources. Today, most clay sources are threatened by modern developments as in Molepolole where several residential and commercial properties have been allocated places that infringe on the clay sources (Thebe 2017).

In enquiring from our potters about key characteristics that determine good clay and temper, most artisans agreed that appropriate materials for potting are found by experiment. Plasticity (*go butsw*a) is the main sign of quality. This is determined by particle size, bonding qualities, colour and for the experienced artisan by smell and taste as well. Temper refers to the coarser components in the clay which are usually added deliberately by the potter. A wide range of materials can be added to clay as temper, including organic materials of animal origin (e.g. dung, shell, bone) and plant materials (e.g. grass, plant fibers, chaff or straw), crushed bricks and potsherds (grog), as well as rocks including limestone, sandstone, basalt and schist (Rye 1981). Organic materials improve clay plasticity. Most potters in our sample mentioned that clay requires some temper to ensure that it does not break during drying and firing (Rice 1987).

Preparation is required for all clay types in order to produce a suitable paste for pottery production. In south-eastern Botswana, clay is usually collected dry. It is often left in an open area to allow the particles to break down in the potters' back yard. Some potters add

water to dry clay then bury and cover it with soil for a few days or weeks to improve its plasticity. Maturation of clay can only occur if the clay is humid. After drying the clay, they remove unnecessary non-plastic materials. Clay and temper are pound using a wooden mortar (*kika*) and pestle (*motshe*). Occasionally, grinding tools are used. Rarely, potters prepare clay straight away without crushing and pounding. Metal sieves are used for removing undesired coarse materials. Lotlhakane East potters are the only artisans who do not sieve and pound clay but instead put it in a container and add water in order to allow coarser particles to settle to the bottom. The fine particles then float on water (called levigation process). Water is then channeled out to allow fine clay particles to settle on top of large particles. Coarse materials are usually removed because they make pots crack during drying and firing. Crushed asbestos is used as temper and is not winnowed for health reasons. The potters use clay recipe depending on the nature of clay material and not on the cultural tradition proper of the group they belong to. All this processing of clay and temper is done by individual potters separately in their own homesteads.

Despite the availability of substitutes such as metal, plastic and glass, people in south-eastern Botswana still use pottery for various purposes including cooking, ritual and decoration. Clay pots are often used in communal events such as weddings and funerals. Most potters sell and distribute their pots from homes to local clients who use them for storing traditional brew, water, grain and decoration. A few thin-walled pots are sold to tourist markets in major centres and outstanding vessels may be sold during trade fairs. Some people prefer to cook in clay pots claiming the food tastes better. As in other parts of Africa, pottery making here is one of the economic strategies to help households make ends meet.

MATERIALS AND METHODS

Using a Thermo Scientific Niton XL3t Goldd+ Portable X-ray Fluorescence (pXRF) instrument, we analyzed clay samples from most of the clay sources utilized by the potters. PXRF is a non-destructive analysis for geochemical investigations. X-ray fluorescence (XRF) spectrometry is a useful method for identifying the chemical elements present in clays and potsherds (e.g., Jacobson 2005; Crow 2011). A correspondence analysis (CA) of the pXRF data was used to search for meaningful patterns in the distribution of the clay sources and elements found in the different locations, different *merafhe* and different schools of learning. CA is a method of visualizing patterns in multivariate data (Shennan 1988: chapter 13) and is a particular case of weighted principal component analysis. Unlike principal component analysis, CA is suitable for presence/absence data that are not normally distributed and can even deal with unbalanced contingency tables with a large number of cells with very small or zero entries and some very large entries as well (e.g., Benzecri 1973; Bolviken *et al.* 1982; Greenacre 2007). As in principal component analysis, in CA we reduce the dimensionality of a contingency table and visualize it in two dimensional scatter-plots. The concept of reducing variability in multivariate statistical analysis is well explained by Shennan (1988: 246-258). For the CA we use the software R (R Core Team 2016) with the package 'ca' (Nenadic and Greenacre 2007). Detailed descriptions of the mathematics to calculate and transform the chi-squared distance in CA can be found in Bolviken *et al.* (1982) and Greenacre (2007).

Eight main clay sources are used by the potters in the study area, but we only had clay samples from six of these for the analysis which follows: two samples from source C, four from G, four from H, four from L, four from M and two from N. Of these, two sources are in situ clay weathered from local bedrock, two are alluvial deposits and two come from termite hills (Tables 1 and 2). The different clay samples from the same source were provided by different potters. The exact location within the source where each sample was

collected is unknown to the authors. Ten potsherds were analysed by pXRF. These potsherds were provided by eight potters, who work in six different locations, belong to five different polities, and are affiliated with five different learning networks (Table 1).

RESULTS AND DISCUSSION

The pXRF analysis shows that the two samples from source C differ considerably from the rest (Fig. 2,Table 3) principally by their high readings of calcium (Ca), as well as scandium (Sc) and sulphur (S). Two of the samples from source M (samples 2 and 3) are separated due to their unusually high content of manganese (Mn), Arsenic (As), mercury (Hg) and lead (Pb). Indeed, the difference is so marked that one wonders if these samples really come from the same source as the other two samples from M (samples 1 and 4).

Correspondence analysis (Fig. 3) indicates two clusters of potsherds. On the left side of the plot sherds H1, H41b, H33a and L6 are separated from the others because of high readings of phosphorus (P) and balance (Bal). This is what is present but not analysed as the total should add up to 100% including water and organic matter. The other six potsherds cluster on the right side of the plot. Curiously, potters 41 and 33--who both supplied two potsherds and prefer to get their clay from source H—each have one potsherd in each of the two clusters. Perhaps modifications by the potter, such as the application of surface treatment and or addition of temper, make it impossible to reliably assign sherds to clay sources by the pXRF method. These results indicate that the elemental composition of the potsherds is not precise enough to help us distinguish the geographic location and cultural affiliations of the potters who made them. Certainly, the elemental composition of the sherds will not, in our study area, inform about the potter's cultural identity.

Figure 4 shows the distribution of the clay sources and the catchment of the potters who use that source. There is a clear geographical pattern. Source H in the south is located at the headwaters of the Notwane River and serves potters in the upper basin of that river who live in the three villages Kanye, Lotlhakane East and Otse. Further north, sources M, N and O are located in the headwaters of the Metsemotlhabe River. They serve potters in the nearby villages of Lotlhakane West and Moshupa. Sources N and O are close together, the latter being an anthill which some of the locals prefer because it is out of the way and the risk of the clay being polluted by passers-by is negligible. Some of the potters who now use source O used to get their clay from source N. Further downstream, source A serves a single potter in Gabane, while past its confluence with the Notwane River, source G serves the potters in Kgwarape and Gaborone, who live close to the Notwane River south of its confluence with the Metsemotlhabe River. Farthest north are the two sources C and L. Source C is in the sandveld along the Moshaweng River, while Source L is at the headwaters of a branch of the Metsemotlhabe River. Source L produces high quality clay and has long been used by potters in Molepolole. They allow potters who live near source C to access source L because the former provides clay of extremely poor quality. The Letlhakeng potters mix clay from source C with source L clay when their supply of the latter gets depleted (see Gosselain 2016; Roddick 2016).

Do these spatial patterns of clay source utilization tell us anything about the potters' language group, the networks in which they learnt their craft, their affiliation with this or that polity? Or do the potters simply use the clay source that is closest to their workshop? Linguistic affiliation is a coarse category but it is interesting to note that the Bakgalakgadi speaking potters in Letlhakeng and Lotlhakane West tend to be the sole users of their nearest clay sources (C, N and O). These three sources are the westernmost in our sample, so a geographical and linguistic boundary can be said to separate the clay procurement catchments in our study area with the Bakgalakgadi-speakers utilizing the westernmost

sources and the Setswana speakers utilizing all the other sources which are located further east. Indeed, there is an element of cultural supremacy in this distribution as well. The Setswana-speaking potters 1 and 2 who get their clay from source H, scoff at the thought of sharing the equally distant sources N and O with the Bakgalakgadi-speaking potters from Letlhakeng West, because historically the Bakgalakgadi people were serfs of the Batswana: potters 1 and 2 would not stoop so low as to ask their former serfs for a favour. They are, however, willing to allow the Bakgalakgadi-speaking potters to ask them for clay, just as the Setswana-speaking potters in Molepolole allow the Bakgalakgadi-speaking potters from Letlhakeng to use their superior clay from source L.

In terms of polities the eight clay sources in our sample serve potters from six different *merafhe* (Fig. 5 and Table 1). The clay sources M and A which serve only a single potter each are not informative for this analysis, but among the rest, it can be seen that some of the clay sources are utilized exclusively by members of one polity. For example, sources N, O and C serve only Bakgalagadi potters. The other sources, however, are all utilized by potters from a mix of *merafhe*. Source G, for example, which is located in the capital of the Bakgatla polity is utilized by a Motswapong as well as by Bakgatla potters. But the Mokgatla potter in Moshupa (potter 32) has her own separate clay source M. As another example, source L is used by both Bakgalakgadi and Bakwena potters; and source H by Bangwaketse and Balete potters. Aside from the westernmost sources then, the use of a specific clay source is not a good indicator of polity membership. But the pattern of utilization is not entirely random and one can associate groups of *merafhe* members with certain sources (Tables 1 and 2): On the one hand, there is joint utilization of different clay sources by Bakgatla/Bangwaketse/Balete polity members, and on the other hand joint utilization of other clay sources by Bakwena/Bakgalakgadi potters. The sole Motswapong potter in the area, a political outsider, works on her own and does not share sources.

Overall, we can see that the choice of clay sources is not a good predictor of *morafhe* membership.

There are six learning networks among the potters (Table 1). Of the 41 potters, eight learnt their craft from a teacher residing beyond their own village. These learners generally returned to their own villages to practice their new skills. There is some overlap between pottery learning networks and preferred clay source catchments (Fig. 6). Besides the preferred clay catchments with only one potter each (sources A and M), we can see some clay sources were exploited exclusively by members of one learning network (sources L and N) while others serve potters from two or three different learning networks (sources G and H). Preferred clay sources are therefore only occasionally a good predictor of which learning network the potter comes from.

All the points regarding the choice of clay and the relationships between clay catchments and potter's language, location, *merafhe* and learning networks apply equally well to the temper sources (Fig. 7). Although the precise locations of temper and clay sources differ slightly, the spatial and social relationships in temper procurement are essentially identical to those of clay procurement.

The distances travelled to procure clay are shown in Table 4. On average, the distance to a potter's nearest source is about 15 km, but the average distance that the potters travel to their preferred source is nearly twice that much. The largest residuals of the distance between preferred and nearest clay source are seen among the Bakgalakgadi potters in Letlhakeng, whose nearest clay source C is of extremely poor quality. Only potter 6 is skilled enough to make pots using only clay from source C and the product is not a good

one. In other words, the large distance to a clay source covered by these Letlhakeng potters is logical in view of the poor quality if clay from source C, and source L is for all intent sand purposes their nearest usable source of clay. The only other large residual distance is for potter 38 who gets her clay from Mochudi (source G) when source A is much closer. Upon questioning, it was clear that potter 38 is unaware of source A, which is used only by potter 23 who is an outsider from Tswapong and does not interact with the other potters in our sample. As far as potter 38 knows, source G is indeed the closest source. It is interesting that most potters in our study area travel more than the 7 km distance which in some other studies has been considered as the maximum average distance between potter and clay source (Arnold 1985; Gosselain 2008 a, b; Fowler et al. 2011). This probably has to do with the good infrastructure of roads and easy availability of motorized transport in today's south-eastern Botswana. But it should also be kept in mind that the long-distance use of clay source L by the potters from Letlhakeng predates easy access to motorized transport and tarred roads (McDonald 1940; Lawton 1967). All factors considered, it is clear that the distance to the nearest (known and usable) clay source is the main determinant for the potters' choice of where to get their clay.

CONCLUSION

We began by asking whether the choice of raw material source could reflect a potter's ethnic and linguistic affiliation. As we have seen, the choice of clay and temper seems to be driven foremost by a consideration for travel distance, which outweighs other relationships such as language of the potters, their affiliations with a particular polity or the pottery learning network to which they belong (see Habicht-Mauche et. al. 2006; Roddick 2016).

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Figure and Table Captions

Figure 1. Map of south-eastern Botswana showing the locations where potters were interviewed and their clay and temper sources.

Figure 2. Correspondence Analysis plot of the chemical elements in the 21 clay samples from six sources (C, G, H, L, M and N). The elements were identified by pXRF analysis.

Figure 3. Correspondence analysis plot of the ten potsherds and their elemental composition obtained by pXRF.

Figure 4. The clay sources and their catchment area of potters, shown against a digital elevation model of the study area with the main drainages emphasized.

Figure 5. The clay sources and their catchments of potters who are identified by their polity (*merafhe*) affiliation.

Figure 6. The clay sources and their catchments of potters who are identified by their learning network.

Figure 7. The temper sources and their catchments of potters.

Table 1. The list of interviewed potters with relevant data.

Table 2. The clay and temper sources in the study area with relevant information.

Table 3. The 10 potsherds submitted to a pXRF analysis.

Table 4. The distances between potters' houses and their preferred as well as nearest clay sources. The distances have been measured in kilometers and along main roads wherever possible.

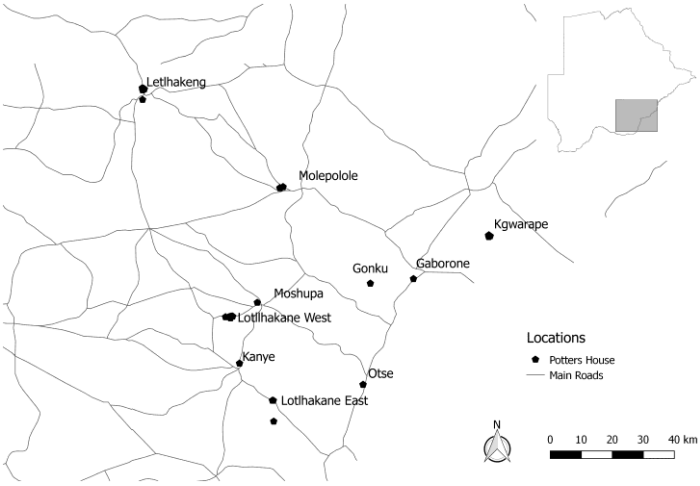


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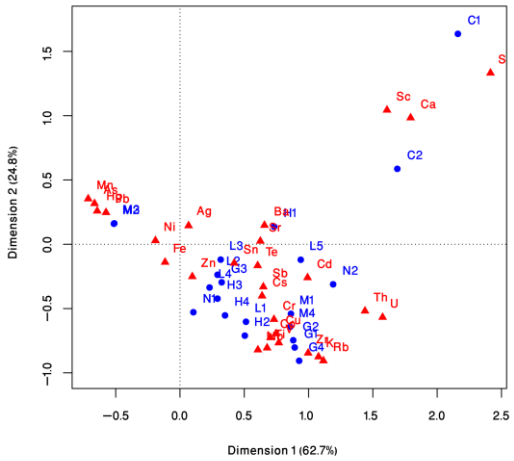


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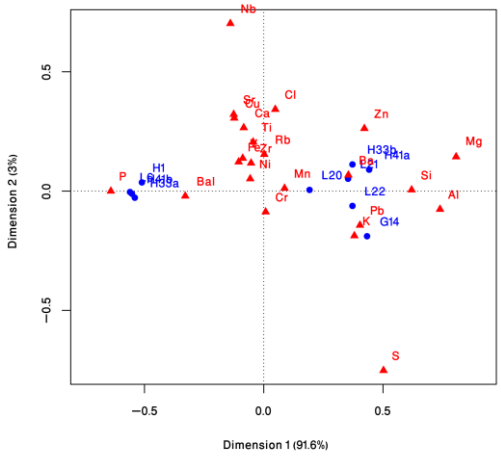


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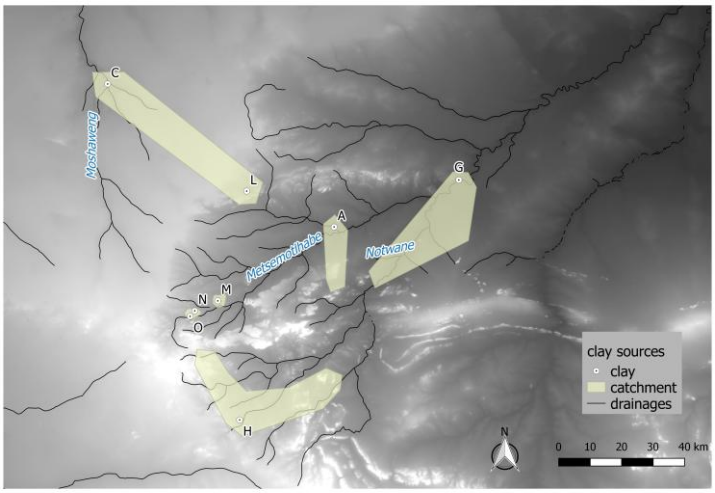


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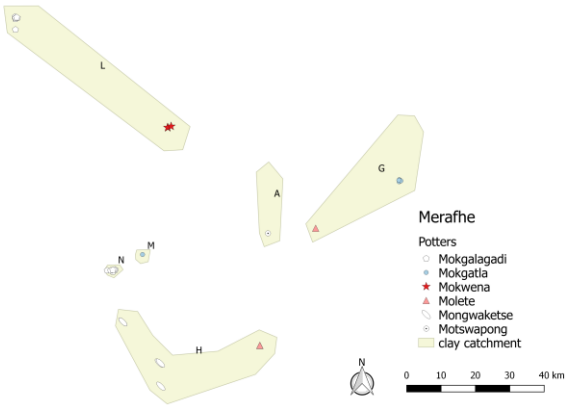


Figure 5. The clay sources and their catchments of potters who are identified by their polity (*merafhe*) affiliation.

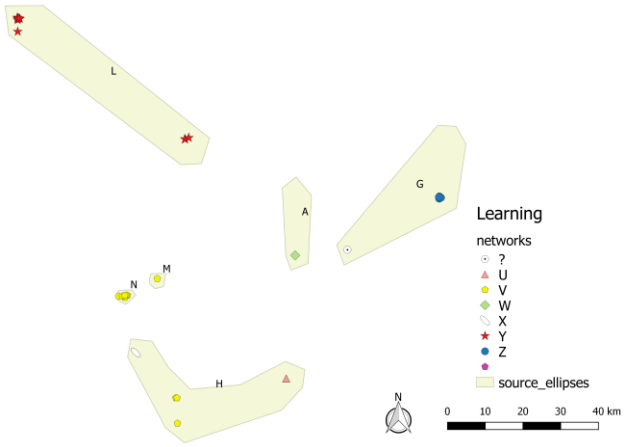


Figure 6. The clay sources and their catchments of potters who are identified by their learning network.

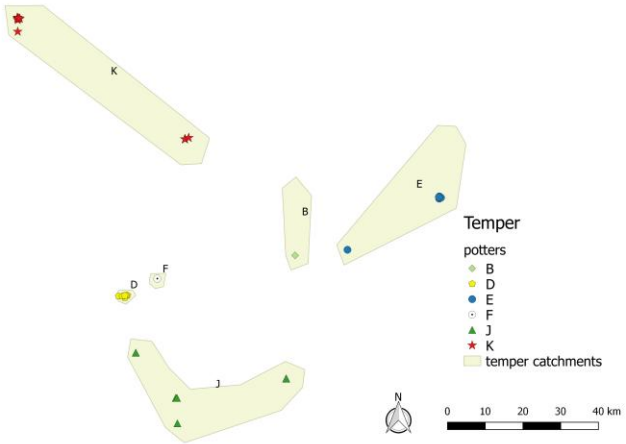


Figure 7. The temper sources and their catchments of potters.

Table 1. The list of interviewed potters with relevant data.

