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Editorial

From 2014 to 2022, Our 8-Year Celebrations Continues: Editors' Note

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Abstract

The Journal of Advocacy, Research and Education started in October 2014 in Ghana, Africa and has grown into international recognition and indexing. Today, we can boast of authors from 23 countries across the globe. With a consistent publishing record, we have stood strong in promoting open access and securing full funding to support all our authors. As we celebrate our 8th year in sharing scientific knowledge without boarders and barriers, we share our achievements as a journal and editorial team. We acknowledge all our regulators and funders for their continuous support. Together, we hope to make the Journal of Advocacy, Research and Education the best and most preferred home to researchers, academics, students, practitioners, policymakers, and all who share or read research outputs.

Keywords: editors' note, Journal of Advocacy, Research and Education, research and education, Ghana.

1. Historical Reflection

The Journal of Advocacy, Research and Education (JARE) began in October 2014 with seven articles from Ghana and the Russian Federation (KAD International, 2014). Following that publication, the journal adopted a publication frequency of once in four months. Today, the JARE has consistently published in April, August, and December from 2015 to 2022. We currently have authors from countries like China, Ethiopia, Germany, Ghana, India, Indonesia, Japan, Kenya, Malaysia, Nigeria, Philippines, Romania, South Africa, Russia, Serbia, South Korea, Tanzania, Ukraine, United Arab Emirates, United Kingdom, United States of America, Vietnam, and Zimbabwe (KAD International, 2022a). The top five contributors are Ghana, Ukraine, South Africa, Russia, the United States of America, and Nigeria (KAD International, 2022a).

Aside from these achievements, the JARE can also boast of several prestigious indexing by notable organisations like the Catholic University of the Sacred Heart (Italy), Crossref (USA), theDirectory of Open Access Journal (Sweden), Electronic Journals Library – Social Science Research Center Berlin (Germany), Electronic scientific library (Russian Federation), and

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EBSCOhost Electronic Journals Service (EJS) (USA) (KAD International, 2022b). Other indexing organisations include EuroPub (UK), Google Scholar, IKCEST under UNESCO (China), Institute of Information Sciences (Slovenia), National Library of Myanmar (Myanmar), Let Pub (China), Open Academic Journals Index (USA), ROAD, the Directory of Open Access scholarly Resources, Sherpa Romeo (Spain), Society of African Journal Editors (Africa), Southeast University Library (China), Trove (Australia), Vancouver Public Library (Canada), University of Oulu (Finland), and Zhejiang University (China) (KAD International, 2022b).

2. Future Aspirations

So far, the JARE can pride itself on having a history of publishing high-quality, evidence-based research articles addressing topical issues of global concern. Our goal as an Editorial Board is to continue JARE's reputation of excellence by publishing high-quality papers accessible to everybody. In today's fast-changing world, we understand the need to collaborate with a wide range of stakeholders, including researchers, reviewers, educators, students, practitioners, policymakers, and community people, to ensure that research is relevant and practical. On behalf of the JARE Editorial Board, we thank our authors, reviewers, readers, indexing organisations, other stakeholders, and funders for their contributions to advancing multidisciplinary research, advocacy, and open evidence-sharing.

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Articles

Woodworkers' Demographic Characteristics and Perceptions of Popular Wood Preservatives in the Ghanaian Housing Industry

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Abstract

In the housing industry in Ghana, wood treatment is often done using water-borne preservatives. Common examples of preservatives include Acid Copper Chromate (ACC), Chromated Copper Arsenate (CCA), and Chlorpyrifos (Dursban). It is important to know that good wood preservatives must be available on the market to ensure the quality of wood products in the Ghanaian housing industry. It is not enough that the preservative is efficient; it ought to be popular on the market. However, the popularity of a preservative may not necessarily portray its popularity. The main purpose of this study was to identify the most and least popular water-borne wood preservatives (Dursban, CCA, and ACC) in use and also determine any possible associations between woodworkers' views concerning the most and least popular water-borne wood preservatives used in the housing industries and demographic status. An analytic sample of 199 participants was included in our study using a cross-sectional descriptive survey design. The results suggest that woodworkers rated Dursban as the most popular (65 %), CCA least popular (52 %), and ACC unsure (37 %). More specifically, young adults (74 %), secondary educated (84 %), carpentry speciality (86 %), and over two years experienced (88 %) woodworkers rated Dursban the most popular water-borne wood preservative used in the housing industry. However, young adults (56 %), secondary educated (59 %), carpentry specialists (59 %), and over two years experienced woodworkers (60 %) rated CCA the least popular water-borne wood preservative use in the housing industry. Further, we observed significant associations between participants' education, profession, and experience with their perceptions of widespread water-borne wood preservatives used in the Ghanaian housing industry. Our study has implications for research, practice, and policy.