Potter ID	Language	Location	Polity	Gender	Year of Birth	Learned pottery	Age at Learning	Learning Network	Preferred Clay	Reserve Clay	Temper Source
1	Setswana	Kanye	Mongwaketse	F	1957	1974	17	X	H		J
2	Setswana	Kanye	Mongwaketse	F	1956	2008	52	X	H		J
3	Sekgalakgadi	Letlhakeng	Mokgalagadi	M	1950	2007	57	Y	L	C	K
4	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1973	2013	40	Y	L	C	K
5	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1972	2009	37	Y	L	C	K
6	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1969	1999	30	Y	L	C	K
7	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1966	2003	37	Y	L	C	K
8	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1963	2013	50	Y	L	C	K
9	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1941	2013	72	Y	L	C	K
10	Sekgalakgadi	Letlhakeng	Mokgalagadi	F	1975	2013	38	Y	L	C	K
11	Setswana	Kgwarape	Mokgatla	F	1986	2001	15	Z	G		E
12	Setswana	Kgwarape	Mokgatla	F	1958	1987	29	Z	G		E
13	Setswana	Kgwarape	Mokgatla	F	1947	1970	23	Z	G		E
14	Setswana	Kgwarape	Mokgatla	F	1949	1970	21	Z	G		E
15	Setswana	Kgwarape	Mokgatla	F	1937	1960	23	Z	G		E
16	Setswana	Kgwarape	Mokgatla	F	1948	1986	38	Z	G		E
17	Setswana	Kgwarape	Mokgatla	F	1976	2000	24	Z	G		E
18	Setswana	Molepolole	Mokwena	F	1985	2001	16	Y	L		K
19	Setswana	Molepolole	Mokwena	F	1951	1972	21	Y	L		K
20	Setswana	Molepolole	Mokwena	F	1947	1969	22	Y	L		K
21	Setswana	Molepolole	Mokwena	F	1944	1962	18	Y	L		K
22	Setswana	Molepolole	Mokwena	M	1976	1999	23	Y	L		K
23	Setswana	Gonku	Motswapong	F	1962	2010	48	W	A		B
24	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1967	2007	40	V	O		D
25	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1953	2012	59	V	O		D
26	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1958	2009	51	V	N		D
27	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1952	1967	15	V	N		D
28	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1937	2009	72	V	O		D
29	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1936	?	?	V	N		D
30	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1970	2007	37	V	N		D
31	Sekgalakgadi	Lotlhakane West	Mokgalagadi	F	1938	1955	17	V	N		D
32	Setswana	Moshupa	Mokgatla	F	1966	2005	39	V	M		F
33	Setswana	Otse	Molete	M	1955	1992	37	U	H		J
34	Setswana	Otse	Molete	F	1993	2013	20	U	H		J
35	Setswana	Otse	Molete	M	1991	2010	19	U	H		J
36	Setswana	Otse	Molete	F	1959	1998	39	U	H		J
37	Setswana	Otse	Molete	M	1996	2010	14	U	H		J
38	Setswana	Gaborone	Molete	F	1958	2004	46	?	G		E
39	Setswana	Lotlhakane East	Mongwaketse	F	1951	1993	42	V	H		J
40	Setswana	Lotlhakane East	Mongwaketse	F	1949	1975	26	V	H		J
41	Setswana	Lotlhakane East	Mongwaketse	F	1943	1969	26	V	H		J

Table 2. The clay and temper sources in the study area with relevant information.

N Potters	Village (Potter's)	Morafhe (Potter's)	Comment
1	Gonku	Motswapong	Secondary clay in alluvial deposits
1	Gonku	Motswapong	cow dung to temper clay
8	Letlhakeng	Mokgalagadi	Poor quality calcrete clay used to mix with superior clay from source L
8	Lotlhakane West	Mokgalagadi	Grit temper
8	Kgwarape	Mokgatla/Molete	Grit temper
1	Moshupa	Mokgatla	Temper from sedimentary rocks in the Mmadibelego River
8	Kgwarape	Mokgatla/Molete	primary clay from the base of a small granite hill
5	Kanye/Lotlhakane East/Ot	Mongwaketse/Molete	Secondary clays
5	Kanye/Lotlhakane East/Ot	Mongwaketse/Molete	Weathered granite grit
13	Molepolole/Letlhakeng	Mokwena/Mokgalagadi	Asbestos
13	Molepolole/Letlhakeng	Mokwena/Mokgalagadi	Red iron rich secondary clay
1	Moshupa	Mokgatla	Clay from termite hills
8	Lotlhakane West	Mokgalagadi	Clay from termite hills
8	Lotlhakane West	Mokgalagadi	Clay from termite hills

Table 3. The 10 potsherds submitted to a pXRF analysis.

Potter ID	Location	Polity	Learning Network	Preferred Clay	PCA ID	HCA Clusters
14	Kgwarape	Mokgatla	Z	G	1	1
22	Molepolole	Mokwena	Y	L	7	1
41	Lotlhakane East	Mongwaketse	V	H	2	2
33	Otse	Molete	U	H	5	2
20	Molepolole	Mokwena	Y	L	9	2
41	Lotlhakane East	Mongwaketse	V	H	3	3
33	Otse	Molete	U	H	4	3
1	Kanye	Mongwaketse	X	H	6	3
21	Molepolole	Mokwena	Y	L	8	4
6	Letlhakeng	Mokgalagadi	Y	L	10	4
6	Letlhakeng	Mokgalagadi	Y	L	11	4

Table 4. The distances between potters' houses and their preferred as well as nearest clay sources. The distances have been measured in kilometers and along main roads wherever possible.

Potter	Preferred Clay	Distance	Nearest Source	Distance to Nearest	Differential
1	H	29.8	H	29.8	0.0
2	H	29.8	H	29.8	0.0
3	L	65.4	C	1.5	63.9
4	L	64.6	C	5.9	58.7
5	L	65.9	C	2.1	63.8
6	L	65.9	C	2.1	63.8
7	L	65.8	C	1.0	64.8
8	L	66.2	C	2.4	63.8
9	L	65.8	C	1.6	64.2
10	L	66.0	C	1.3	64.7
11	G	26.6	G	26.6	0.0
12	G	26.6	G	26.6	0.0
13	G	26.7	G	26.7	0.0
14	G	26.5	G	26.5	0.0
15	G	26.6	G	26.6	0.0
16	G	26.6	G	26.6	0.0
17	G	26.6	G	26.6	0.0
18	L	3.6	L	3.6	0.0
19	L	3.6	L	3.6	0.0
20	L	3.7	L	3.7	0.0
21	L	6.5	L	6.5	0.0
22	L	6.5	L	6.5	0.0
23	A	18.6	A	18.6	0.0
24	O	1.0	O	1.0	0.0
25	O	2.2	N	0.9	1.3
26	N	1.0	N	1.0	0.0
27	N	1.7	O	0.8	0.9
28	O	0.8	O	0.8	0.0
29	N	2.7	O	1.3	1.4
30	N	1.5	O	1.0	0.5
31	N	1.3	O	1.2	0.1
32	M	0.7	M	0.7	0.0
33	H	53.0	H	53.0	0.0
34	H	53.0	H	53.0	0.0
35	H	53.0	H	53.0	0.0
36	H	53.0	H	53.0	0.0
37	H	53.0	H	53.0	0.0
38	G	51.0	A	31.5	19.5
39	H	1.1	H	1.1	0.0
40	H	10.8	H	10.8	0.0
41	H	10.8	H	10.8	0.0
AVERAGE		28.4		15.5	

CHAPTER 4: FORMING AND SHAPING POTTERY

PHENYO C. THEBE* [1&2]

KARIM SADR [2]

Forming and Shaping Pottery Boundaries in Contemporary South-Eastern Botswana

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Running head: Forming and shaping pottery boundaries.

Archaeological time period: ethnoarchaeology/present.

Country and region discussed: south-eastern Botswana.

Abstract

In southern African archaeology, the equation of pottery styles with archaeological 'cultures' and their attribution to the antecedents of contemporary ethnic groups has been common practice for a long time. Ethnoarchaeological studies from other parts of Africa and beyond have shown that the matter is complex and that stylistic and technological boundaries in ceramic distributions can reflect different kinds of social boundaries under different circumstances. To expand on these findings and make them locally relevant, a large scale ethnoarchaeological study of 41 potters in south-eastern Botswana aims for a better understanding of ceramic technological style and boundary relations. Here we present and explain only the results concerning the boundaries in the forming and shaping stage of ceramic vessel manufacture. We conclude that learning networks explain the visible boundaries in the technological style of forming and shaping pots in south-eastern Botswana today; language and ethnic affiliation do not. Boundaries in the other stages in the operational sequence of pottery manufacture, such as clay sourcing and preparation, vessel surface treatment and decoration, firing and finishing will be presented in a series of further publications.

En archéologie de l'Afrique australe, l'équation de styles de poterie avec ‘cultures’ archéologiques, et leur attribution aux antécédents de groupes ethniques contemporaine a été une pratique courante depuis longtemps. Les études ethnoarchéologiques provenant d'autres parties de l'Afrique et au-delà ont montré que la question est complexe et que les frontières stylistiques et technologiques dans les distributions de céramique peut refléter différents types de frontières sociales dans des circonstances différentes. Pour développer sur ces résultats et les rendre pertinentes au niveau local, une étude ethnoarchéologique à grande échelle de 41 potiers dans le sud-est du Botswana vise à une meilleure compréhension de ces relations. Ici, nous présentons et expliquons que les résultats

concernant les limites dans l'étape de formation et de mise en forme de la céramique. Nous concluons que les réseaux d'apprentissage expliquent les limites visibles dans le style technologique de former et de façonner des pots dans le sud-est du Botswana; la langue et l'appartenance ethnique ne le font pas. Les limites sociaux dans les autres étapes de la séquence de fonctionnement de la fabrication de la poterie, tels que l'approvisionnement de l'argile et de la préparation, le traitement de surface de la cuve et de la décoration, la cuisson et la finition seront présentés dans une série d'autres publications.

Key words: pottery style; pottery technology; ethnoarchaeology; social boundaries; Botswana.

Introduction

For a long time archaeologists have sought to identify ethnic and linguistic groups in the archaeological record. Many archaeologists continue to assume a one to one relationship between ethnic, linguistic groups and material culture. For them, cultures are geographically distinct and have unique material traits. However, this simplistic view of the relationship between ethnicity and material culture began to lose its appeal when Fredrik Barth (1969) showed that social boundaries were created through interaction, not isolation. Importantly, he noted that social boundaries enclose collectively constructed identities that may be neither ethnic nor linguistic. The material markers of such constructed identities are emic and entirely subjective: "…one cannot predict from first principles which features will be emphasized and made organizationally relevant by the actors..." (Barth 1969: 14). The social boundaries around an individual's religious identity, social class, ethnic and linguistic affiliation are not of identical shape and size, and although each will be

demarcated clearly from the actor's point of view, outsiders do not always recognize the boundary markers.

Faced with such daunting obstacles to identifying archaeological 'cultures' by their material culture boundaries, from the 1970s onwards some archaeologists adopted an information exchange model to study ethnicity in the archaeological record (e.g. Hodder 1982; Shanks and Tilley 1987; Wiessner 1983). But the problem did not go away and no set rules could be found to predict which styles would be used to communicate which kinds of social boundaries. A breakthrough came with Pierre Lemonnier's (1986) ethnoarchaeological study in Papua New Guinea. Building on James Sackett's (1982) concept of isochrestic variation or passive style and Leroi-Gourhan's (1964) concept of the *chaîne opératoire*, Lemonnier showed that throughout the operational sequence of manufacturing any product, technical choices are made that are not consciously seen as markers of social boundaries but are in fact the deeply ingrained technological style of a specific community of practice (see also Dietler and Herbich 1998; Gosselain 1992, 2000: 193; Mayor 2010; Stark 1999). Most often the technological style is the product of motor habits learned from a teacher through repeated training and development of the necessary muscles and physical dexterity required to carry out a particular task just so (Arnold 1985: 147; Gosselain 1998: 94). These mimetic models are transferred in intensive teacher-pupil relationships that require close interaction and co-residence, and so over time they become circumscribed within the producers' social boundary (Smith 2009: 141). The technological style can be detected in the archaeological record to reveal producer identity, and the geographical spread of the technological style can be delineated spatially to show the social boundaries of that community of practice. Depending on marriage patterns and social mobility, these boundaries may or may not correspond to ethnic units.

With the grand aim of investigating the potential use of technological style as an ethnic marker in southern African Iron Age ceramics, an ethnographic study of 41 contemporary potters has been undertaken in south-eastern Botswana (Fig. 1). These aims are achieved through mapping different stylistic and technical boundaries in pottery forming and shaping techniques among contemporary traditional potters from different social and cultural groups in south-eastern Botswana. The study adopts the *chaîne opératoire* approach and technological style is isolated in several stages of pottery manufacture from the extraction of clay to firing of the vessels.

The present paper reports only on technological styles at the forming and shaping stage of the pottery manufacture. In the forming stage, the prepared lump of potting clay is formed to create a hollow cylindrical or conical form; in the shaping stage the cylinder or cone is further manipulated to look like the vessel it will become. The two stages overlap considerably (e.g. Livingstone Smith 2010). Concerning pottery in south-eastern Botswana, there are further reports now in preparation that will describe technological style in clay extraction and preparation, pottery decoration, surface treatment and firing. Grand conclusions will have to await the completion of the analyses of all these different operational stages, but interim observations and interpretations are offered here to explain the observed correlations between forming and shaping techniques and various social boundaries in south-eastern Botswana today.

Ceramic Studies in Southern Africa

Ceramic studies are relatively recent in southern African archaeology and include two main approaches: the technical and the stylistic (Sadr 2008:104). Although there has been

'ethnographic' interest in southern African traditional pottery since the early 17th century, systematic ceramic research in the archaeology of the subcontinent only began in the late 1920s. Getrude Caton-Thompson is well known for an interdisciplinary survey and excavation project at Great Zimbabwe. Her excavations and ceramic studies in 1929 confirmed that the site represented a culture of African origin (Caton-Thompson 1931). In 1929, P.W. Laidler published the first comprehensive archaeological and ethnographic classification of southern African pottery (Laidler 1929, see also 1938). Schofield (1948) furthered stylistic classification of pottery from southern Africa. He associated ceramic wares with different population groups. More recent pottery studies of southern African Iron Age ceramic also focussed on stylistic attributes and cultural identity (Denbow 1981; Hall 2012; Huffman 1980, 1989, 2002, 2007; Maggs 1980; Mason 1952; Phillipson 1968, 1977). There were several attempts to understand the local chronology of ceramics (Hall 1984; Huffman 1980; Lindahl and Pikirayi 2010). Beyond using ceramic evidence as the basis for culture group definition, chronology and migration, Pikirayi (2007) advocates for using communication theory to understand ceramics. Ceramics must also be understood in terms of ideology, social organization and gender (Hall 1984). Several recent studies have investigated production sequences of pottery to examine ceramic technology, use, symbolism and distribution (Fowler 2008, 2011, 2015; Fredriksen 2011; Lindahl and Matenga, 1995; Lindahl and Pikirayi 2010; Mubaya and Mawere 2015; Ndoro 1996; Pikirayi and Lindahl 2013). The contemporary traditional pottery of south-eastern Botswana allows exploration of several of these avenues.

In Botswana the craft of traditional pottery production has witnessed a major revival in the last two decades (Kgang 2003; Moilwa 2007; Mokone 2009; Molatlhegi 2010; Thebe 1996; Thebe et al. 2010; Wilmsen et al. 2009). There are a number of ethnographic and archaeological studies that were undertaken in south-eastern Botswana that assumed pottery style reflects linguistic or cultural identity (Caister 1982; Campbell et al. 1991; Denbow 1981; Gollifer 1986; Horner 1986; Huffman 2002; Labounty 1995; Segobye 1987; Van

Waarden 1999). Other studies in Botswana provide ethnographic baselines of Tswana pottery technology from clay collection to firing (Lawton 1967; McDonald 1940). Ethnographic evidence shows that pottery used to be made in greater quantities throughout southern Africa than it is today (Denbow and Thebe 2006; Lawton 1967; Letlole and Ntsambiwa 1993; McDonald 1940; Thebe 1996; Thebe et al. 2010). Many people who have the knowledge of making pots no longer use it. They prefer using plastic containers and metal vessels from shops and market traders.

Few ethnoarchaeological investigations have been undertaken in Botswana concerning contemporary pottery making styles and boundaries. Traditional potting in Botswana is changing. It is important to document the work of living potters because they can assist us to understand archaeological ceramics. It is also important to place the techniques used by Botswana potters within the larger regional context. Our study investigates the relationship between pottery and ethnic identity which is a foundation of archaeological interpretation in the Iron Age of Southern Africa.

South-Eastern Botswana and its Potters

Geographically, south-eastern Botswana covers an area of approximately 76 332 km^2. Administratively, it incorporates portions of South East, Southern, Kgatleng and Kweneng Districts. It covers parts of two major drainage basins. Most of south-eastern Botswana is drained by the Metsemotlhabe River which flows north-east to join the Limpopo River. The north-western sector of the study area drains north into the Kalahari Drainage Basin. The watershed between these two basins forms a linguistic boundary between the Sekgalagadi-speakers in the Kalahari and the Setswana-speakers in the Metsemotlhabe basin.

Geologically, the study area is varied. Granite exposures around Gaborone are some of the oldest rocks on earth. Kgwarape borders on Modipane granites. Kanye sits on a geological formation of homogeneous felsite. Lotlhakane West near Kanye is on metamorphosed sandstone, limestone, shale, mudstone and ironstone. These produce good clays and are mined and used by potters in the area (Grobler and Walraven 1993). Reddish sandstone and conglomerate are found in Molepolole and the iron-rich clays here are exploited by potters as far west as Letlhakeng. The sandy landscape in the north-western portion of our study area presents a very different geological setting. Letlhakeng is located on karoo arkosic sandstone.

South-eastern Botswana is one of the most densely populated regions of the country. The rural population here engages in arable and pastoral farming and other activities include pot making, construction, welding, basket weaving, sculpture, and leather tanning. Pottery making is seen as an economic strategy to gain income. Despite the availability of substitutes such as metal, plastic and glass vessels, people in south-eastern Botswana occasionally use un-glazed earthenware ceramic vessels for various purposes including cooking, ritual and decoration. Traditional clay pots are used in communal events such as weddings, rituals, funerals and other celebrations. Some claim that food is healthier and tastes better when cooked in ceramic pots.

For the present study, we visited 41 potters from five different *merafhe* (Bakwena, Bangwaketse, Balete, Bakgatla and Bakgalagadi) in south-eastern Botswana. In the Tswana language (Setswana), *morafhe* (pl.:*merafhe*) can refer to an ethnic group or tribe (Nyamnjoh 2007) but definitions vary. Wilmsen and MacAllister (1996) designate ethnic groups as people with a distinct social and historical identity, living with other such groups in a multicultural society. The ethnographer Isaac Schapera (1938) defined *morafhe* as all natives living in a particular Reserve who acknowledged the supremacy of the Chief of the

ruling community. For Schapera, a *morafhe* thus constituted a political unit. He documents many 'ethnically' diverse members of Tswana *merafhe*. Each 'tribe' was composed of people drawn from different stock. To understand how and why these variations developed, we need to understand 'tribal history' in detail (Schapera 1952). Somewhat similarly, Bolaane and Mgadla (1997) define a *morafhe* as a chiefdom, consisting of a group of people descended from the same ancestor. In this paper, we use the concept of polity to capture the meaning of *morafhe* as a politically organised community with a distinct social, historical, and sometimes linguistic identity (Griffiths 1997; Wilmsen and MacAllister 1996). The five *merafhe* represented in our study come from two linguistic groups: the Bakgalagadi who speak Sekgalagadi and the other four *merafhe* which are composed of Setswana-speakers. Both languages belong to the Sotho subgroup of South-eastern Bantu languages (Finlayson 1987; Louw and Finlayson 1990; Van der Spuy 1990).

The 41 potters in this study are from various age, gender and skill groups. They come from different social classes and follow different religious traditions. The majority are full-time potters who manufacture pots for the market. Most are female; only five are male of whom one resides in Molepolole, the other one in Letlhakeng, while three are in Otse (Table 1). The average age of the male potters is 41 while the average age of the female potters is 57. This suggests that males may have turned to making pots relatively recently. Overall, the 1950s gave birth to just under a third of the potters in our sample. The average age of the potters at the time of the interviews in 2013 was 52 with a median at 54; the youngest potter was a 16 year old male and the oldest was a 76 year old female. The average age of potters in Kgwarape is the same as in the overall sample, but the potters in Letlhakeng and Molepolole are on average younger at 48 years old, and in Lotlhakane East and West older at 64 and 60 years respectively. Otse has the youngest cohort of potters with an average age of 32 years. Other locations contain too few potters to calculate meaningful averages. Overall, around half of the potters are married, but among the males 4 out of 5 are single. A little under a third of the potters, all females, have no formal education. Around two thirds

of our sample considers pottery their full-time occupation. Another two-thirds profess Christianity as their religion.

Information about these potters was collected through standard methods including oral interviews and direct observations, field notes, videos and photographs of the production sequence of pottery. Attention was given to life histories, economic situation, context of making pots, techniques of shaping pots, tools used and various body gestures. Analysis of forming and shaping strategies focused on equipment, body gestures, shaping techniques, as well as associated learning patterns, rituals and taboos (for similar examples from other parts of the world see David and Kramer 2001; Dietler and Herbich 1998; Stark 1998; Stark et al. 2000). Family trees were drawn to show kin relationships and the lines of transmission of pottery skills.

Pottery Forming and Shaping Process

In this paper we focus on the forming and shaping of pots. Forming and shaping begins after the clay has been collected and treated. It concerns the transformation of the lump of clay into a vessel. This vessel is not yet a finished product: surface treatment, decoration and firing remain to be done. There are many types and varieties of forming and shaping techniques in sub-Saharan Africa and each is independent of the nature of the clay or the morphology of the desired pot. The choice of forming and shaping technique can only be explained as cultural preference: in forming and shaping a pot the potters carry on a technological tradition and are often convinced there is no other way of forming and shaping pots (Gosselain 1992). They make pots the way they learnt from their teachers. The deeply ingrained motor habits involved in forming and shaping the pot are highly resistant to change (Armstrong and Calder 1996; Armstrong et al. 2008; Arnold 1989; Fowler 2008;

Gosselain 1992, 2010; Reina and Hill, 1978: 230; Van der Leeuw 1993). Specialized body gestures, especially the movement of hand and fingers, have been identified as the main causes for stability in forming and shaping techniques through time and space. Also, the artisans prefer not to innovate at this stage because modifications in the manufacturing process may jeopardize its outcome (Gosselain 2011). It is easier and carries far less risk to innovate at the decoration stage, for example.

All the potters in our sample produce their pots by hand and none throw them on a wheel. The 41 potters were recorded producing a total of 45 pots. Five additional potters who have not been interviewed (potters 42-46) and played an important role in transmitting knowledge of pottery manufacture are introduced in a later section. These five artisans are deceased or live outside the study area and information about them was acquired from the 41 interviewed potters in our study area.

Five distinct forming and shaping techniques were identified in our sample. These are briefly described below.

Technique 1 (Fig. 2) is the most common technique of forming and shaping pots among our sample of potters. It is widely practised in southern Africa (Hall 2012; Lindahl and Matenga, 1995; Lindahl and Pikirayi 2010; Pikirayi and Lindahl 2013; Mubaya and Mawere, 2015): the four other modes of forming are apparently restricted to south-eastern Botswana. Gosselain (2000: 201-202 and fig. 5) calls this common technique the 'drawing of a ring-shaped lump,' and notes that its distribution fits the spread of Bantu-speakers. In Technique 1 the upper half of the pot is made first. Generally, the potter begins by flattening a coil of clay by hand, and then forms it into a ring and stands it inside a shallow bowl (Fig. 2 upper row). The dimensions of the coil and ring vary and the bowl used as a

support is usually enamel, but plastic and glass bowls were also occasionally observed. For small pots, even a low tin can might be used as a support. The clay ring is then drawn upwards by hand and/or with the help of a spatula to raise the walls of the pot while rotating the dish upon which the ring-shaped lump rests; it is the interaction of pulling, drawing and rotating that makes the pot. Expert potters begin with a ring of clay voluminous enough to complete the pot without adding any more clay. Most potters however add further flattened coils or small lumps of clay in order to raise the walls to the desired height. A rare variation (Technique 1i) begins by pressing lumps of clay into the enamel bowl instead of standing a clay ring. Further lumps or flattened coils are added to raise the pot. Regardless of the technical variation, the neck of the vessel is produced by bending the top of the pot at the desired height, usually with the aid of a wooden spatula or piece of a cow's rib bone (Fig. 2 middle row). Once the upper half of the pot is smoothed and sufficiently dry, it is taken out of its bowl support and the base is formed by covering the hole with a lump of clay that is shaped to the desired form by hand and with the help of a spatula (Fig. 2 lower row). This technique was practiced by 27 potters in our sample, and most of them sat on the ground with legs stretched out in front throughout the process of forming and shaping.

Technique 2 (Fig. 3) is in some ways very similar, but in others stands in stark contrast to technique 1. The salient difference is that the lower half of the pot is made first. This technique begins with a flattened coil of clay, which is formed into a ring and stood up on top of a metal pot lid (Fig. 3 top row). The walls are drawn up by hand and gradually formed into a cone, which is eventually closed off, flattened and smoothed to form the base of the pot (Fig. 3 middle row). The potter may move around the pot during manufacture but mostly rotates the metal pot lid. A large wooden spatula or plank of wood is used to smooth the walls and flatten the base. Once this lower half of the pot is sufficiently dry, it is removed from its support and flattened coils or rings of clay are added to build the upper half of the pot (Fig. 3 lower row). The neck is eventually formed in the same manner as in

Technique 1. Seven potters in our sample used this technique and several of them stood bent double while working the base of the pot which rested on the ground. Although the end product and the forming and shaping techniques of 1 and 2 are very similar, the sequence of starting with the upper versus the lower half of the pot and the sitting versus standing posture of the potters mark these as clearly different--even though related--pottery traditions.

Technique 3 (Fig. 4) is quite unlike techniques 1 and 2 and can be considered a modern innovation. The potters using this technique are on average significantly younger than the overall sample and include a majority of males. Their workshop is very market oriented. In Technique 3, the pot is made from the base upwards using uniformly thick, flattened, cut slabs of clay. The slabs are flattened on a table with a wooden or metal roller and 'rails' ensure the slabs are of uniform thickness. A slab is then cut to the right shape to form the base of the vessel and other slabs are cut and moulded over various objects to give the desired shape to the vessel. Among the objects recorded were a ceramic bowl wrapped in plastic, a glass bottle and a length of large bore PVC pipe. To raise the walls of the vessel to the desired height and shape, clay slabs were 'glued' to each other using wet clay. At the appropriate time, the guiding form (the bottle, bowl or pipe) is removed and the clay pot is finished off by adding more slabs, fanciful coils and balls of clay as decoration and trim. All of the potters using technique 3 work standing at a table. Technique 3 is clearly not a traditional one and is only used in one workshop where a small number of potters, mostly males, are employed.

Technique 4 is a classic pinch method of forming a pot but is very rare and only used by 2 potters who demonstrated it for us. The potter begins with a ball of clay and with a thumb pokes a hole halfway into the ball and then draws up the walls of the pot around this hole with a pinching and drawing motion. If necessary round or flattened coils, or even just

morsels of clay are added to raise the walls to the desired height and the vessel is smoothed with the help of a moistened spatula. The neck is formed as described above in Technique 1. Technique 4 is used as an alternative way of forming and shaping pots by potters who normally used Technique 1.

Technique 5 (Fig. 5) is a classic coil method of manufacturing pots that has been practiced in several places in the world for millennia but is very rare in our sample: only 3 potters use it exclusively (potters 23, 35, 38) and 2 others (24, 32) use Technique 1 as well. The technique, though ancient, was only recently re-introduced to our study area through formal workshops organized by the Botswana Government. In Technique 5, the potter begins with a flat circular base obtained either from a flattened ball of clay, or from a slab of clay trimmed to size, or from a spiralled coil flattened to shape. The walls are raised by adding coils of clay and joining them with finger pressure and drawing. Eventually the joins are smoothed over with a spatula. One potter (23) used flattened coils drawn upwards, very much as in Technique 1. Nevertheless we classified her work as Technique 5 because she starts with a flat circular disk for the base of the pot, rather than standing the clay ring in a bowl as in Technique 1.

Patterns in the Distribution of Forming and Shaping Techniques

Distributions by Villages

The first three forming and shaping techniques show clear geographical patterning in their distribution (Table 2 and Fig. 6). Technique 1 is utilized by potters in Kanye, Letlhakeng, Molepolole, Lotlhakane East and West, as well as Moshupa. These locations are all in the western portion of the study area (Fig. 7). Technique 2 is exclusively found among our

sample of potters from Kgwarape, in the eastern part of the study area. Technique 3 is restricted to the potters from the workshop in Otse, in the southern part of the study area. Techniques 4 and 5 are geographically less specific (Fig. 8). They may represent a kind of 'technical multilingualism' caused by individual mobility across social boundaries, perhaps in matrimony (Gosselain 2000: 206).

Patterns in Morafhe Affiliation

As Table 3 shows, there is also a strong correlation between choice of forming and shaping technique and *morafhe* membership. Technique 1 is practiced by Bakgalagadi, Bakwena and Bangwaketse in our sample of potters (Fig. 9) Technique 2 is exclusively practiced by Bakgatla potters in our sample. Most of the Balete potters practice Technique 3, while the rare Techniques 4 and 5 are not specific to any *morafhe*. The sample of Batswapong potters is too small to draw any conclusions.

The clear geographic boundary that we saw between Techniques 2 and 3 also marks a *morafhe* boundary, with Technique 3 being a Molete marker and Technique 2 a Mokgatla marker. Technique 1 is shared by the three great western *merafhe*, the Bakgalagadi, Bakwena and Bangwaketse and is used by both Setswana- and Sekgalagadi-speaking practitioners. Indeed, it is a widespread technique throughout southern Africa; its geographic distribution may correspond with the Bantu linguistic boundary.

Patterns in the Age of Learning

The age at which the potters in our sample learned their craft highlights some interesting patterns (Table 4). The average age at learning the craft was just under 35 years old with a median age at 37. The youngest trainee was 14 and the oldest 72! As mentioned earlier, there has been a major revival in making pottery in Botswana and this can be seen by the fact that of the 23 potters who learned their craft when they were older than 35 years, only 4 did so in the last century. The other 19 learned their craft it in the 21st century. The potters who learned their craft since the year 2000 include the isolates in Gaborone and Gabane (23, 38); all but one of the 8 potters in Letlhakeng (and the eighth learnt it in 1999); and both potters in Moshupa. The veteran potters, those who in 2013 had been practicing their craft for at least 28 years, include one of the two potters in Kanye, half the potters in Molepolole, four out of seven potters in Kgwarape, and all the potters in Lotlhakane East. Two of the nine potters in Lotlhakane West are also veterans as is the founder of the Otse workshop. The senior members of our sample of potters in south-eastern Botswana, those with over 40 years of experience in their craft, are based in Kgwarape, Molepolole, Lotlhakane East and West. These locations can thus be considered the established pottery centres of south-eastern Botswana.

Teaching and Learning Pottery in South-Eastern Botswana

The Learning Process

The apprentice learns by assisting the established artisan with various stages of pottery production including clay extraction, processing, decorating and firing. Apprentices then start by making miniature pots, mimicking what their teachers produce. Participatory learning is perceived as the best form of apprenticeship.

Initially, it was difficult to acquire information on how the actual skill of pottery making was learned. Most potters claimed that they learned the skill by casual observation; basically they claimed that they were self-taught. Later, more detailed interviews revealed that in fact they were all taught directly by other potters.

The craft of pottery making in south-eastern Botswana is open to everyone who wants to learn and pass it on. However, in practice specialized and expert pottery making is confined to a few families. Apprenticeship often takes place in adulthood. Sometimes training occurs outside the place where potters were born. It takes a few months to a year for artisans in south-eastern Botswana to learn pottery making. However, it takes a few years of practice to produce fine pots. The rate of mastering pottery is determined by artistic skills, interest and intensity of training. Cooperation between the teacher and apprentice is essential to ensure successful training. Most potters interviewed indicated that the link between the teacher and the learner is a long term one. This helps explain why artisans continue to shape pots according to their teacher's practice.

The potters interviewed consider forming and shaping as the most difficult stage of the learning process. Those who learnt their skills outside their own village mentioned that they normally copy the forming and shaping techniques and gestures of their teacher even after relocating back to their own villages. Learners stressed that they shape pots according to their teacher's technique irrespective of *morafhe* membership.

Knowledge and Skills Transfer

Potting skills are often transferred through the female line in the family: from grandmother or mother or aunt or sister to the novice potter (17 out of 41 potters). Only four potters learnt their skill from a male family member, and they are all members of the innovative Otse potting workshop. Their teacher is potter 33 who learnt his craft at a formal educational establishment in Francistown, over 400 km from Otse (Fig. 10). Their forming and shaping Technique 3 is thus a foreign import which has not yet spread beyond the family of the innovator who introduced it to south-eastern Botswana.

Kgwarape is the only area where the potters practice Technique 2 in forming and shaping their pots. Our sample suggests that they have not exported this technique nor apparently have others come to learn it from them (but this could be a spurious result of our sample size). In contrast, Technique 1 reached Letlhakeng via the senior member of the Molepolole potters (21), who taught her craft to potters 6 and 7, Sekgalagadi-speakers who came from Letlhakeng to learn from the Master. Potter 6 then trained seven fellow Sekgalagadi-speaking potters in Letlhakeng (Fig. 10). Clearly, the teaching and learning patterns are of primary importance for understanding the distribution patterns of pottery forming and shaping techniques in south-eastern Botswana.

Of the 41 potters, eight learnt their craft from a teacher residing beyond their own village. Potters who learnt the craft outside their villages travelled significant distances for their training. These learners always returned to their own villages to practice their new skills. Nonetheless, there is clearly a pattern to the teaching networks. Kgwarape and Otse display intra-location teaching networks. Otse is a new pottery centre so its apparent isolation is probably not due to sampling bias. Kgwarape, however, has been a centre of pottery manufacture for many years and it seems unusual that it has not attracted learners from outside.

In the western half of the study area where forming and shaping Technique 1 is common, there is a boundary between two teaching networks; one in the north connecting Molepolole and Letlhakeng and the other in the south connecting Lotlhakane East with other locations. These are respectively the schools of master potters 21 in Molepolole and 41 in Lotlhakane East (Fig. 10).

Teacher-Learner Link and Historical Connections

The past sheds some light on the particular configuration of the teaching networks and the geographical distribution of the five forming and shaping techniques (Figs 10 and 11). The teacher of master potter 41 in Lotlhakane East was a Mokwena from the Seoke-Molepolole area (potter 45). She married into the Bangwaketse *morafhe*, which could suggest that the forming and shaping Technique 1 originally reached Lotlhakane East from the Bakwena of Molepolole. However, the current master potter of Molepolole (potter 21) and her sisters (potters 19 and 20) learnt their craft from their mother (potter 44) who was a Mongwaketse born in Molapowabojang, about 20 km south of Lotlhakane East. She married a Mokwena and moved to Molepolole. In turn, potter 44 had learned pottery making from her mother who lived in Molapowabojang.

In Kanye, the Mongwaketse potter 1 learned her craft from her Mongwaketse grandmother (potter 43) who originally came from Lotlhakane East. She (potter 43) in turn had learnt from her mother who was a Mokwena and originally came from Molepolole. Clearly, the potting links between the Bakwena and the Bangwaketse are old and strong and we cannot tell if Technique 1 originally can be attributed to one *morafhe* or the other, but it is

interesting to note that if we look further back in time oral traditions suggest the Bangwaketse were an offshoot of the Bakwena (Schapera 1942) so they are in any case closely related.

Our sample clearly illustrates that the teacher-learner link overrides *morafhe* affiliation when it comes to utilizing a particular forming and shaping technique. In Kgwarape, the master potter 15 is originally a Shona-speaker who married a Mokgatla man and moved to Kgwarape. She learned her craft from her mother-in-law (potter 42) and so one presumes the forming and shaping Technique 2 is indeed a marker of Bakgatla pottery. Potter 42 was taught pottery making by her mother who was a renowned potter in Mochudi, the capital village of the Bakgatla. However, potter 32 who is also a Mokgatla but resides in Moshupa practices forming and shaping Technique 1 which is typical for the Bangwaketse but not the Bakgatla. She learnt her craft from master potter 41 in Lotlhakane East, presumably after she married and moved into Bangwaketse territory. All the Bakgalakgadi potters in Letlhakeng practice Technique 1 which ultimately reached them through the Mokwena master potter 21 (Fig. 11). And, finally, all the Balete potters in Otse are practicing the forming and shaping Technique 3 which comes from far away in Francistown, far outside the domain of the *merafhe* in our study area, thanks to the fact that their master potter (33) learned his craft there.

Technique 3 provides a good example of how shaping and forming techniques become popular. A person who is taught how to make pots by a moulding technique does not require much training. That person can readily open up a workshop. In the case of Otse where formal training occurs in a modern workshop, the technique can spread fast and production of pots using the technique can also expand. Apparently, there were other potters using other techniques in Otse before potter 33 opened up the workshop, but unfortunately we have not yet been able to obtain the details.

Conclusions

The reported study of the forming and shaping phase of ceramic vessel manufacture among 41 potters in south-eastern Botswana has shown clear boundaries between three distinct techniques. The three techniques are geographically separate and their boundaries correlate to some extent with *morafhe* and linguistic affiliation of the potter. A much stronger correlation, however, exists with the teaching and learning networks in pottery manufacture. The study has shown that the way potters form and shape their pots in south-eastern Botswana today has everything to do with the way they were taught to form and shape pots, no matter whether or not the learner belonged to the same *morafhe* and linguistic group as the teacher. The technological style of forming and shaping ceramic vessels in the study area can thus be designated as isochrestic (Sackett 1982) and identifies a school of learning; a community of practice, in a sense. These results echo those from similar studies conducted in other parts of Africa (e.g. Gosselain 1992; Dietler and Herbich 1998; Stark 1999).

Since forming and shaping techniques cannot be changed as easily as other aspects of ceramic manufacture such as surface treatment and decoration, they can be studied in an archaeological setting to see how well boundaries between different techniques correlate with more superficial aspects of pottery manufacture. Specifically, in southern African Iron Age studies they can serve to test commonly held notions that ceramic decorations and surface treatment are useful *morafhe* or linguistic markers. The south-eastern Botswana ethnoarchaeological evidence from pottery manufacturing style, along with those from other parts of Africa (e.g. Gosselain 1992, 2000; Livingstone Smith 2010; Mayor 2010)

suggest that ceramic stylistic boundaries need to be studied on a case by case basis and cannot be assumed *a priori* to reflect a particular type of social boundary.

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Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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Captions

Fig. 1 The location of potters in south-eastern Botswana

Fig. 2 Forming and shaping Technique 1 (photos by first author)

Fig. 3 Forming and shaping technique 2 (photos by first author)

Fig. 4 Forming and shaping technique 3 (photos by first author)

Fig. 5 Forming and shaping technique 5 (photos by first author)

Fig. 6 Chart showing pots made by different techniques among the various villages

Fig. 7 Distribution of shaping and forming Techniques 1, 2 and 3. The size of the symbols represents the number of pots produced by the technique in each location. For details see Table 2

Fig. 8 Distribution of shaping and forming Techniques 4 and 5. The size of the symbols represents the number of pots produced by the technique in each location. For details see Table 2

Fig. 9 Chart showing pots made by different techniques among the various *merafhe*

Fig. 10 Teaching and learning networks indicated by potter's village

Fig. 11 Teaching and learning networks indicated by potter's *morafhe*

Table 1 Data on the potters interviewed in south-eastern Botswana

Table 2 Distribution of pots produced by different techniques in the villages

Table 3 Distribution of pots produced by different techniques in the *merafhe*

Table 4 Data on teaching and learning networks

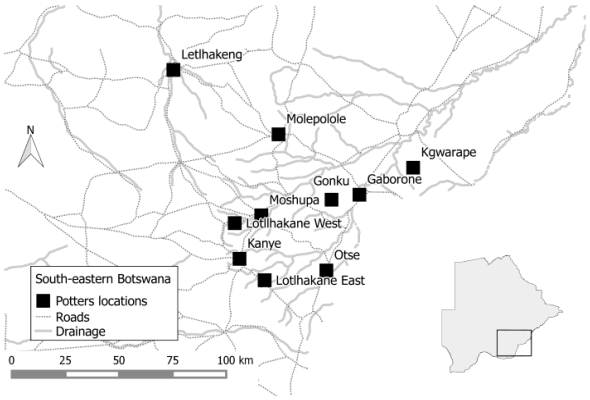


Fig. 1 The location of potters in south-eastern Botswana



Fig. 2 Forming and shaping Technique 1 (photos by first author)



Fig. 3 Forming and shaping technique 2 (photos by first author)



Fig. 4 Forming and shaping technique 3 (photos by first author)



Fig. 5 Forming and shaping technique 5 (photos by first author)

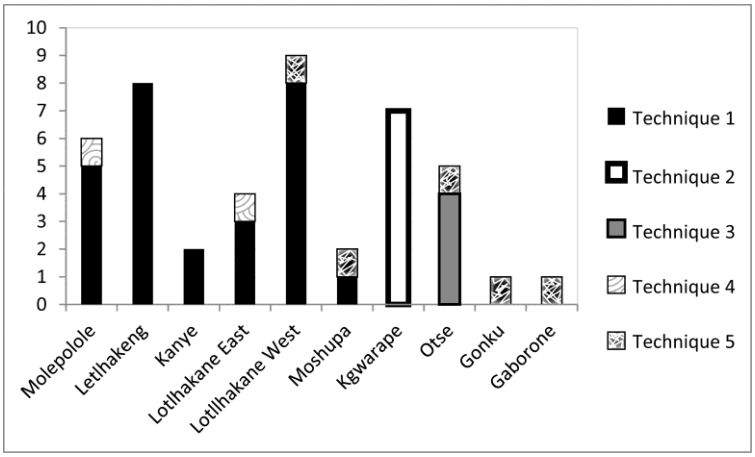


Fig. 6 Chart showing pots made by different techniques among the various villages

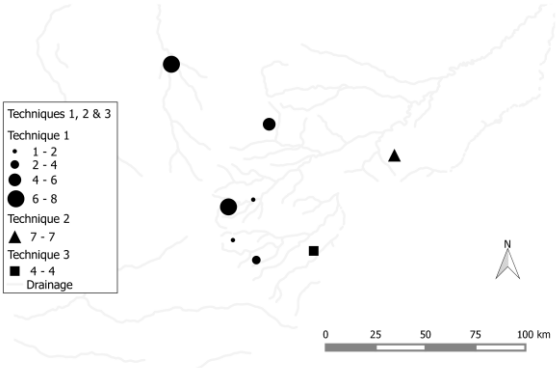


Fig. 7 Distribution of shaping and forming Techniques 1, 2 and 3.

The size of the symbols represents the number of pots produced

by the technique in each location. For details see Table 2

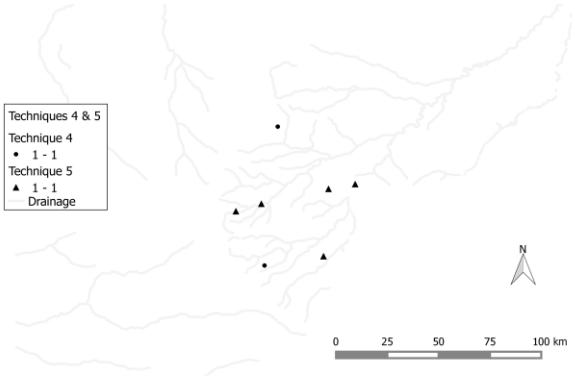


Fig. 8 Distribution of shaping and forming Techniques 4 and 5.