Keywords: demographic characteristics, Ghana, housing industry, perceptions, popular wood preservatives, woodworkers.

1. Introduction

In the housing industry in Ghana, wood treatment is often done either using tar oils (Creosote) or water-borne preservatives such as Acid copper chromate (ACC), Chromated Copper Arsenate (CCA), and Chlorpyrifos (Dursban). Woodworkers' enhanced utilisation of these types of water-borne wood preservatives has recently received much attention from professionals in wood

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science, wood treatment industries and do-it-yourself (DIY) wood treatment for the construction industry (Li et al., 2019). Oil-borne and water-borne preservatives were introduced in the companies since the 1830s to protect wood against insects, fungi and alteration from weathering. Preservatives help to extend the wood service time by 25 to 50 years (Coudert et al., 2013; Hill, 2007; McBain et al., 1995). Water-borne preservatives were introduced into the market in the 1950s. Their carrier often provides a clean surface on the treated wood (Schultz, Nicholas, 2004). Preserved wood with water-borne preservatives can be painted post-treatment and used for a wider range of applications, such as utility poles, residential lumber, and timber, as well as for the protection of wood composites (American Wood Protection Association, 2019). Despite the necessity of normal seasoning being required after treatment, good water-borne preservatives do not "bleed" when dried and are odourless and non-combustible (Everett, Barritt, 1994). Usually, they are greatly used for pressure impregnation, and deep penetration is obtained in permeable timbers. Good wood preservatives must be available for use. It is not enough that the product is efficient; it ought to be popular on the market. However, the popularity of a chemical may not necessarily portray its popularity; this study seeks to find out which of the water-borne wood preservatives in Ghana ACC, CCA and Dursban is most and least available on the market.

Acid Copper Chromate (ACC) is one of the copper compounds of wood preservatives frequently used (Jones et al., 2019). The ACC is a wood preservative only registered for industrial and commercial uses (Virani et al., 2021). It holds well when exposed to decay and termite attack and prevents corrosion (Lebow, 2010). It contains 31.8 % copper oxide and 68.2 % chromium trioxide (Lebow, 2003). Another common preservative is Chromated Copper Arsenate (CCA), which contains 47.5 % Hexavalent Chromium, 18.5 % copper, and 34 % inorganic arsenic (Chen, Olsen, 2016). According to them, in the 1970s, CCA was widely used in the US for outdoor residential wood such as decks, picnic tables, landscaping timbers, fencing, patios, walkways, boardwalks and playground structures until it was banned (Stilwell et al., 2003).

In the early years of the 20th century, the preservative most commonly used in building construction in the United States was CCA (Prestemon, 1914); the pressure-treated wood was then labelled to show the chemical retained and the appropriate use. For instance, Hopey (1998) reported that about 20-50 % of CCA can seep out of wood when it is improperly applied, which causes their imperfect "fixing". According to Ofori and Bamfo Jr (1994), CCA, the most widely used wood preservative in Ghana, is non-toxic to humans and animals because of its permanence in wood. For CCA, the hazard associated with arsenic and chromium are more acute before impregnation, as fixation results in forming insoluble complexes in wood (Eaton, Hale 1993). Dursban appears to be the most common wood preservative on the Ghanaian market nowadays. Chlorpyrifos, the active ingredient in Dursban, was considered moderately hazardous to humans by the World Health Organization (WHO) based on its acute toxicity (WHO, 2010). In agriculture, it was one of the most widely used organophosphate insecticides in the United States. Before it was phased out for residential use, it was one of the most used residential insecticides (Moore et al., 2014).

In this study, we explored the association between demographic characteristics and popular perceived water-borne wood preservative (ACC, CCA, and Dursban) usage. The perceived agreement level of widespread use of water-borne wood preservatives was measured among woodworkers with varied educational levels, major fields, and experience levels in the wood industries. We were interested in knowing from woodworkers' perspectives which water-borne wood preservatives were the most popularly used and determining how these water-borne wood preservatives were associated with the woodworkers' demographic groupings. By popularity, we operationalised as the chemical most liked, accepted, esteemed or patronised by many woodworkers as the most preferred for preservation.