The size of the symbols represents the number of pots produced

by the technique in each location. For details see Table 2

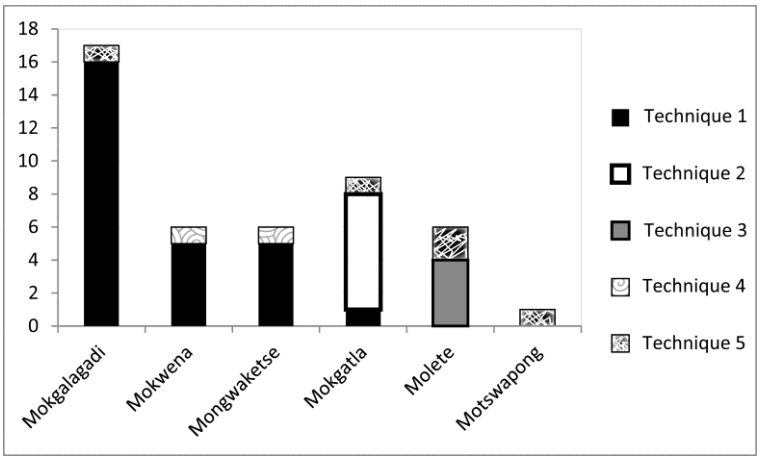


Fig. 9 Chart showing pots made by different techniques among the various *merafhe*

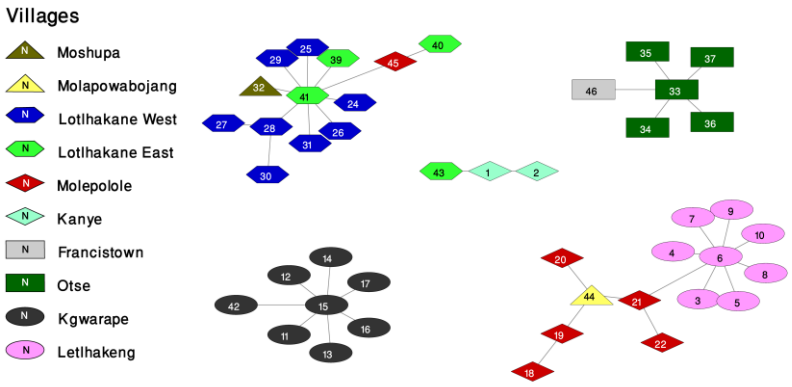


Fig. 10 Teaching and learning networks indicated by potter's village

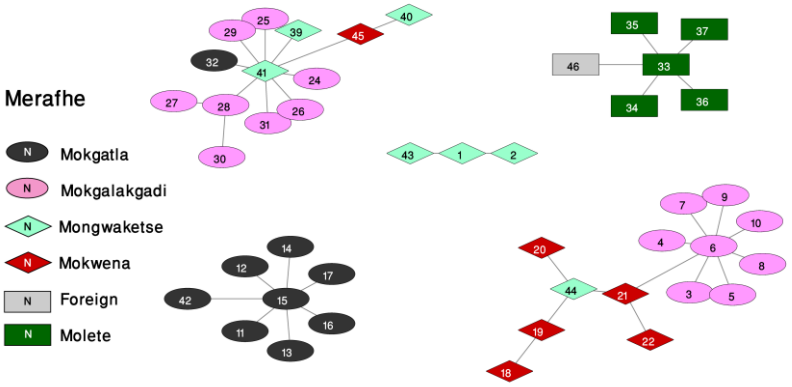


Fig. 11 Teaching and learning networks indicated by potter's *morafhe*

Table 1. Data on the potters interviewed in south-eastern Botswana

Potter ID	Village	*Morafhe*	Gender	Year of Birth	Learned pottery	Age at learning	Teacher ID	Forming and Shaping Technqiue(s)
1	Kanye	Mongwaketse	F	1957	1974	17	43	1
2	Kanye	Mongwaketse	F	1956	2008	52	1	1
3	Letlhakeng	Mokgalagadi	M	1950	2007	57	6	1
4	Letlhakeng	Mokgalagadi	F	1973	2013	40	6	1
5	Letlhakeng	Mokgalagadi	F	1972	2009	37	6	1
6	Letlhakeng	Mokgalagadi	F	1969	1999	30	21	1
7	Letlhakeng	Mokgalagadi	F	1966	2003	37	6	1

Potter ID	Village	*Morafhe*	Gender	Year of Birth	Learned pottery	Age at learning	Teacher ID	Forming and Shaping Technqiue(s)
8	Letlhakeng	Mokgalagadi	F	1963	2013	50	6	1
9	Letlhakeng	Mokgalagadi	F	1941	2013	72	6	1
10	Letlhakeng	Mokgalagadi	F	1975	2013	38	6	1
11	Kgwarape	Mokgatla	F	1986	2001	15	15	2
12	Kgwarape	Mokgatla	F	1958	1987	29	15	2
13	Kgwarape	Mokgatla	F	1947	1970	23	15	2
14	Kgwarape	Mokgatla	F	1949	1970	21	15	2
15	Kgwarape	Mokgatla	F	1937	1960	23	42	2
16	Kgwarape	Mokgatla	F	1948	1986	38	15	2
17	Kgwarape	Mokgatla	F	1976	2000	24	15	2
18	Molepolole	Mokwena	F	1985	2001	16	19	1
19	Molepolole	Mokwena	F	1951	1972	21	44	1
20	Molepolole	Mokwena	F	1947	1969	22	44	1
21	Molepolole	Mokwena	F	1944	1962	18	44	1
22	Molepolole	Mokwena	M	1976	1999	23	21	1 &4
23	Gonku	Motswapong	F	1962	2010	48	?	5
24	Lotlhakane West	Mokgalagadi	F	1967	2007	40	41	1&5
25	Lotlhakane West	Mokgalagadi	F	1953	2012	59	41	1

Potter ID	Village	*Morafhe*	Gender	Year of Birth	Learned pottery	Age at learning	Teacher ID	Forming and Shaping Technqiue(s)
26	Lotlhakane West	Mokgalagadi	F	1958	2009	51	41	1
27	Lotlhakane West	Mokgalagadi	F	1952	1967	15	28	1
28	Lotlhakane West	Mokgalagadi	F	1937	2009	72	41	1
29	Lotlhakane West	Mokgalagadi	F	1936	?	?	41	1
30	Lotlhakane West	Mokgalagadi	F	1970	2007	37	28	1
31	Lotlhakane West	Mokgalagadi	F	1938	1955	17	41	1
32	Moshupa	Mokgatla	F	1966	2005	39	41	1,5
33	Otse	Molete	M	1955	1992	37	46	3
34	Otse	Molete	F	1993	2013	20	33	3
35	Otse	Molete	M	1991	2010	19	33	5
36	Otse	Molete	F	1959	1998	39	33	3
37	Otse	Molete	M	1996	2010	14	33	3
38	Gaborone	Molete	F	1958	2004	46	?	5
39	Lotlhakane East	Mongwaketse	F	1951	1993	42	41	1
40	Lotlhakane East	Mongwaketse	F	1949	1975	26	45	1
41	Lotlhakane East	Mongwaketse	F	1943	1969	26	45	1&4

Table 2. Distribution of pots produced by different techniques in the villages

	Number of Pots made with corresponding Technique					
Village	1	2	3	4	5	Total
Molepolole	5			1		6
Letlhakeng	8					8
Kanye	2					2
Lotlhakane East	3			1		4
Lotllhakane West	8				1	9
Moshupa	1				1	2
Kgwarape		7				7
Otse			4		1	5
Gonku					1	1
Gaborone					1	1
Total	27	7	4	2	5	45

Table 3. Distribution of pots produced by different techniques in the *merafhe*

	Number of Pots made with corresponding Technique					
Morafhe	1	2	3	4	5	Total
Mokgalagadi	16				1	17
Mokwena	5			1		6
Mongwaketse	5			1		6
Mokgatla	1	7			1	9
Molete			4		2	6
Motswapong					1	1
Total	27	7	4	2	5	45

Table 4. Data on teaching and learning networks

Teacher *Morafhe*	Teacher Village	Teacher ID	Learner ID	Learner Village	Learner *Morafhe*	Learner Gender	Learner's Year of Birth	Date of Learning	Learner's Age at learning
Mongwaketse	Kanye	1	2	Kanye	Mongwaketse	F	1956	2008	52
Mokgalagadi	Letlhakeng	6	3	Letlhakeng	Mokgalagadi	M	1950	2007	57
Mokgalagadi	Letlhakeng	6	4	Letlhakeng	Mokgalagadi	F	1973	2013	40
Mokgalagadi	Letlhakeng	6	5	Letlhakeng	Mokgalagadi	F	1972	2009	37
Mokgalagadi	Letlhakeng	6	7	Letlhakeng	Mokgalagadi	F	1966	2003	37
Mokgalagadi	Letlhakeng	6	8	Letlhakeng	Mokgalagadi	F	1963	2013	50
Mokgalagadi	Letlhakeng	6	9	Letlhakeng	Mokgalagadi	F	1941	2013	72
Mokgalagadi	Letlhakeng	6	10	Letlhakeng	Mokgalagadi	F	1975	2013	38
Mokgatla	Kgwarape	15	11	Kgwarape	Mokgatla	F	1986	2001	15
Mokgatla	Kgwarape	15	12	Kgwarape	Mokgatla	F	1958	1960	29
Mokgatla	Kgwarape	15	13	Kgwarape	Mokgatla	F	1947	1970	23

Teacher *Morafhe*	Teacher Village	Teacher ID	Learner ID	Learner Village	Learner *Morafhe*	Learner Gender	Learner's Year of Birth	Date of Learning	Learner's Age at learning
Mokgatla	Kgwarape	15	14	Kgwarape	Mokgatla	F	1949	1970	21
Mokgatla	Kgwarape	15	16	Kgwarape	Mokgatla	F	1948	1986	38
Mokgatla	Kgwarape	15	17	Kgwarape	Mokgatla	F	1976	1960	24
Mokwena	Molepolole	19	18	Molepolole	Mokwena	F	1985	2001	16
Mokwena	Molepolole	21	6	Letlhakeng	Mokgalagadi	F	1969	1999	30
Mokwena	Molepolole	21	22	Molepolole	Mokwena	M	1976	1999	23
Mokgalagadi	Lotlhakane West	28	27	Lotlhakane West	Mokgalagadi	F	1952	1967	15
Mokgalagadi	Lotlhakane West	28	30	Lotlhakane West	Mokgalagadi	F	1970	2007	37
Molete	Otse	33	34	Otse	Molete	F	1993	2013	20
Molete	Otse	33	35	Otse	Molete	M	1991	2010	19
Molete	Otse	33	36	Otse	Molete	F	1959	1998	39
Molete	Otse	33	37	Otse	Molete	M	1996	2010	14
Mongwaketse	Lotlhakane East	41	24	Lotlhakane West	Mokgalagadi	F	1967	2007	40
Mongwaketse	Lotlhakane East	41	25	Lotlhakane West	Mokgalagadi	F	1953	2012	59
Mongwaketse	Lotlhakane East	41	26	Lotlhakane West	Mokgalagadi	F	1958	2009	51
Mongwaketse	Lotlhakane East	41	28	Lotlhakane West	Mokgalagadi	F	1937	2009	72
Mongwaketse	Lotlhakane East	41	29	Lotlhakane West	Mokgalagadi	F	1936	?	?
Mongwaketse	Lotlhakane East	41	31	Lotlhakane West	Mokgalagadi	F	1938	1955	17
Mongwaketse	Lotlhakane East	41	32	Moshupa	Mokgatla	F	1966	2005	39
Mongwaketse	Lotlhakane East	41	39	Lotlhakane East	Mongwaketse	F	1951	1993	42
Mokgatla	Kgwarape	42	15	Kgwarape	Mokgatla	F	1937	2008	71
Mongwaketse	Lotlhakane East	43	1	Kanye	Mongwaketse	F	1957	1974	17
Mongwaketse	Molapowabojang	44	19	Molepolole	Mokwena	F	1951	1972	21

Teacher *Morafhe*	Teacher Village	Teacher ID	Learner ID	Learner Village	Learner *Morafhe*	Learner Gender	Learner's Year of Birth	Date of Learning	Learner's Age at learning
Mongwaketse	Molapowabojang	44	20	Molepolole	Mokwena	F	1947	1969	22
Mongwaketse	Molapowabojang	44	21	Molepolole	Mokwena	F	1944	1962	18
Mokwena	Molepolole	45	40	Lotlhakane East	Mongwaketse	F	1949	1975	26
Mokwena	Molepolole	45	41	Lotlhakane East	Mongwaketse	F	1943	1969	26
Foreign	Francistown	46	33	Otse	Molete	M	1955	1992	37
?	?	?	23	Gonku	Motswapong	F	1962	2010	48
?	?	?	38	Gaborone	Molete	F	1958	2004	46

CHAPTER 5: POTTERY DECORATION

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Pottery Decoration in Contemporary South-Eastern Botswana

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Abstract

The presumed link between pottery style and linguistic identity has played a key role in the archaeological interpretation of the peopling of southern Africa. To re-assess this link, we study ceramic vessel decorations used by 41 contemporary potters in south-eastern Botswana, who are from two separate language groups, come from six different ethnic groups, learnt their craft in one of five different 'schools' of pottery and who live scattered in ten different villages. Our observations of ceramic style are on a small sample of pots

available at the time of fieldwork. We isolate 24 attributes under three major categories of decoration motif, technique of plastic decoration, and surface treatment. Our study shows that in contemporary south-eastern Botswana, pottery style does not help to distinguish the pots made by potters from different language groups. However, to varying degrees it can reveal differences in the products of potters from different locations, ethnic groups and schools of learning.

La relation présumée entre la décoration de la poterie et l'identité culturelle des potiers a joué un rôle clé dans l'interprétation archéologique du peuplement de l'Afrique australe. Pour évaluer cette relation, nous étudions les décorations de pot en céramique utilisés par 41 potiers contemporains dans le sud-est du Botswana, qui sont de deux groupes linguistiques distincts, doivent allégeance à l'un des six groupes ethniques différents, ont appris leur art dans l'une des cinq différentes «écoles» de la poterie et qui vivent dispersés dans dix villages différents. Nos observations de style céramique sont sur un petit échantillon de pots disponibles au moment du travail sur le terrain. Nous isolons 24 attributs sous les trois grandes catégories de motif, de technique et de traitement de surface. Notre étude montre que dans le sud-est du Botswana aujourd'hui, le style de la poterie n'aide pas à distinguer les pots fabriqués par les potiers de différents groupes linguistiques. Cependant, à des degrés divers, il peut révéler des différences dans les produits des potiers de différents endroits, des groupes ethniques et des écoles d'apprentissage.

Key words: pottery; decoration; ethnoarchaeology; social boundaries; Botswana.

Introduction

Archaeologists have long sought to identify linguistic groups in the archaeological record and many have presumed a direct association between language and style of material culture (e.g. Laidler 1929, 1938; Schofield 1948; Shepard 1956; Sadr and Sampson 1999). Style resides in every stage of the manufacturing process of an artifact and its cultural

transmission is driven by certain individuals deciding to imitate others (e.g. Sackett 1977; Dietler and Herbich 1998; Stark *et al.* 2000; Mayor 2010; Fredriksen and Bandama 2016). The assumption that different styles necessarily reflect linguistic groups was challenged long ago by Fredrik Barth (1969) who showed that social boundaries between groups of people enclose collectively constructed identities that may be neither ethnic nor linguistic, with material markers that are emic and entirely subjective (see also Hodder 1982).

Nonetheless, the conventional view of the peopling of southern Africa during the last two millennia still rests on the distribution of ancient ceramic vessel decorative styles (e.g. Phillipson 1977; Evers 1988; Evers and Huffman 1988; Sampson 1988; Huffman 2007). Against this view there have been dissidents who cautioned against oversimplifying the link between pots and people, and of ignoring the social context of ceramic production and deposition (e.g. M. Hall 1984; Lindahl and Matenga 1995; Lindahl, and Pikirayi 2010; S. Hall 2012; Pikirayi and Lindahl 2013), but the conventional view is a strong one. Its strength comes from an ethnoarchaeological study of contemporary pots produced by potters from five different language groups with clearly distinct styles (Huffman 1980).

In this paper we undertake a similar ethnoarchaeological study, but based on a more haphazardly collected sample of modern pots. Quite simply, we ask whether we can detect a language boundary in the choice of motif, technique and surface treatment in a sample of 256 pots produced by 41 contemporary potters in south-eastern Botswana. We conclude that in our study area different language groups cannot be recognized from their ceramic decoration style. However, the choice of decorative attributes does mark other kinds of social boundaries. We thus agree with Barth, and think that different pottery styles always mark some kind of social boundary, but *a priori* they cannot be equated with different language groups.

South-eastern Botswana covers an area of 76 332 km^2. Climate is semi-arid with most rainfall in summer from November to May. Poor rainfall patterns hamper food production in the area resulting in migration to urban and major village centre to seek for employment and infrastructural developments. Administratively, it incorporates portions of the South

East, Southern, Kgatleng and Kweneng Districts (Figure 1). It covers parts of two major drainage basins: Most of south-eastern Botswana is drained by the Metsemotlhabe River which flows north-east to join the Limpopo River on the north-western portion and drains north into the Kalahari Drainage Basin (Key and Ayres 2000). The watershed between these two basins forms a linguistic boundary between the Sekgalagadi-speakers in the Kalahari and the Setswana-speakers in the Metsemotlhabe basin.

Our study area is quite a densely populated agricultural and pastoral landscape. Here most people engage in other activities including construction, welding, basket weaving, sculpture, and leather tanning. Sorghum, maize and beans are the common cereals that are cultivated. Pottery is seen as an economic strategy to gain income. Despite the availability of substitutes such as metal, plastic and glass vessels, people in south-eastern Botswana occasionally use un-glazed earthenware vessels for various purposes including cooking, ritual and decoration.

In our study area we visited 41 potters in ten locations (Figure 1), most of whom sell and distribute their pots from home to a local clientele, to be used as vessels for storing traditional brew, water, grain or just for decoration. The 41 potters are from six different *merafhe* (Table 1). This word (singular: *morafhe*) can be defined as an ethnic group, tribe or polity (e.g. Schapera 1938, 1952, 1963; Wilmsen and McAllister 1996; Bolaane and Mgadla 1997; Wilmsen 2002). The members of five of these *merafhe* speak the Tswana language, Setswana. The members of the sixth *merafhe*, the Bakgalagadi, speak the Kgalagadi language or Sekgalagadi. Both languages belong to the Sotho subgroup of south-eastern Bantu languages (Louw and Finlayson 1990; Van der Spuy 1990). Traditionally, both the Batswana and the Bakgalagadi *merafhe* follow patriarchal rules, marry cross cousins, follow certain totems under a chief (*kgosi*) in a village who organizes major public activities through corresponding age regiments (*mephato*) (Richards 1961; Solway 1980; Wilmsen 1989).

It is said that the Tswana and the Kgalagadi cultural entities formed between the 13th and the 15th centuries AD, at the time of the Great Zimbabwe state (Tlou and Campbell 2000: 89), and that the Kgalagadi people (or the Bakgalagadi: the prefix Ba- in the Tswana language denotes a people) arrived in south-eastern Botswana before the Tswana-speakers, or Batswana. The Tswana-speaking Kwena (ancestors of the Bakwena *morafhe* in our study) entered the study area in the eighteenth century and subjugated the Bakgalagadi, displacing many of them further north and west into the Kalahari sandveld (Okihiro 1976; Ngcongco 1977; Mautle 1986; Morton 2013). The Bakwena have their capital at Molepolole and are considered the most senior *morafhe* in Botswana (Schapera 1980; Ramsay 1991). The Ngwaketse people (Bangwaketse *morafhe* in our study) broke away from the Bakwena around 1750 AD and established their own capital at Kanye (Schapera 1942a). The Tswana-speaking Kgatla people (Bakgatla *morafhe*) arrived later in the late nineteenth century and established their capital at Mochudi in the eastern territories of the Kwena (Schapera 1942b; Morton *et. al.* 2008). The Balete *morafhe* settled in modern Botswana around the same time as the Bakgatla (Matemba 2003). One of the potters in our study area is from the Batswapong, which is another major *morafhe* now based in the Tswapong hills in eastern Botswana, far outside our study area (Schapera 1952).

Methods

Our data on pots and potters were collected through field inquires, observations, interviews, and photography. In all, 256 pots were recorded, but at the time of our fieldwork some potters had more pots in stock, so our sample is not evenly distributed (Table 1). In our sample, certain decorative attributes are common and can be considered emblemic (*sensu* Wiessner 1983). Emblemic is used to express objective social attributes of identity (Zavalloni 1973:253). Others are idiosyncratic and probably represent assertive style. Assertive style is formal variation in material culture which is personally based and which carries information supporting individual identity, by separating persons from similar others as well as by giving personal translations of membership in various groups (Plog

1980, 1983). Other approaches to style are technological and based on community of practice (Sackett 1982, 1985). We have left these out of our statistical analyses. We have removed the attributes that are very rare (maybe these are the assertive ones, but in a small sample it is hard to tell) and would introduce outliers in our statistical analyses which will create unclear patterns. We are after clear patterns created in the distribution of attributes that are relatively common, and these are also more likely to be emblemic. The paper is subsequently about how boundaries are reflected in emblemic style, not in assertive style.
In our sample, we observed two overarching techniques of decoration. Plastic decoration includes impressing or incising the damp clay with various tools, or even by adding bits of clay (appliqué) to produce raised decoration or functional traits such as handles. In the second overarching technique, pots are decorated by the application of other substances to the pot surface, such as slip, paint and varnish, or even a layer of carbon through smoke firing.

Our study is an attribute analysis (Sackett 1966; Spaulding 1977; Adams and Adams 1991: 172-173). Given the small size of our sample we refrain from combining attributes into a formal typology of decorative styles, such as is common in southern African Iron Age ceramic studies (e.g. Huffman 2007). Another powerful technique for analysing ceramic style is by the *chaîne opératoire* approach originally developed by Leroi-Gourhan (1964) and now used by several scholars (e.g. Gosselain 1998, 1999, 2008a, b, 2011; Livingstone Smith 2000, 2016; Roux 2007; Fowler 2011; Gosselain and Livingstone-Smith 2013). We did not use this approach as most of the pots were decorated in our absence, so we cannot fully describe the operational sequence.

We have isolated 24 attributes for our study. They are grouped in three major categories: decorative motif (DM); plastic decoration technique (PD); surface treatment (ST). Below we briefly describe these attributes.

DM1: Arcades (Fig. 2a) are the most common motif in our sample. They are used in single, double and multiple bands, and occasionally morph into half-moons (Fig. 2b) Arcades, like other motifs, can be incised or painted.

DM2: Geometric shapes include triangle, diamond, lozenge and rhombus (Fig. 2d). Geometrics are the second most common motif in our sample.

DM3: Zigzag lines create chevron designs (Fig. 2c). In form, they relate to the triangle designs in the geometric motif. Zigzag lines are the third most common motif in our sample.

DM4: Ellipses and circles are related to arcades insofar as they are both curvilinear motifs, rather than geometric.

DM5: Vegetal motifs such as leaves and flowers (Fig. 2i) are a modern innovation.
DM6: A painted 'belt' around the middle of the pot.

DM7: Figurative human or animal motif (Fig. 2g).

DM8: Script, such as number or text (Fig. 2h) used as decoration. This is a rare motif seen on only two pots.

DM9: Diagonal line across the pot. This is an idiosyncratic motif found on only one pot.

DM10: This is something of a misnomer as it refers to the absence of any specific motif: Many pots carry no recognizable motif, although they may be decorated with applied bits of clay or have their surfaces evenly coloured. In terms of numbers of occurrences, DM10 is second only to DM1 (arcades).

PD1: Incised decoration (Figs 2a and d) involves cutting lines into the surface of the clay while it is still damp or leather hard. This is the most common plastic decorative technique and can involve a variety of tools from metal knives to acacia tree thorns.

PD2: Impressed decoration (Figs 2a, d and f) concerns the displacing of clay by pressing into the surface of damp or leather hard clay with a variety of possible tools, including fingers.

PD3: Appliqué (Figs 2e and g) refers to the adding of small, shaped pieces of clay to the surface of the vessel. A variety of shapes and motifs can be added, and some of these also serve a functional purpose such as handles and spouts.

PD4: Pinched and scalloped rims are made by cutting, pressing and/or squeezing the damp clay at the rim of the pot.

ST1: Red ochre applied as slip (Figs 2 a, d, g and h) is the most common surface treatment.

ST2: Manganese, grayish-white oxide applied as paint.

ST3: Enamel paint applied to the pot after firing (Figs 2c and e).

ST4: Graphite or crystalline carbon applied as paint.

ST5: Liquid varnish applied to the pot after firing.

ST6: Crayon, chalk or pencil used to apply marks on the pot surface after the firing of the vessel.

ST7: Smoke firing to blacken the surface of the vessel. This can be achieved by using grass, cow dung and wood as fuel. There are only two examples of this treatment in our sample of pots.

ST8: Calcrete or calcium rich limestone applied as paint. There is only one example of this type of surface treatment in our sample of pots.

We first mapped the distribution of our decorative attributes, but found no visually compelling patterns. Arcades, for example are used as a decorative motif by nearly all the potters except the Balete from Otse. Likewise, the techniques of incision and slipping with red ochre are very widespread, although they are found at different frequencies in different places. Less common motifs and techniques are often too rare to produce meaningful distribution patterns.

Subsequently, we opted for a statistical approach and correspondence analysis (CA) proved to be most useful. This is a method of visualizing patterns in multivariate data (Shennan 1988: chapter 13) and is a particular case of weighted principal component analysis. Unlike principal component analysis, CA is suitable for presence/absence data that are not normally distributed and can even deal with unbalanced contingency tables with a large number of cells with very small or zero entries and some very large entries as well (e.g. Benzecri 1973; Bolviken et al. 1982; Greenacre 2007). As in principal component analysis, in CA we reduce the dimensionality of a contingency table and visualize it in two-dimensional scatter-plots. The concept of reducing variability in multivariate statistical analysis is explained well by Shennan (1988: 246-258). For plotting, the coordinates of each row and each column in Tables 3-5 were calculated from their relative frequencies, or profiles, and compared to the average profiles of the rows and columns to obtain the so-

called chi-squared distance, which is essentially a weighted Euclidean distance between the profiles. In our case this allows us to plot the potters and the decorative attributes together on the same two-dimensional scatter-plot where similarity and correspondence are expressed by Euclidean distance (Figures 2-4). For the CA analysis we used the software R (R Core Team 2016) with the package 'ca' (Nenadic and Greenacre 2007). Detailed descriptions of the mathematics to calculate and transform the chi-squared distance in CA can be found in Bolviken et al. (1982) and Greenacre (2007).

Some researchers are concerned that CA is unduly influenced by rare categories which appear as outliers on the scatterplot (e.g. Rao 1995: 45). To avoid any such problems, we omitted the idiosyncratic attributes from the CA analyses. Further, as we have very few photographed pots from some of our potters, we have analysed only those groupings of potters with a sample of > 10 counts in the total attribute list. We can justify such culling on the grounds that in order to test whether the material boundaries in decorative styles correspond to social boundaries in south-eastern Botswana, we do not need to examine all the decorative attributes but only those for which we have adequate samples.

For testing the significance of our findings we rely on the Mann-Whitney U test and the Spearman's rho correlation statistic. Both are non-parametric, which means that they can be applied to samples that are not normally distributed. The Mann-Whitney tests the null hypothesis that the means of the two samples are similar enough to indicate that they come from the same population. A very low p-value (<0.05) is taken to mean that the null hypothesis is highly improbable and that the two samples probably come from two different populations. Spearman's rho can indicate the degree of correlation between two samples. In our study, a high correlation between the attributes used by two samples of potters can indicate that they come from the same population.

Results

We began with the simple question of whether the 24 attributes of decoration motif (DM), plastic decoration technique (PD) and surface treatment (ST) allow us to distinguish between the pots produced by potters from the two different language groups in our study area. In our sample of 41 potters, 16 are Kgalagadi-speakers and 25 are Tswana speakers (Table 1). We compared the output of the potters by language group (Table 2) and subjected the data to the Mann-Whitney U test. This gave a p-value of 0.09844 for the DM attributes, 0.1102 for the PD attributes and 0.8734 for the ST attributes. All these p-values are >0.05 so we cannot refute the null hypothesis that the two samples come from the same population; in other words the Mann-Whitney test cannot distinguish between the pottery decorations of the Kgalagadi-speaking and Tswana-speaking potters. We further conducted a Spearman's correlation to get a different view of the degree of similarity between the two samples. In the DM attributes, the correlation between the Kgalagadi and the Tswana potters was 0.9089992 and highly significant (p-value 0.0006841). In plain English, the decorative motifs used by the potters from the two language groups were all but identical. In terms of the PD and ST attributes, the correlations were considerably lower (respectively 0.3162278 and 0.3170968) and not statistically significant, meaning that in terms of plastic decorative techniques and surface treatments, potters from the two language groups did not follow very similar practices. However, a Mann-Whitney test of the PD and ST attributes produced quite high p-values (respectively 0.1102 and 0.8734). In other words, we were unable to refute the null hypothesis that the samples, in terms of PD and ST attributes, came from the same population.

We can summarize these findings by saying that our experiment did not support the conventional South Africa archaeological view that pottery style marks linguistic identity. But, as we shall see below, the choice of decorative attributes do mark other kinds of identity and affiliation.

The correspondence analysis indicates clearly different preferences for motifs in different locations (Fig. 3a and Table 3a). DM1 (arcades) is more characteristic of the pots coming from Kanye and Lotlhakane East (the southern sector of our study area, see Figure 1), and DM10 (no motif) is more characteristic of pots coming from Letlhakeng, Molepolole and Moshupa (in the northern sector). The remaining decorative motifs distinguish the potters of Kgwarape and Lotlhakane West from the others. These two locations are geographically separate from each other but fall in a central line between the northern and the southern sectors. A series of Mann-Whitney U tests showed that the DM attributes used by the Kgwarape potters differed significantly from that of all other potters (p-values ranging from 0.001945 to 0.01745, that is to say below the conventional cut-off point of 0.05). Also significant were the differences in DM attributes used by Lotlhakane West potters compared against potters from Moshupa and Letlhakeng (p-values of 0.04605 and 0.01646 respectively). What this means is that, statistically speaking, the potters in different locations have different preferences for motifs. It is interesting to note that that the potters from Lotlhakane West and Letlhakeng, who are all Kgalagadi-speakers, do not use a similar range of decorative motifs; they should if the conventional view of pottery style as a marker of linguistic identity were valid. Likewise, one would not have expected the choice of decorative motifs among the Tswana-speaking potters, such as in Kgwarape and Kanye for example, to have been significantly different.

In terms of the potters' *morafhe* affiliation (Table 3b), Figure 3b shows that the prevalence of DM1 (arcades) distinguishes the Bangwaketse from the others. The Bakgatla potters are separated from the rest particularly by DM 5 and 6. DM 10 (no motif) pulls the Balete potters to the far right in our graph, and also contributes to separating the Bakwena and Bakgalagadi potters from the Bangwaketse and Bakgatla potters. The proximity of their CA coordinates indicates that the Bakgalagadi and Bakwena potters, who speak different languages, use similar decorative motifs. This may have to do with the fact that the Bakgalagadi have been subjects of the Bakwena ever since the latter arrived in this location in the seventeenth century, so the close relationship in their use of decorative motifs in part

may be a reflection of this close historical association. A series of Mann-Whitnery U tests indicate that the choice of decorative motifs by the Bakgatla potters, all but one of whom live in Kgwarape, are significantly different from those chosen by the Bakwena, Balete and Bangwaketse *merafhe* (respective p-values of 0.009538, 0.001845, and 0.02141). These are all Tswana-speaking potters.

In terms of the pottery 'school' where they learnt their craft (Table 3c), Figure 3c shows that the members of School 1 are characterized by their use of a large diversity of decorative motifs including DMs 4, 5, 6 and 7. All School 1 members live in Kgwarape and are of the Bakgatla *morafhe*. Their choice of a large diversity of motifs may be explained by the fact that the master teacher of school 1 is Potter 15 who is originally from Zimbabwe. She married a Mokgatla man whom she met in Mochudi when she came to sell various products including clothing and crafts. As it is customary, she was involved in a post marital 'internship' where she stayed with her new in-laws for some time before establishing her independent home. She originally learned pottery in Zimbabwe from her mother but has adopted Bakgatla style that includes arcades. She introduced the vegetal motif, which is a modern innovation that she learned in Zimbabwe. A Mann-Whitney U test shows that the choice of decorative motifs in School 1 is significantly different from those of School 2 (p-value 0.01034). Members of Schools 2 and 4 are characterized by their heavier reliance on the arcade decorative motif (DM1). The members of these two schools comprise Bangwaketse and Bakgalakgadi potters who are from different language groups but are historically related as masters and subjects. As we saw in the previous paragraph, DM1 is particularly strongly associated with the Bangwaketse. School 3 is pulled far to the right hand side of our graph by the reluctance of its potters to put recognizable motifs on their pots (DM10). They come from two separate language groups, Tswana and Kgalagadi, and are also historically related in a master/subject relationship. The master teacher of School 3 is a Tswana-speaker from the Bakwena *morafhe*. All these links and patterns of similarity and dissimilarity suggest that schools of learning have a particularly significant

role in determining the preference for decorative motifs, more so than language, location and *morafhe* affiliation.

The correspondence analyses for choice of plastic decoration techniques (PD attributes, Table 4) also yielded clear patterns, but with fewer significant results in the statistical tests. In terms of location of the potters, Figure 4a shows a clear separation of the techniques predominantly used in different places, but these are not always geographically contiguous locations. A series of Mann-Whitney U tests indicated significant differences in the choice of technique between the Kgwarape potters and those from Letlhakeng, Moshupa and Otse (all three with p-values of 0.0294). This mirrors what we saw in the decoration motif choices.

In terms of *morafhe* affiliation, the choice of plastic decoration techniques is also quite distinct on the CA graph (Fig. 4b). The Bakwena and Bakgalagadi potters rely heavily on a similar arsenal of decorative techniques, principally PD 1 (incision) that sets them apart from the other *merafhe*, while the Bakgatla potters with their diversity of techniques are located near the centre of our graph. The outlier status of the Balete potters is a reflection of the innovative practices in their Otse workshop. The Mann-Whitney U test indicated a significant difference in the choice of technique between the Bakgatla potters and those of the Bakwena and Balete *merafhe* (p-values 0.04083 and 0.0294 respectively). This mirrors the significant differences we saw in the decoration motifs.

The CA graph of the schools in which the potters learnt their craft (Fig. 4c) also shows clear separations in choice of plastic decorative techniques. A Mann-Whitney U test indicates a significant difference in the choice of decoration techniques between Schools 1 and 5 (p-value 0.02857).

Figure 5a shows the CA coordinates for surface treatment attributes and the location of potters (see also Table 5). There are clear patterns of spatial separation in the choice surface treatment techniques, but none of these proved to be statistically significant. Much the same

can be said for the coordinates of surface treatment attributes and the potters' *morafhe* affiliation (Fig. 5b), as well as the school in which the potters learnt their craft (Fig. 5c).

Conclusion

Our ethnoarchaeological study of decoration on ceramic vessels produced by 41 contemporary potters in south-eastern Botswana has failed to support the conventional view in South African archaeology that different ancient pottery styles always mark the language group of the ancient potters. Instead, correspondence analysis and statistical tests showed that the choice of decorative attributes can indicate the potter's geographic location, ethnic affiliation, but most importantly the schools or networks in which they learnt their craft. Results of this study are relevant to literature on 'communities of practice' and their application to archaeology (e.g. Roddick and Stahl 2016) especially around the valency of teaching networks in the creation of ceramic styles.

The pottery learning networks in our study area are described and illustrated in detail in Thebe and Sadr (2017: figs 10 and 11). Here, we will only point out the relevant relationships. One of the patterns that indicate the primacy of learning schools in the choice of decorative attributes is the fact that the potters of the Bakgalagadi language group do not have a common ceramic decorative style. Instead, the decorative style of their pots identifies them as members of one of two schools of learning, where they were taught the craft by master potters from two different Tswana-speaking ethnic groups (or *merafhe*). Another enlightening pattern is that the statistically most significant differences in choice of decorative attributes distinguish the potters of Kgwarape village from all other potters. The Kgwarape potters are all from the Bakgatla ethnic group, and they all learnt their craft in School 1 from their master potter who married into the Bakgatla *merafhe* and brought with her some of the decorative attributes she had learnt back home in Zimbabwe. The addition of the exotic attributes to the local repertoire of decoration motif and technique has created a distinctive 'Kgwarape' style, but it is not so much their location as the cultural

background of the teacher that explains this distinctiveness. The potter in Moshupa who is also from the Bakgatla ethnic group does not follow the decorative practices of the Kgwarape potters; she learnt her craft in School 4. Another pattern illustrating the key role of learning networks is provided by the potters of School 5. These potters from Otse village have an exotic style that can be recognized at a glance. The master potter of School 5, potter 33, learnt his craft in a vocational school about 400 km north of Otse. So far, his innovative approach to pottery has only spread to other members of his family, but in due time, if he succeeds economically, they may come to be imitated even outside his ethnic group. Potter 38 in Gaborone is also from the Balete *morafhe*, but she is from a different learning network and makes a different style of pots.

Our study was an analysis of decorative attributes. There is a possibility that other approaches focusing more on decorative technique and ornamentation structure may yield additional information to distinguish between the groupings of potters. But we doubt that they would reveal a statistically significant boundary between the decorative choices made by Kgalagadi and Tswana-speaking potters.

Finally, our study is ethnoarchaeological and the modern condition of potters in Botswana is surely different from that of pre-colonial potters in southern Africa. We do not pretend that we have explained the distribution of ancient ceramic styles. Ethnoarchaeology cannot explain the past; it can only provide useful hypotheses to test against the archaeological record (David and Kramer 2001). Our study suggests that southern African archaeologists should treat the link between ceramic style and language group not as 'Truth,' but as a hypothesis to be tested case by case with independent archaeological evidence. And they should consider alternative hypotheses as well; for example, that in some situations the ancient ceramic styles may represent learning networks, or communities of practice, or ethnic groups within a single language group. Or indeed, that ceramic styles can transcend language barriers when members of one language group subjugate members of another, as historically was the case with the Tswana- and Kgalagadi-speakers in our study area; and as

has been argued for an archaeological case involving Venda- and Northern Sotho-speakers (Huffman 2002: 3).

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Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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Captions

Figure 1: South-eastern Botswana showing the drainages and the main places mentioned in the text.

Figure 2. Some examples of the decorated pots.

Figure 3. Plots showing the statistical correspondence of decorative motif attributes against potters grouped by: a) location; b) ethnic group of *morafhe*; c) pottery learning school or network.

Figure 4. Plots showing the statistical correspondence of attributes of plastic decorative technique against potters grouped by: a) location; b) ethnic group of *morafhe*; c) pottery learning school or network.

Figure 5. Plots showing the statistical correspondence of surface treatment attributes against potters grouped by: a) location; b) ethnic group of *morafhe*; c) pottery learning school or network.

Table 1. Basic information about the potters in south-eastern Botswana.

Table 2. The distribution of decorative attributes among potters of the two language groups.

Table 3. The distribution of decorative motifs among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

Table 4. The distribution of plastic decoration techniques among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

Table 5. The distribution of surface treatments among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

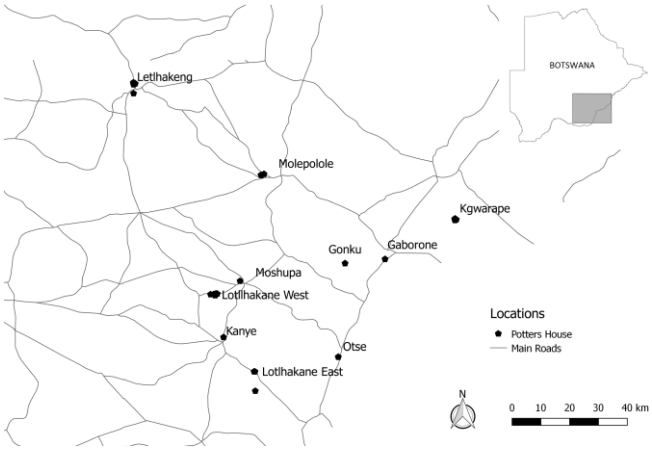


Figure 1. South-eastern Botswana showing the drainages and

the main places mentioned in the text.



Figure 2. Some examples of the decorated pots.

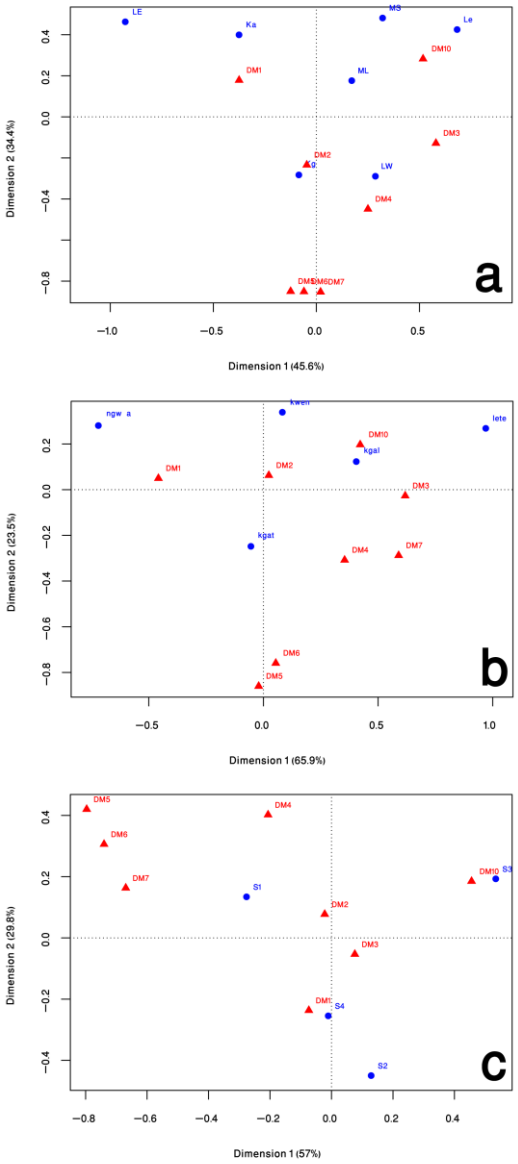


Figure 3. Plots showing the statistical correspondence of decorative motif attributes against potters grouped by:

a) location; b) ethnic group of *morafhe*; c) pottery

b) learning school or network.

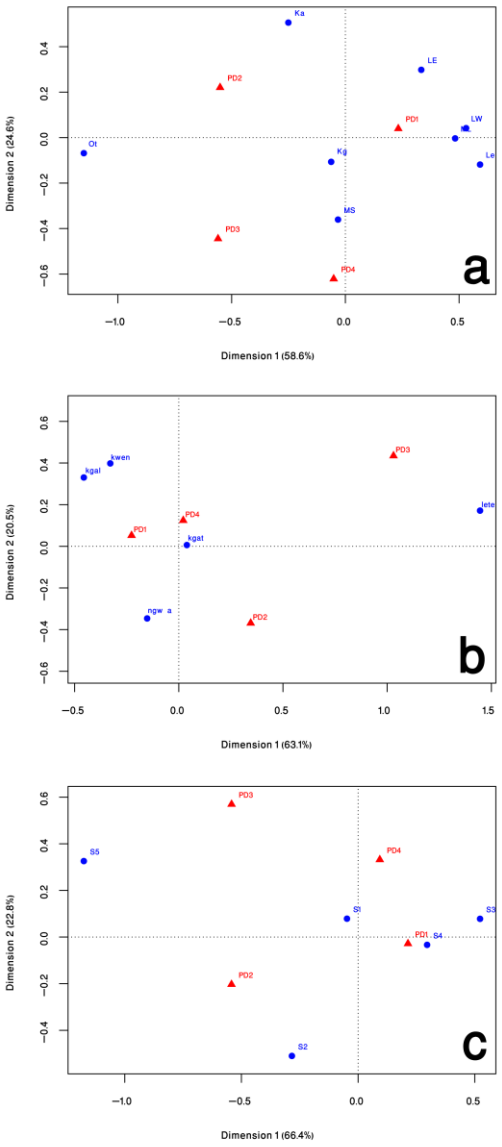


Figure 4. Plots showing the statistical correspondence of attributes of plastic decorative technique against potters grouped by: a) location; b) ethnic group of *morafhe*; c) pottery learning school or network.

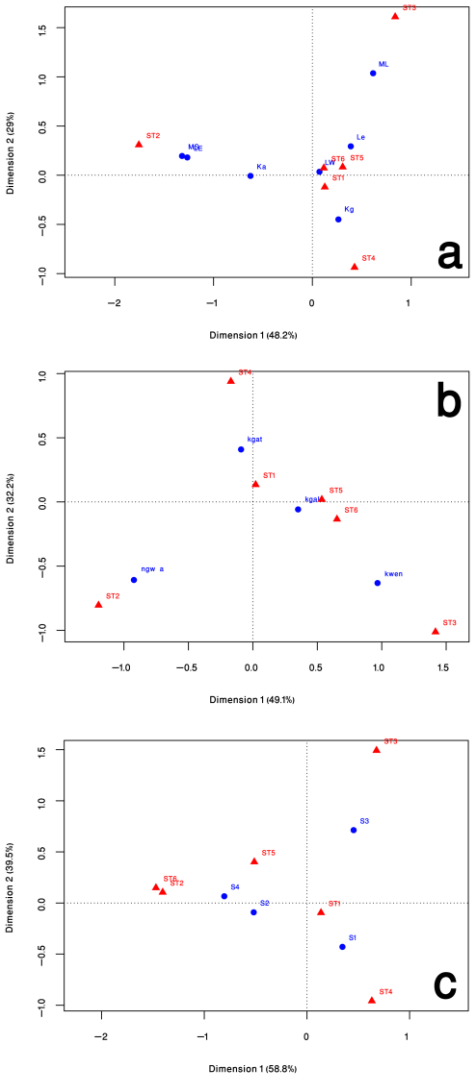


Figure 5. Plots showing the statistical correspondence of surface treatment attributes against potters grouped by: a) location; b) ethnic group of *morafhe*; c) pottery learning school or network.

Table 1. Basic information about the potters in south-eastern Botswana.

N pots	Location	*Morafhe*	School
11	Kanye	Mongwaketse	2
11	Kanye	Mongwaketse	2
1	Letlhakeng	Mokgalagadi	3
1	Letlhakeng	Mokgalagadi	3
1	Letlhakeng	Mokgalagadi	3
8	Letlhakeng	Mokgalagadi	3
6	Letlhakeng	Mokgalagadi	3
2	Letlhakeng	Mokgalagadi	3
1	Letlhakeng	Mokgalagadi	3
7	Letlhakeng	Mokgalagadi	3
1	Kgwarape	Mokgatla	1
13	Kgwarape	Mokgatla	1
16	Kgwarape	Mokgatla	1
30	Kgwarape	Mokgatla	1
25	Kgwarape	Mokgatla	1
22	Kgwarape	Mokgatla	1
6	Kgwarape	Mokgatla	1
5	Molepolole	Mokwena	3
8	Molepolole	Mokwena	3
1	Molepolole	Mokwena	3
5	Molepolole	Mokwena	3
2	Molepolole	Mokwena	3
2	Gonku	Motswapong	0
5	Lotlhakane West	Mokgalagadi	4
1	Lotlhakane West	Mokgalagadi	4
1	Lotlhakane West	Mokgalagadi	4
1	Lotlhakane West	Mokgalagadi	4
2	Lotlhakane West	Mokgalagadi	4
5	Lotlhakane West	Mokgalagadi	4
4	Lotlhakane West	Mokgalagadi	4

N pots	Location	*Morafhe*	School
6	Lotlhakane West	Mokgalagadi	4
13	Moshupa	Mokgatla	4
3	Otse	Molete	5
1	Otse	Molete	5
1	Otse	Molete	5
1	Otse	Molete	5
1	Otse	Molete	5

Table 2. The distribution of decorative attributes among potters of the two language groups.

	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM10
Kgalagadi	14	6	8	4	1	1	1	1	20
Tswana	89	32	11	11	9	5	4	1	44
	PD1	PD2	PD3	PD4					
Kgalagadi	24	0	1	1					
Tswana	134	49	19	15					
	ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8	
Kgalagadi	41	2	5	0	6	3	1	1	
Tswana	136	22	12	12	1	0	1	0	

Table 3. The distribution of decorative motifs among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

A)	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM10
Kanye	16	4	0	0	0	0	0	5
Letlhakeng	7	1	3	2	0	0	0	15
Kgwarape	44	18	6	9	9	5	3	18
Molepolole	8	7	1	1	0	0	0	8
Lotlhakane West	7	5	5	2	1	1	1	5
Moshupa	5	0	2	0	0	0	0	4
Lotlhakane East	16	1	0	0	0	0	0	0
B)								
Mokgalagadi	14	6	8	4	1	1	1	20
Mokgatla	49	18	8	9	9	5	3	22
Mokwena	8	7	1	1	0	0	0	8
Molete	0	2	2	1	0	0	1	7
Mongwaketse	32	5	0	0	0	0	0	5
C)								
School 1	44	18	6	9	9	5	3	18
School 2	16	4	0	0	0	0	0	5
School 3	15	8	4	3	0	0	0	23
School 4	28	6	7	2	1	1	1	9

Table 4. The distribution of plastic decoration techniques among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

A)	PD1	PD2	PD3	PD4
Kanye	16	11	0	0
Letlhakeng	9	0	0	1
Kgwarape	81	28	10	13
Molepolole	11	0	1	0
Lotlhakane West	15	0	1	0
Moshupa	7	2	1	2
Otse	2	5	3	0
Lotlhakane East	17	3	0	0
B)				
Mokgalagadi	24	0	1	1
Mokgatla	88	30	11	15
Mokwena	11	0	1	0
Molete	2	5	5	0
Mongwaketse	33	14	0	0
C)				
School 1	81	28	10	13
School 2	16	11	0	0
School 3	20	0	1	1
School 4	39	5	2	2
School 5	2	5	3	0

Table 5. The distribution of surface treatments among the potters grouped by a) location; b) ethnic group or *morafhe*; c) School or network of learning.

A)	ST1	ST2	ST3	ST4	ST5	ST6
Kanye	8	3	0	0	0	0
Letlhakeng	22	0	4	0	2	0
Kgwarape	88	0	0	12	1	0
Molepolole	18	0	10	0	0	0
Lotlhakane West	19	2	1	0	4	3
Moshupa	5	5	0	0	0	0
Lotlhakane East	15	14	0	0	0	0
B)						
Mokgalagadi	41	2	5	0	6	3
Mokgatla	93	5	0	12	1	0
Mokwena	18	0	10	0	0	0
Mongwaketse	23	17	0	0	0	0
C)						
School 1	88	0	0	12	1	0
School 2	8	3	0	0	0	0
School 3	40	0	14	0	2	0
School 4	39	21	1	0	4	3

CHAPTER 6: FIRING POTS

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Running head: Firing Pots in Contemporary South-Eastern Botswana

Archaeological time period: ethnoarchaeology/present.

Country and region discussed: south-eastern Botswana.

Abstract

For many years, archaeologists in Southern Africa have equated pottery 'style' with archaeological 'cultures' and modern ethnolinguistic groups. In order to investigate this association, we undertook an ethnoarchaeological study of 41 contemporary potters in south-eastern Botswana to observe what social groupings of potters correlate with their preferences for a particular style of making and decorating pots. This paper presents and analyses the firing stage of pottery manufacturing in contemporary south-eastern Botswana and looks for social boundaries in the preference for firing techniques. Unlike a study completed half a century ago, we find that firing technique preferences are village based

and reflect the common technique used by potters in that locality, regardless of their linguistic affiliation, ethnic group membership, gender, age, religious persuasion or the network in which they learnt their craft.

Key words: pottery; firing; ethnoarchaeology; social boundaries; Botswana.

Introduction

The relationship between language and material culture has concerned archaeologists in southern Africa for a long time. In the late 1920s, Gertrude Caton-Thompson (1931) used ceramic style to demonstrate that Great Zimbabwe represented a major culture of African origin. Around the same time, PW Laidler (1938, 1929) published the first comprehensive archaeological and ethnographic classification of southern African pottery and associated different ceramic wares with specific population groups. Huffman (1980) firmly entrenched the view that ceramic styles reflect linguistic identity. In south-eastern Botswana, ceramic studies followed a similar trend (Campbell et al. 1991; Caister 1982; Denbow 1981; Pahl 1974; McDonald 1940).

Our research is an attempt to reach a more nuanced understanding of how social boundaries are reflected in all the aspects of pottery production, from collecting the raw materials to firing the pots. We have studied 41 contemporary potters in south-eastern Botswana and in this paper analyse the social boundaries that are reflected in the potter's preference for technique of firing (Figure 1). Firing is the final stage in pottery manufacture, where heat fuses clay minerals and turns mud into ceramic (Maggetti et. al. 2011; Mayor 2010; Livingstone Smith 2001; Rice 1987); and firing techniques are some of the common

investigations in archaeometry (Kaare et al. 2012; Gosselain and Livingstone Smith 1997; Maniatis and Tite 1981; Tobert 1984). The aim of firing clay pots (Gosselain 1992, 1998, 2008; Livingstone Smith 1997, 2010) is to achieve a soaking time in the mid 700¬ºC range for a duration of around 20 min, regardless of the firing structure, fuel, or tools used. Eight different firing techniques have been documented in Africa (Gosselain 1992): (1) bonfire (open firing), (2) elevated bonfire, (3) bonfire with isolation, (4) depression, (5) pit, (6) pit with isolation, (7) oven, and (8) updraft kiln. About half a century ago, in south-eastern Botswana Lawton (1967: 130-159) noted different firing techniques used by potters from different ethnic groups (locally referred to as *merafhe*): the Bangwaketse and Bakwena used depression firing, the Bakgalagadi and Bakgatla used pit firing and the Balete used open bonfires. In this paper we aim to see if such clear ethnic boundaries are still visible.

The 41 potters in our study are affiliated to six different *merafhe*, or ethnic groups (or polities). The *merafhe* represented in our study can be divided in two linguistic groups: the Kgalagadi- and the Tswana-speakers. Both languages are part of the Sotho subgroup of south-eastern Bantu languages (Louw and Finlayson 1990; Van der Spuy 1990). According to oral traditions, the Bakwena *morafhe* (singular of *merafhe*) whose capital is Molepolole, arrived here in the 17th century. Before their arrival, the area was occupied by San hunter-gatherers and Kgalagadi-speaking herders and farmers. The Tswana-speaking Bakwena subjugated the Bakgalagadi (in the Tswana language, the prefix 'Ba' denotes the 'people of'). Another Tswana-speaking *morafhe* in our area, the Bangwaketse with their capital in Kanye, is an offshoot of the Bakwena. The Tswana-speaking Bakgatla and the Balete *merafhe* arrived in the 19th century (Matemba 2003; Schapera 1942). The Tswana-speaking Batswapong are from the Tswapong hills far outside our study area (Mpulubusi 1992; Parsons 1973; Sillery 1953; Schapera 1952); in our study they are represented by one potter who moved here some time ago.

The potters in this study come from different social classes and follow different religious traditions. The majority are full-time potters who manufacture pots from their homes to supply local and regional markets. The vessels are distributed within a radius of 100 km. Target consumer groups include individuals, museums, craft centres, government departments, traditional doctors and tourists. Local individuals are by far the most common customers who use pots for display and sometimes even for cooking. Botswana government policy is to buy local craft from artisans to decorate government offices so several departments are adorned with pots. *Dingaka* (traditional doctors) buy small undecorated vessel that are considered "pure" and use them for medicinal purposes. Pots are sometimes distributed to the tourist market through trade fairs, middle men and craft centres.

Field work commenced in January 2013 and ended in January 2015. Some potters fired individually to demonstrate firing techniques but there is a general preference to fire in groups. During fieldwork, attention was given to how potters collected fuel, firing kiln types, fuel types and how the fuel is piled in "kilns" or "open fires'', the number of vessels fired, duration of firing and lighting procedures. We also collected considerable background information on associated learning patterns, rituals and taboos.

In our study area, potters do not preheat pots. All pots are originally left to dry gradually in potters' shelters and then are taken to direct sunlight so that they do not crack during firing. Drying can take anything from a few days to a couple of weeks depending on the type of potting material, climatic conditions, personal conceptions, ways of scheduling manufacturing process and size of the pot. The general practice it to keep pots in the house for a week before exposing them to direct sunlight. Potters frequently burnish pots during drying in order to speed up the process, fuse clay particles together and avoid cracks during firing. Potters usually dry pots for a long time to remove excess water from the clay. Pots are considered ready for firing when they are leather hard.

Fuel combinations used in south-eastern Botswana are few and can be classified into three categories according to the nature of the material: (1) manure (cow dung), (2) light and (3) heavy fuel. Cow dung now is the preferred fuel for firing and other forms of manure including donkey and horse are not used. The potters attributed good firing success rate to the slow but constant heat from cow dung. Dominant material for light fuel includes grass, paper and stems. Heavy fuel is dominated by branches of trees, bark and wood. Tree fuel comes from many types of tree species (see Table 1). In general, there is limited potting during the summer rainy season because most potters engage in arable farming. But during the winter dry season when harvesting has been done, cows are moved back to the fields and cow dung is abundant.

The Data

We recorded four types of firing structures: (1) open bonfires, (2) elevated bonfires, (3) shallow depressions and (4) deep pits. Below we describe each.

Open Bonfires (firing technique 1 or FT1) is the simplest firing technique among our sample of potters. This technique involves placing pots on a metal sheet at ground level then adding successive pellets of cow dung mixed with light fuel such as saw dust, grass, twigs, leaves and branches. Vessels are placed on their sides and not vertically in preparation for firing. For fuel, cow dung was preferred by most potters in our study area. The metal sheet is optional; its purpose is to prevent ground moisture reaching the pots and causing cracks during firing.

Open bonfires produce temperatures of between 600 °C-940 °C (Gosselain 1992, 2010; 2008, Livingstone Smith 2001; Steele 2012; Fowler 2015). Despite the simplicity of technique 1, potters can control and monitor the firing conditions to produce well fired wares (Cheetham 1982; Martlew 1982). Once firing occurs, potters and helpers constantly poke the fire and add additional fuel to ensure uniform firing. Open fires are situated within the compound but as far as possible from the houses for safety and purity reasons. Late mornings to late afternoons are preferred times of firing. Firing duration in open bonfires is usually about an hour. Thereafter firing is interrupted as vessels are taken out when red hot to cool off. The open bonfire is only used by one potter in our sample (Table 3, (Figure 2).

Elevated bonfires (FT 2) is a variation of FT1 (Figure 3). The potter identifies an old firing spot in the back yard and clears it. The artisan then builds a shelter with sheets of metal, corrugated tin and such. The size depends on the number of pots to be fired. If few, an old metal bucket can be used as the shelter. Within the shelter, a bed of fuel is placed and on top of this pots are placed. Additional fuel is then heaped on top of the pots. Few potters in our study use firing technique 2.

Depression firing (FT3, *leswaswa*) describes the situation when pots are placed in shallow excavations 40-50 cm deep (Figure 4). The majority of the potters in our area practice firing technique 3 (Table 3). A metal sheet may be placed at the base and on sides of the depression to ensure fuel efficiency. Vessels, when placed on a bed of fuel in the depression still stand higher than ground level. Firing in a depression takes about an hour. Some artisans mentioned that depression firing is their traditional method, and that this method ensured constant heat and minimum breakage.

Pit firing (FT4) differs from depression firing insofar as the pit is deeper and the vessels do not stand above ground surface (Figure 5). The pit is usually between 1-2 metres deep, and a step ladder may be used to assist potters in and out of the pit. Pit firing usually involves collective firing because most pits can accommodate many vessels at a time. Cow dung is used as the main fuel. Large pots may be filled with fuel inside; thereafter they are covered with a layer of light fuel including dry grass and twigs. Potters using technique 4 usually prefer late afternoon to evenings for firing because firing in pits takes over an hour and pots are usually left overnight to burn and cool off before being taken out next day. Pits are usually located at the corner of the backyard, and are used repeatedly over a long time. Only seven potters used FT 4 in our area (Table 3). Where there are a few small pots to be fired and fuel has to be saved, vessels may be put inside a metal container and placed at the base of the pit. FT4 then becomes a variety of FT 2.

The Distribution of Firing Techniques in south-eastern Botswana

Our research question is whether differences in the technique of firing ceramic vessels reflect the different language groups to which the potters belong. Alternatively, or additionally, do they reflect other social groupings of potters? To answer this, we look at the distribution of firing techniques against potters grouped by language, gender, belief system, age, *merafhe* membership or ethnic group, learning network and the potters' geographic location. Somewhat complicating our task are four potters (38, 39, 40 and 41), who are recorded as utilizing both FT2 and FT3. Closer investigation has revealed that these four potters shifted for convenience from FT3 to FT2 within the last five years. FT3, which involves digging a shallow pit, requires more labour. Potter 38 suffers from arthritis and thinks that she is too old now to dig a pit. At 59, she is the youngest of the four potters who have switched from FT3 to FT2. Under ideal circumstances, the potters prefer FT3 because they think top soil contains too much moisture and can cause pots to crack during

firing, hence the desirability of removing the topsoil by digging a depression. To accommodate these four potters in our analysis, we create two tables for each grouping of potters, A and B. Table A counts the current firing practices of the potters and Table B counts their ideal technique. We statistically test to see whether the preferences for firing techniques may differ significantly across the different groupings of potters, and we use correspondence analysis to show more clearly how well the distribution of firing techniques matches this or the other social grouping.

Language group: the potters in our study are from two different language groups, Kgalagadi and Tswana. These are different but related languages (Schapera 1952; Tlou and Campbell 2000). Table 3 shows the distribution of the firing techniques by the two language groups. The Mann Whitney U tests show that there is no significant difference between the firing techniques used by the Kgalagadi and the Tswana-speakers (p-value of 0.3005 in both A and B).

Gender: most of the potters in our sample are females but there are a few male potters as well. Table 4 shows their preferences for firing techniques. Mann-Whitney U tests show that the differences are statistically not significant at the conventional 0.05 level (p-values of 0.07959 and 0.1059 for A and B).

Belief system: Traditionally, superstitions influenced decisions about firing pots but some modern potters who follow other religions hardly pay any attention to them (Wilmsen et. al 2016; Thebe et al. 2010; Wilmsen et. al 2009; Thebe 1996; Lawton 1967). The idea behind social prohibitions is to protect the firing process by ensuring that people with bad intentions do not jeopardize the practice (Gosselain 2010, 2008; Livingstone Smith 2001). Some potters in south-eastern Botswana today insist that pregnant women, widows,

menstruating women or people who have recently aborted, lost a child or had sexual contact in the previous day are not allowed to participate in firing pots. No talking, eating or drinking of water is allowed during firing. All potters who follow social prohibitions maintain that pots must be handled with clean hands before firing otherwise they will crack. Some Christian potters pray before firing pots (Figure 6). Table 5 shows the preferences for firing techniques among two groups of potters; those who observe rituals and taboos and those who do not. Mann-Whitney U tests show that the differences are not statistically significant (p-value of 0.8845 and 1 for A and B).

Age cohort: the potters in our study range, at the time of writing this paper, range from 21 to 81 years of age, with a median age of 59. The distribution of firing technique preferences amongst the younger (under 59) and older (59 and more years) is shown in Table 6. Mann Whitney tests show that the differences are not significant (p-values of 0.8845 and 0.6631 for A and B). A finer distinction into three age cohorts (Table 7) reveals an interesting pattern. A correspondence analysis (Figure 7 B) shows a clear separation in the ideal preference for firing techniques by age of potters. It shows that the oldest cohort is more closely associated with FT4, the youngest cohort with FT2, and the middle cohort with FT3. Since only one potter uses FT1, she has been left out of the correspondence analysis, but her date of birth (1958) would put her in the middle cohort. Of the four potters who use both FT2 and FT3, two are in the oldest cohort and two in the middle. When we look at the correspondence analysis of Table 7 A, wherein these four potters are counted as using FT2, the separations by age cohorts are less clear but is still recognizable (Figure 7 A). One could argue that the younger potters are more pragmatic and opt for less labour intensive firing methods, while older potters follow tradition.

School of learning: There are five local schools or networks of learning pottery in our study area (Table 8). One potter who originally comes from Tswapong outside our area was

taught elsewhere (School 0 in Table 8). These networks of learning were described and illustrated in Thebe and Sadr (2017: figures 10 and 11) and so we will only point out pertinent relationships in this section. A correspondence analysis of the firing technique preferences by learning networks shows clear separations (Figure 8). To avoid small sample issues we have omitted the single potter from School 0 in this analysis. Figure 8 B shows in the upper left sector of the graph the correspondence between FT4 and School 1, and in the lower right FT2 pulls School 3 potters away from the rest. These are all clustered in the top right corner of the graph in proximity to FT3. In plain English, potters who learnt their craft in School 1 prefer to use firing technique 4; those from School 3 prefer technique 2; and those from Schools 2, 4 and 5 generally use technique 3. Recall that Figure 8 B refers to the ideal and not the actual firing technique practiced by the four elderly potters discussed earlier. In Figure 8 A these potters are counted as practicing their actual firing technique and the correspondence analysis produces less clear separations. Nevertheless, the fact that different schools have corresponding firing techniques remains evident even in this graph.

Ethnic group or *merafhe* affiliation: The potters in our study area belong to six different ethnic groups (or *merafhe*). Table 9 shows the distribution of their preferred firing techniques. A correspondence analysis shows the clear separation in the preference for firing techniques among different *merafhe* (Figure 9). In order to avoid small sample problems, the single potter from the Batswapong *merafhe* was omitted from the correspondence analysis. In Figure 9 B, the Bakgalagadi, Bangwaketse and Balete potters cluster around FT3 in the top left sector of the graph; in the right hand side of the graph are the Bakwena and FT2; while in the lower left of the graph are the Bakgatla and FT4. The pattern of separation is less clear in Figure 9 A, which counts the current rather than the ideal firing technique used by the four elderly potters. Nevertheless the separation is still evident and the correspondence between specific firing techniques and the different *merafhe* remains clear. We can conclude that *merafhe* membership, or ethnic group

affiliation, is as strong a determinant of which firing technique the potters use, as was the learning network to which they belonged. But there is an even stronger grouping as we shall see below.

Geographic location: the potters can be linked to ten locations--villages, towns and cities--in our study area (Table 10). Using table A, which counts the four dual-technique potters using their current technique, we see a very clear spatial separation between potters and techniques (Figure 10 A), but one that is geographically not very coherent: FT2 is scattered throughout the study area. If we look at the distribution with the dual-technique potters counted with their ideal technique (Table 10 B), the spatial pattern becomes more coherent (Figure 10 B): FT3 can be seen as the dominant technique covering most of the study area; FT2 is confined to Molepolole and FT4 to Kgwarape. FT1 is used by the sole potter in Gaborone who is originally from Tswapong. The clarity of the patterns in both versions A and B suggest that the most relevant determinant for a potter's firing technique is their location. Furthermore, the difference between patterns A and B indicates that although pragmatism may have induced potter 38 in Gaborone to switch to a less labour intensive firing technique, the fact that all three potters (39, 40 and 41) in Lotlhakane West have switched together suggests that the way in which one's neighbouring potters fire their pots has a strong influence on determining one's own firing technique. Community of practice is a term that has wide connotations but is in a way not inappropriate to describe what we seem to be seeing in terms of firing practices in south-eastern Botswana. Figure 11 reveals the perfect correspondence between the potters' location and their firing techniques, in both version A and B. Compared to the previous correspondence analysis graphs, these ones clearly show the highest correspondence between variables, leading us to think that potters' location trumps all other variables in determining the potter's chosen firing technique.

Conclusion

This study of firing techniques among 41 potters in south-eastern Botswana has shown clear and distinct patterns: boundaries in firing style are sharpest between geographic locations. *Morafhe* affiliation and learning network membership show much less clear boundaries. Firing techniques seem to be adopted from the immediate group of potters among whom one works. This is confirmed by the curious pattern in the transmission of FT2 in so far as among the potters who learned this technique, only a few practise it. Once their apprenticeship is over, they use the firing technique that is common in their own villages. When preference for firing techniques changes, all potters in that locality seem to switch together (e.g., Kanye). Presumably, this has to do with the fact that our potters prefer to fire communally rather than in isolation. When firing in a group, it makes sense to follow the same technique as the established potters in the group use. 'Community of practice' may be an appropriate concept to employ here. Communities of practice do things the same way (Wenger 1998; Arnold 1984). Most potters from the same geographic location share firing techniques because they collectively plan firing, collectively gather fuel resources, fire in a group and fire in a common location. In most regions of Africa, artisans habitually associate with relatives, friends, or neighbours for firing their wares. These associations have several advantages: they allow artisans to invest less effort in gathering fuel, they permit sharing in firing surveillance, they also allow artisans to meet a restrictive firing calendar, for example, consideration of weekly markets (Gosselain 2008, Livingstone Smith 2001; Cheetham 1982).

This ethnoarchaeological study of south-eastern Botswana does not confirm ceramic investigations from other parts of Africa where boundaries between techniques of pottery firing is weak compared to other stages of the operation sequence because of its collective and public nature. Firing techniques in south-eastern Botswana coincide with geography to

suit local practices and technical adjustments. Although firing in our study area is also undertaken in groups, these gatherings are smaller here than in other parts of Africa and comprise only of two or three individuals from the same village or town. It is easier to adhere to social norms in a small group than in a large gathering. This might help us to understand why firing techniques mark geographic locations so well in our study area.

Another issue that is under investigation in this paper is that if Lawton was right that half a century ago firing technique preferences were *morafhe* based, what might account for the change to the pattern we see today? Clearly, Lawton did not study an adequate sample and her interpretation of the data may not be accurate. Lawton was only able to identify open bonfire and pit firing in our study area and does not discuss elevated and depression firing. Elevated bonfires are usually made of metal sheets and containers that perhaps were not readily available half a century ago. Small pots are now fired in elevated bonfires (containers) to meet the demands of the tourism industry. Half a century age more medium to large pots were produced for functional and domestic use. Pits may be abandoned in favor of depression firing due to the practical and logistical reasons. These trajectories show that potters are flexible in choosing firing techniques and their choices can be dictated by a number of variables.

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Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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Captions

Figure 1. The location of potters in south-eastern Botswana

Figure 2. Open Bonfire, firing technique 1.

Figure 3. Elevated bonfire, firing technique 2.

Figure 4. Depression firing, firing technique 3.

Figure 5. Pit firing, technique 4.

Figure 6. Potter ID 6 praying before firing pots

Figure 7 A) correspondence analysis plot of actual firing technique against age cohort. B) Correspondence analysis plot of ideal firing technique against age cohort.

Figure 8 A) correspondence analysis plot of actual firing technique against pottery learning schools or networks. B) Correspondence analysis plot of ideal firing technique against pottery learning schools or networks.

Figure 9 A) correspondence analysis plot of actual firing technique against *morafhe* membership. B) Correspondence analysis plot of ideal firing technique against *morafhe* membership.

Figure 10 A) map showing distribution of actual firing technique by potter's location. B) map showing distribution of ideal firing technique by potter's location.

Figure 11 A) correspondence analysis plot of actual firing technique against potter's location. B) Correspondence analysis plot of ideal firing technique against potter's location.

Table 1: Examples of heavy fuel used for firing pots in south-eastern Botswana

Table 2: Database of the potters interviewed in south-eastern Botswana.

Table 3 A) The distribution of the actual firing techniques among the two language groups in the study area. B) The distribution of the ideal firing techniques among the two language groups in the study area.

Table 4 A) The preferences for actual firing techniques by potter's gender. B) The preferences for ideal firing techniques by potter's gender.

Table 5 A) The preferences for actual firing techniques among two groups of potters; those who observe rituals and taboos and those who do not. B) The preferences for ideal firing techniques among the same two groups of potters.

Table 6 A) The distribution of actual firing technique preferences amongst the younger (under 59) and older (59 and more years) potters. B) The distribution of ideal firing technique preferences amongst the two age cohorts.

Table 7 A) The distribution of actual firing technique preferences amongst three age cohorts. B) The distribution of ideal firing technique preferences amongst the three age cohorts.

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Table 9 A) The preference for actual firing techniques among the different merafhe. B) The preference for ideal firing techniques among the different merafhe.

Table 10 A) The preference for actual firing techniques in the different geographic locations. B) The preference for ideal firing techniques in the different geographic locations.

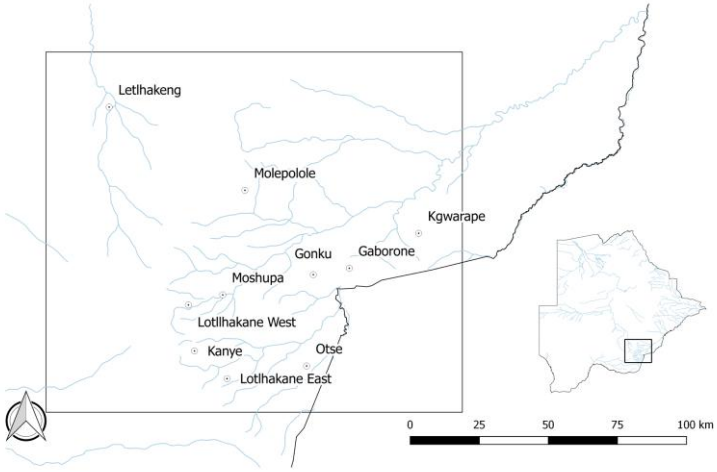


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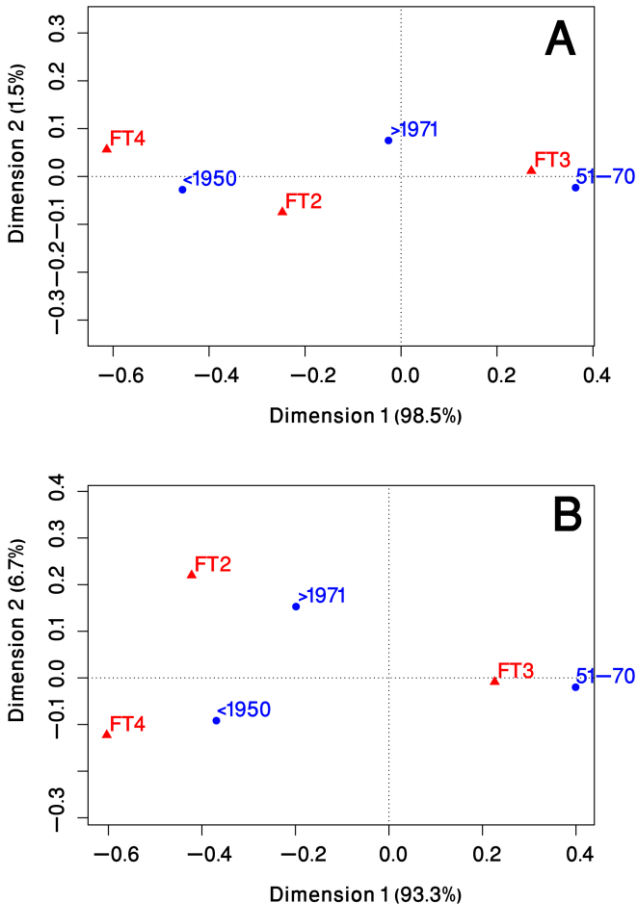


Figure 7. A) correspondence analysis plot of actual firing technique against age cohort. B) Correspondence analysis plot of ideal firing technique against age cohort.

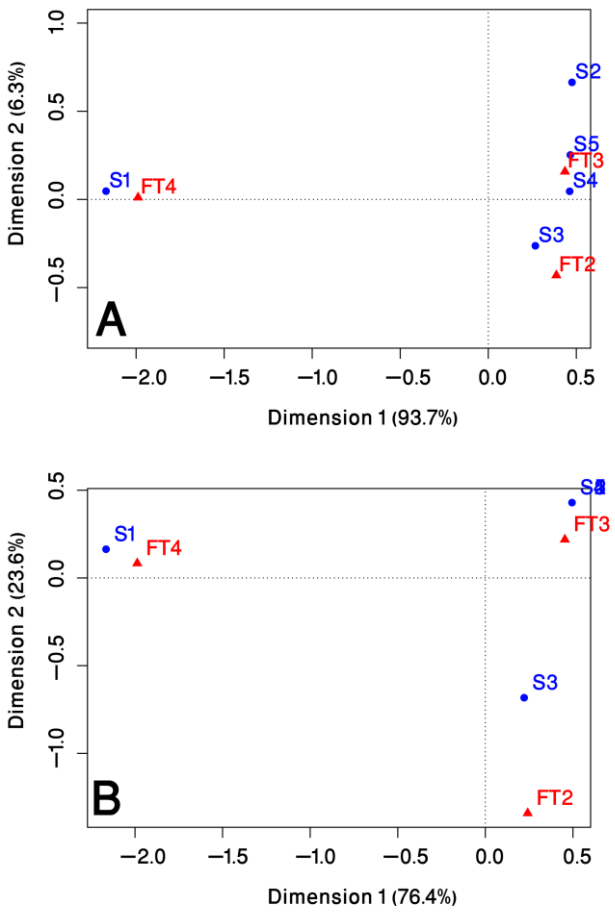


Figure 8. A) correspondence analysis plot of actual firing technique against pottery learning schools or networks. B) Correspondence analysis plot of ideal firing technique against pottery learning schools or networks.

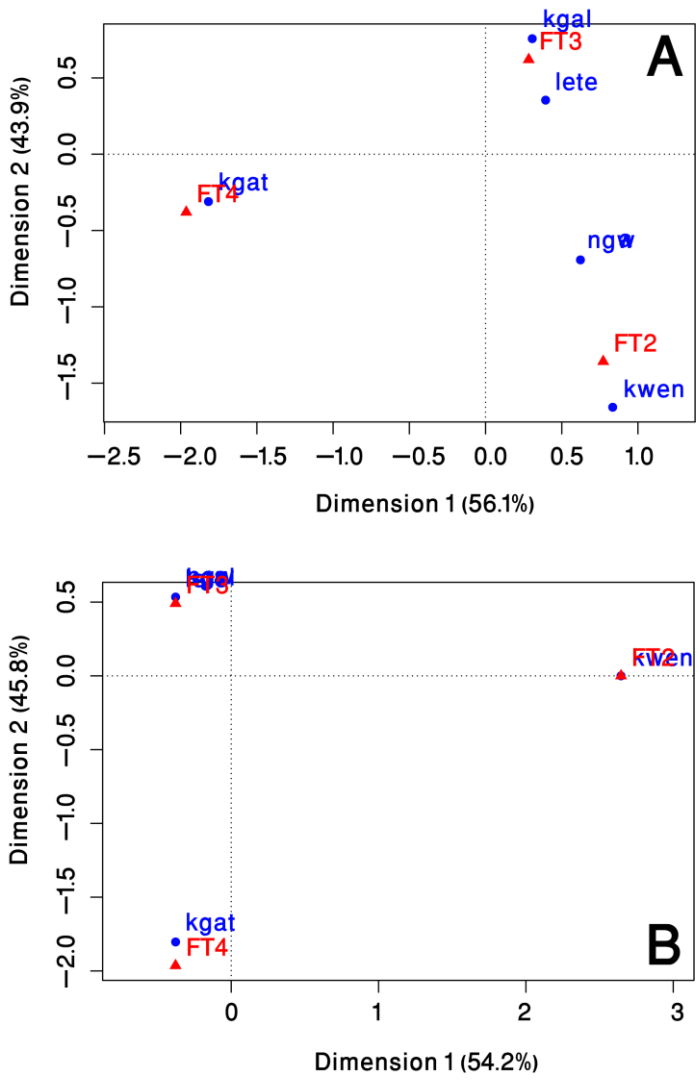


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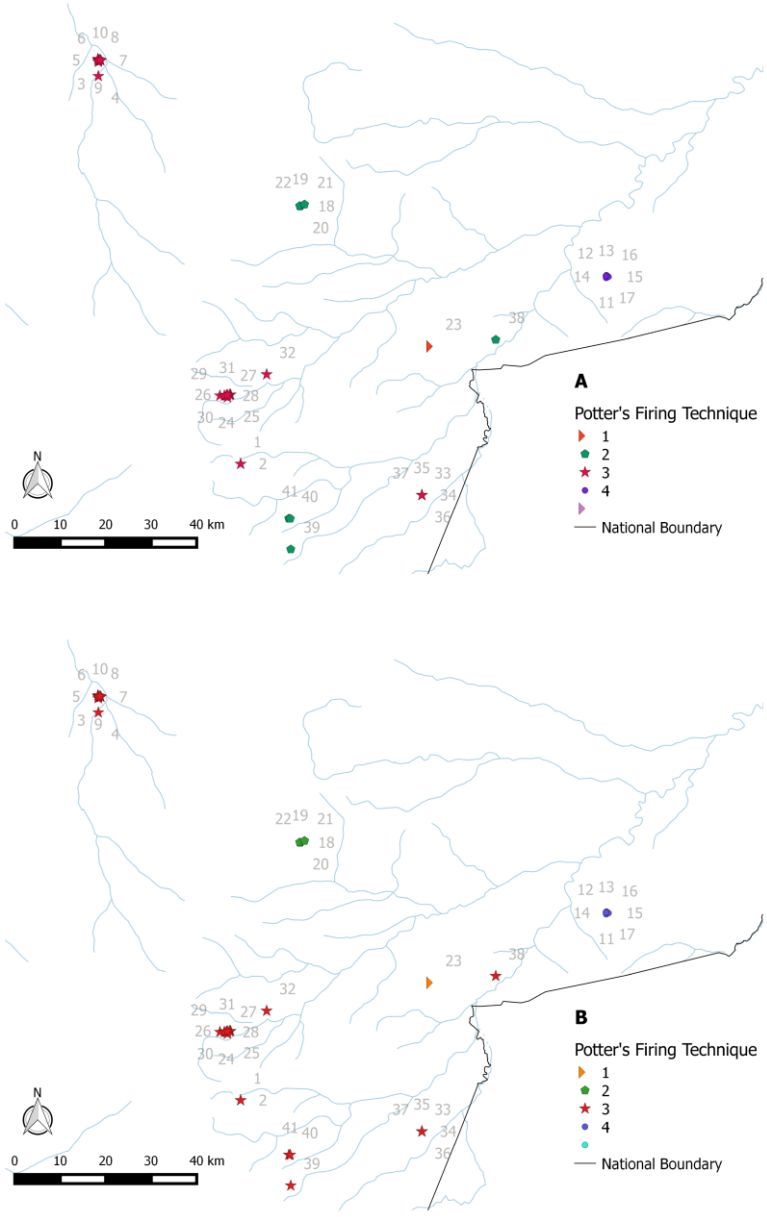


Figure 10. A) map showing distribution of actual firing technique by potter's location. B) map showing distribution of ideal firing technique by potter's location.

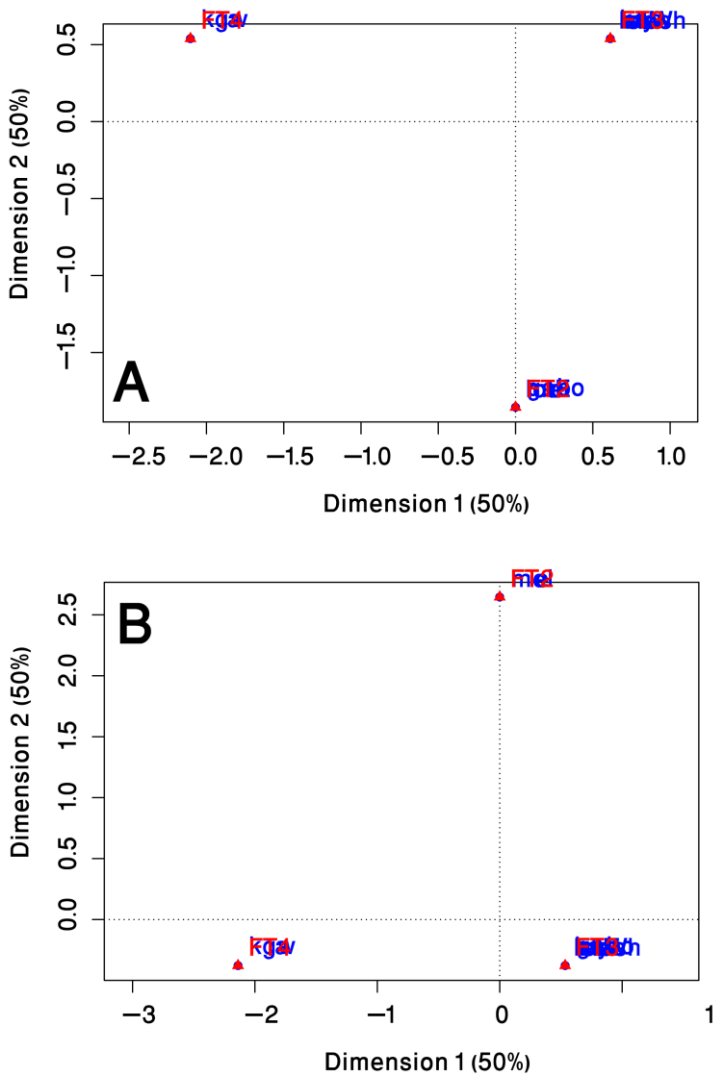


Figure 11. A) correspondence analysis plot of actual firing technique against potter's location. B) Correspondence analysis plot of ideal firing technique against potter's location.

Table 1: Examples of heavy fuel used for firing pots in south-eastern Botswana

Setswana	Scientific	English
1. Mosetlha	*Peltophorum africanum*	African wattle
2. Motlhakolwane	*Euclea undulata* small-	leaved guarri
3. Mosu	*Acacia tortilis*	umbrella thorn
4. Mogonono	*Terminalia sericea*	silver cluster-leaf
6. Monato	*Burkea africana*wild	syringa

Table 2: Database of the potters interviewed in south-eastern Botswana.

Potter ID	Village	Morafhe	School	Language	YOB	Gender	Firtech a	Firtech b	Rituals	Age
1	Kanye Village	Mongwaketse	2	Tswana	1957	F	3	3	1	60
2	Kanye Village	Mongwaketse	2	Tswana	1956	F	3	3	1	61
3	Letlhakeng	Mokgalagadi	3	Kgalagadi	1950	M	3	3	0	67
4	Letlhakeng	Mokgalagadi	3	Kgalagadi	1973	F	3	3	0	44
5	Letlhakeng	Mokgalagadi	3	Kgalagadi	1972	F	3	3	0	45
6	Letlhakeng	Mokgalagadi	3	Kgalagadi	1969	F	3	3	0	48
7	Letlhakeng	Mokgalagadi	3	Kgalagadi	1966	F	3	3	0	51
8	Letlhakeng	Mokgalagadi	3	Kgalagadi	1963	F	3	3	0	54
9	Letlhakeng	Mokgalagadi	3	Kgalagadi	1941	F	3	3	0	76
10	Letlhakeng	Mokgalagadi	3	Kgalagadi	1975	F	3	3	0	42
11	Kgwarape	Mokgatla	3	Tswana	1986	F	4	4	1	31
12	Kgwarape	Mokgatla	1	Tswana	1958	F	4	4	1	59
13	Kgwarape	Mokgatla	1	Tswana	1947	F	4	4	1	70
14	Kgwarape	Mokgatla	1	Tswana	1949	F	4	4	1	68
15	Kgwarape	Mokgatla	1	Tswana	1937	F	4	4	1	80
16	Kgwarape	Mokgatla	1	Tswana	1948	F	4	4	1	69
17	Kgwarape	Mokgatla	1	Tswana	1976	F	4	4	1	41
18	Molepolole	Mokwena	3	Tswana	1985	F	2	2	0	32
19	Molepolole	Mokwena	3	Tswana	1951	F	2	2	0	66
20	Molepolole	Mokwena	3	Tswana	1947	F	2	2	0	70
21	Molepolole	Mokwena	3	Tswana	1944	F	2	2	0	73
22	Molepolole	Mokwena	3	Tswana	1976	M	2	2	0	41
23	Gonku	Motswapong	0	Tswana	1962	F	1	1	1	55
24	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1967	F	3	3	0	50
25	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1953	F	3	3	0	64
26	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1958	F	3	3	0	59
27	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1952	F	3	3	0	65
28	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1937	F	3	3	0	80
29	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1936	F	3	3	0	81
30	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1970	F	3	3	0	47
31	Lotlhakane West	Mokgalagadi	4	Kgalagadi	1938	F	3	3	0	79
32	Moshupa	Mokgatla	4	Kgalagadi	1966	F	3	3	0	51
33	Otse Village	Molete	5	Tswana	1955	M	3	3	0	62
34	Otse Village	Molete	5	Tswana	1993	F	3	3	0	24
35	Otse Village	Molete	5	Tswana	1991	M	3	3	0	26
36	Otse Village	Molete	5	Tswana	1959	F	3	3	0	58
37	Otse Village	Molete	5	Tswana	1996	M	3	3	0	21
38	Gaborone	Molete	5	Tswana	1958	F	2	3	0	59
39	Lotlhakane East	Mongwaketse	4	Tswana	1951	F	2	3	1	66
40	Lotlhakane East	Mongwaketse	4	Tswana	1949	F	2	3	1	68
41	Lotlhakane East	Mongwaketse	4	Tswana	1943	F	2	3	1	74

Table 3: A) The distribution of the actual firing techniques among the two language groups in the study area. B) The distribution of the ideal firing techniques among the two language groups in the study area.

A	FT1	FT2	FT3	FT4
Kgalagadi	0	0	16	0
Tswana	1	9	8	7
B	FT1	FT2	FT3	FT4
Kgalagadi	0	0	16	0
Tswana	1	5	12	7

Table 4: A) The preferences for actual firing techniques by potter's gender. B) The preferences for ideal firing techniques by potter's gender.

A	FT1	FT2	FT3	FT4
Female	1	8	20	7
Male	0	1	4	0
B	FT1	FT2	FT3	FT4
Female	1	4	24	7
Male	0	1	4	0

Table 5: A) The preferences for actual firing techniques among two groups of potters; those who observe rituals and taboos and those who do not. B) The preferences for ideal firing techniques among the same two groups of potters.

A	FT1	FT2	FT3	FT4
Ritual Yes	1	3	2	7
Ritual No	0	6	22	0
B	FT1	FT2	FT3	FT4
Ritual Yes	1	0	5	7
Ritual No	0	5	23	0

Table 6: A) The distribution of actual firing technique preferences amongst the younger (under 59) and older (59 and more years) potters. B) The distribution of ideal firing technique preferences amongst the two age cohorts.

A	FT1	FT2	FT3	FT4
59 years or older	0	7	11	5
58 years or younger	1	2	13	2
B	FT1	FT2	FT3	FT4
59 years or older	0	3	15	5
58 years or younger	1	2	13	2

Table 7: A) The distribution of actual firing technique preferences amongst three age cohorts. B) The distribution of ideal firing technique preferences amongst the three age cohorts.

A	FT1	FT2	FT3	FT4
Born 1950 or earlier	0	4	5	4
Born between 1951 and 1970	1	3	13	1
Born since 1971	0	2	6	2
B	FT1	FT2	FT3	FT4
Born 1950 or earlier	0	2	7	4
Born between 1951 and 1970	1	1	15	1
Born since 1971	0	2	6	2

Table 8: A) The preferences for actual firing techniques among the different pottery learning schools or networks. B) The preferences for ideal firing techniques among the different pottery learning schools or networks.

A	FT1	FT2	FT3	FT4
School 0	1	0	0	0
School 1	0	0	0	6
School 2	0	0	2	0
School 3	0	5	8	1
School 4	0	3	9	0
School 5	0	1	5	0
B	FT1	FT2	FT3	FT4
School 0	1	0	0	0
School 1	0	0	0	6
School 2	0	0	2	0
School 3	0	5	8	1
School 4	0	0	12	0
School 5	0	0	6	0

Table 9: A) The preference for actual firing techniques among the different merafhe. B) The preference for ideal firing techniques among the different merafhe.

A	FT1	FT2	FT3	FT4
Bakgalagadi	0	0	16	0
Batswapong	1	0	0	0
Bakwena	0	5	0	0
Balete	0	1	5	0
Bangwaketse	0	3	2	0
Bakgatla	0	0	1	7
B	FT1	FT2	FT3	FT4
kgalagadi	0	0	16	0
tswana	1	0	0	0
kwena	0	5	0	0
lete	0	0	6	0
ngwaketse	0	0	5	0
kgatla	0	0	1	7

Table 10: A) The preference for actual firing techniques in the different geographic locations. B) The preference for ideal firing techniques in the different geographic locations.

A	FT1	FT2	FT3	FT4
Gaborone	0	1	0	0
Gonku	1	0	0	0
Kanye	0	0	2	0
Kgwarape	0	0	0	7
Letlhakeng	0	0	8	0
Lotlhakane East	0	3	0	0
Lotllhakane West	0	0	8	0
Molepolole	0	5	0	0
Moshupa	0	0	1	0
Otse	0	0	5	0
B	FT1	FT2	FT3	FT4
Gaborone	0	0	1	0
Gonku	1	0	0	0
Kanye	0	0	2	0
Kgwarape	0	0	0	7
Letlhakeng	0	0	8	0
Lotlhakane East	0	0	3	0
Lotllhakane West	0	0	8	0
Molepolole	0	5	0	0
Moshupa	0	0	1	0
Otse	0	0	5	0

CHAPTER 7: DISCUSSION AND CONCLUSION

Here I will discuss and bring together the separate strands of the various papers and chapters, and I make an overall assessment of what they together can say in answer to various research aims and objectives presented in Chapter 1. I indicate the tools that explain the spatial patterning of pottery manufacturing process (*chaîne opératoire*) focusing on geographic location, linguistic and ethnic affiliation, membership of learning networks and what this informs us about pottery and stylistic markers. I conclude by making observations on the contribution of this thesis to our current understanding of pottery style and technology boundaries in south-eastern Botswana and on the light that this study sheds on archaeology.

The biographic, socio-economic, geographic, learning networks and historical context of data collected during field work in south-eastern Botswana highlights useful perspectives for understanding pottery making boundaries in the landscape. Information presented and analysed in this thesis indicates that sourcing strategies are principally influenced by potter's location to clay sources. Learning networks and *merafhe* do not correlate with boundaries between sources. For example, all Bakgalagadi do not get their clay from the same space. The Bakgalagadi of Letlhakane West were taught how to make pots by potter id 40, a Mongwaketse from Lotlhakane East but they use different clay sources from their teacher. Also the potter id 32 from Moshupa, a Mokgatla artisan, uses a different clay source from her teacher, potter id 40. This information has an impact on archaeological interpretations because it is important to know whether the choice of potter's raw material can reflect cultural identity. Jacobson (2005) PIXE analyses show that provenancing pottery plays a significant role to archaeological interpretation. He concludes that the composition of the clay from ancient potsherds can be attributed to the cultural identity of the potters provided the geology of the study area is varied. In my study area, elemental

composition of sherds did not provide useful information about the potter's cultural identity because the geology is generally uniform. We have seen that potters work in groups to source raw materials for pottery making and artisans in the same geographic location or close to each other share clay sources. This position has already been highlighted by several studies (e.g. Arnold 1989; Jacobson 2005; Fowler 2008; Gosselain 2008; Livingstone Smith 2006). It fits with Hodder's (1982) ground breaking work that demonstrates that boundaries in material culture are only noticeable if there is competition for resources.

As we saw in chapter 4, contemporary potters in south-eastern Botswana are strongly influenced by their instructor's manufacturing techniques, regardless of whether the apprentice shares geographic location and ethnolinguistic affiliation with teacher or not. These results echo those from similar studies conducted in other parts of Africa (e.g. Gosselain 1992; Dietler & Herbich 1998; Stark 1999). The technological style of forming and shaping techniques can thus be designated as isochrestic (Sackett 1982) and identifies a school of learning; a community of practice, in a sense. This study resonates with similar statements by Gosselain (2001, 2008, 2010) that roughing-out techniques are a key part of the technical tradition.

The past sheds some light on the particular configuration of these learning networks. Potter id 15 from Kgwarape is originally from Zimbabwe where she learnt the craft of pottery making. She got married to a Mokgatla man and relocated to stay with her in-laws in line with patriarchal rules. It is here that she 're-learnt' the skill. Kgwarape potters have established their own independent learning networks that have not attracted learners from outside. It has been shown that Kgwarape potters form and shape pots in a different way from other artisans in south-eastern Botswana. The skill has not been exported anywhere else outside Kgwarape. This is an interesting major technological boundary that deserves attention in future. The Zimbabwean connection to Kwarape probably contributes to the

uniqueness of the pottery style and technology. Furthermore, Otse potters also have unique forming, shaping and decoration techniques because the master potter id 33 was trained in a formal school in Francistown about 400km north of the village. Clearly *morafhe* and geography do not explain forming and shaping boundaries as well as learning networks do. The Molete potter in Gaborone (potter id 38) uses a different forming and shaping technique from the Balete artisans at Otse. On the other hand, potter id 32 from Moshupa practices a different forming and shaping technique from other Bakgatla outside her area at Kgwarape. This data has implications for archaeology because boundaries in forming and shaping methods may mark learning networks as opposed to the conversional notion that ceramic style is associated with ethnolinguistic affiliation. Lawton (1967) provides useful case studies on forming and shaping in south-eastern Botswana that are relevant to this study. She observes that the forming and shaping method used by potters depends on the technique they were taught by their teachers with some modification from a personal approach (Lawton 1967:9). The study describes pot shapes that are uniform except for the Kgwarape potters. However, Lawton's study does not describe the pottery forming and shaping process in detail and is based on a small sample.

As chapter 5 has shown, pottery decoration in south-eastern Botswana does not mark ethnic groups. This contradicts previous work on this subject. This thesis has demonstrated that teacher-learning overrides geographic location and ethnic affiliation in decoration attributes. The primacy of learning schools is demonstrated by the choice of decorative attributes amongst the Bakgalagadi language group who do not all share or have a common ceramic decorative style. We see the decorative style of their pots identifying them as members of one of the two schools of learning, here potters follow styles of their master potters.

Another most important difference is in choice of decorative attributes at Kgwarape that makes artisans different from the rest of the potters. It is striking that potter id 15 from Kgwarape whose network has already been discussed adds exotic attributes to the local repertoire of decoration motif and technique. She decorates pots according to her teacher however she has introduced leaf motif in Kgwarape that she learnt from her mother in Zimbabwe. This has created a distinctive 'Kgwarape' style, but it is not so much their location as the cultural background of the teacher that explains this distinctiveness. A further example that illustrates the strength of learning network is from potter id 32 from Moshupa who is also from the Bakgatla *morafhe*. However, she does not follow the decorative practices of the Kgwarape potters; but instead uses decoration style of her teacher from School 4.

A further pattern illustrating the key role of learning networks is provided by potters of School 5. Otse potters produce a striking style that is easily recognizable at a glance. Potter id 33, is from the Balete *morafhe* and the master potter of School 5. After learning how to make pots in a formal school, he trained members of his family who are part of his workshop how to make pots. So this innovative skill is still confined at family level but has potential to be spread to the rest of village and beyond. All potters in School 5 make pots according to their teacher. Potter 38 in Gaborone is also from the Balete *morafhe*, but she is from a different learning network and makes a different style of pots. This ethnoarchaeological study has shown that decoration styles of modern potters in south-eastern Botswana do not mark ethnolinguistic groups.

The modern condition of potters in south-eastern Botswana is definitely different from that of pre-colonial potters in southern Africa. The study has provided useful hypothesis to explain decoration styles in the archaeological record particularly that it is not always the 'Truth' that we can 'equate' pottery decoration with linguistic and ethnic groups. Surely, a

case by case study will allow us to consider alternative hypotheses that in some situations the ancient ceramic styles may represent learning networks, or communities of practice, or ethnic groups within a single language group.

In chapter 6, we find some clear and distinct geographical boundaries in firing techniques. In contrast to a study completed half a century ago, we find that firing technique preferences are village based and represent the common technique used by potters in that locality, regardless of their linguistic affiliation, ethnic group membership, gender, age, religious persuasion or the network in which they learnt their craft. The boundaries in firing techniques in our study area are clearly between locations and distinguish different communities of practice, which cut across ethnolinguistic boundaries and training school affiliations. In this chapter, it was seen that firing is conducted in groups and the techniques seem to be adopted from the immediate group of potters among whom one works. Group firing has several advantages: it allows potters to efficiently organize fuel, labour resources and plan for markets. Between potters who learn potting techniques from their teacher, only a few practice it. Kgwarape potters stand out with their unique pit firing technique that is not practiced anywhere in the study area because of historical ties of the master potter to Zimbabwe. The artisans from Kgwarape work in 'isolation' with limited interaction from other potters in the study area. An ethnoarchaeological study of modern firing techniques in south-eastern Botswana has provided another 'caution' that we should not to always equate 'ceramic styles' with 'archaeological cultures'. Some firing technique preferences in the archaeological record may have been village based and represented the common technique used by potters in that locality, regardless of their linguistic affiliation and ethnic group membership.

Ethnoarchaeological investigations of south-eastern Botswana do not confirm ceramic investigations from other parts of Africa where pottery firing stylistic boundaries is weakest

compared to other stages of the operation sequence. Strong firing patterns in my study area demonstrate the need to study each area in depth in order to identify particular social and technological boundaries that firing pots may reflect.

The stylistic and technological uniqueness of the Bakgatla potters tells us that modern pottery making in Botswana is a network of relationships that survive for a long time and are re-invented. The re-creation of pottery style and technology is a result of potter mobility, for example, marriage can now take place in both inter and intra ethnolinguistic groups. Long distance learning networks are now easy due to improvement in transport infrastructural development and most potters interact regularly through district, regional and national trade fairs. These proxies remain to be seen in stylistic and technological aspects of the *chaîne opératoire* of living pottery traditions.

In contemporary south-eastern Botswana, pottery style does not help to distinguish the pots made by potters from different language groups. The study suggests that southern African archaeologists should treat the link between ceramic style and language group not as 'Truth,' but as a hypothesis to be tested case by case with independent archaeological evidence. This research suggests that a case by case ethnoarchaeological study of pottery making stages may be used to explain stylistic and technological boundaries found in the archaeological record. This study of modern potters from south-eastern Botswana challenges the commonly held notion in southern Africa that ancient ceramic decorations always mark ethnolinguistic groups.

Data obtained amongst 41 potters in south-eastern Botswana demonstrates that complex patterns of *chaîne opératoire* are key to understanding stylistic and technological boundaries. This research has helped to improve the archaeological interpretation of

ceramics in the Iron Age of southern Africa, by exploring further the relationship between ceramic style, technology and social boundaries using the following parameters: a) geographic location b) linguistic and ethnic affiliation and c) membership of learning networks. The results of this study imply that material culture is not always associated with cultural linguistic groups; it may mark other social boundaries.

Future work needs to consider pottery morphology. A comparison of social and technological results of potters in south-eastern Botswana with artisans from other regions in Botswana ("outliers") should be explored at macro scale. I hope that further research will explore the correlation between the Ntsweng historical site of Bakwena occupied between 1864-1937 and modern pots in Molepolole who are their descendants. Finally, to what extent can we use present ethnoarchaeological observations of potters to represent the past? In other words, how far back can we go into the past using present day occurrences? The present can always be used as a historical tool just as a linguistist can infer things about the past.

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APPENDICES

Previous Studies connected to the Project

Wilmsen and Killick launched a pilot petrographic study of 108 sherds from 28 sites in Botswana dated between cal AD 200 and AD 1885; this has been expanded to include over 500 sherds and clays from 181 sources. Over the last ten years they have studied potters in various parts of Botswana (Wilmsen *et al*. 2009, 2016; Thebe *et al.* 2010).

What is Clay?

There is an ambiguity in defining clay sources—regionally, locally and to site (Rye 1976, 1981; Rice 1987; Gosselain 1994). Clay remains one of the most complicated raw materials to be defined because of its wide range of use and application. The soil scientist defines clay as a fine particle of two micron maximum size having the ability to retain water necessary for plant growth (Ekosse 1994:139). Hodges (1989) describes clays as the finest particles produced by weathering of certain rocks, few particles being larger than 0.01mm in diameter. The chief constituent of clay is a hydrated silicate of aluminium, kaolinite ($Al_2O_3.2SiOS_2.2\ H_2O$ which is derived from the physical breakdown of feldspathic rocks. Because of its mode of origin, clay substances or kaolinites are seldom found in a pure state in nature. The more finely divided the kaolinite particles, the greater the plasticity and vice versa (Hodges 1989:21). Ekosse (1994) identifies kaolinite as a major mineral in clay with confined presence of quartz, smectite and muscovite.

What is "Ceramic"?

"Ceramic" is the general term derived from the Greek word *keramos*, literally translated as "burned stuff" or "earthenware" which is a product of burnt raw clay material (Rice 1987; Hodges 1989). In this thesis, the words "pottery" and "ceramics" are interchangeably used.