2. Methods

Research Design

A cross-sectional study with a descriptive survey design was used.

Population and Sampling

The target population of this study consisted of all woodworkers in the Greater Accra Region of Ghana between June and July 2021. From this population, a total of 300 woodworkers were originally sampled for the study.

Instrument

The instrument comprised two main sections; socio-demographics and perceptions of the woodworkers on popular water-borne wood preservatives in Ghana. The socio-demographic characteristic items included questions on participants' age, education, profession, and experience. The section on woodworkers' perception consisted of 4 items measured on a 5-point Likert scale [5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree, and 1 = strongly disagree] to measure their views on each statement of popular water-borne wood preservative in use.

Data Collection and Procedures

The authors designed a self-reported questionnaire, and was piloted. The pilot study was conducted using a convenience sample of approximately 50 woodworkers from a different district in the region to establish the reliability coefficient for the items in the questionnaire. The pilot study's results helped ensure the survey items' clarity, phrasing, and sequencing. The main objective of the pilot study was to determine the reliability value based on Cronbach's alpha. The Cronbach's alpha value for the perceived popular water-borne wood preservative was 0.34. No item in the response scale score was reversed. After conveniently selecting 300 woodworkers, only 240 responses were retrieved, giving a response rate of 80 %.

Data Analysis and Procedures

For this study, these independent variables; age groups (teens (up to 20 years) and young adults (above 20 years), education (basic level, secondary level), profession (carpentry, building technology), and experience (less experienced (up to 2 years), more experienced (above two years), were used in the analyses. The dependent variable, perception of the popularity of water-borne wood preservatives in usage, was categorised as most popular, least popular, and unsure. Only woodworkers with fully completed the questionnaire were included in the analyses.

Cross-tabulation and Chi-square approaches were used through IBM SPSS Statistics 26. After cleaning the missing data values and non-response items, 41 of the 240 cases were excluded, and the remaining 199 cases were the sample size that could be described as a convenience sample. All 199 questionnaires were analysed.

Interpretive response scale. The 5-point response scale to each item was modified and collapsed into a 3-point response scale category, namely, most popular (1), least popular (2), and unsure (3). This modification was necessary to meet the rule of the Chi-square test that contingency s with more than 1 degree of freedom expected count of a cell should not be less than 5 (Meyers et al., 2013).

Interpretive scale of Cramer's V. In this study, Cramer's value for association was interpreted as follows. Weak association ranged from 0 to .24; moderate association ranged from .25 to .34; and strong association ranged from .35 to .60.

3. Results

Demographic Profiles

Table 1 provides frequencies and percentages of the demographic status of the woodworkers who participated in this study. The sample was dominated by male woodworkers (96 %), and the majority (59 %) of woodworkers were young adults. Approximately 56 % of the woodworkers had at least some secondary education, but 44 % had gone through basic school. About 51 % of the woodworkers were carpenters, and 49 % were building technologists. About 52 % of the woodworkers were more experienced, while 48 % were less experienced in the housing industry.

Table 1. Frequency/ Percentage Distribution of Woodworkers' Demographic Status (N = 199)

Status	Frequency	Percentage (%)
Gender		
Male	190	95.5
Female	9	4.5
Age		
Teen	82	41.2
Young adult	117	58.8

Education (Level)		
Basic	88	44.2
Secondary	111	55.8
Profession		
Carpentry	102	51.3
Building Technology	97	48.7
Experience (in years)		
<=2	95	47.7
>2	104	52.3

Woodworkers' Age and Perceptions of Popular Water-borne Wood Preservatives

To determine whether there was any association between age and perceptions of the most or least popular water-borne wood preservative used in the housing industry.

Ho: There was no significant association between age and perceptions of the most or least popular water-borne wood preservative used in the housing industry.

H1: There was a significant association between age and perceptions of the most or least popular water-borne wood preservative used in the housing industry.

In this study, woodworkers were classified in two ways: by types of water-borne wood preservatives and by age groups. The results of cross-tabulation are shown in Table 2.

Table 2. Cross-Tabulation of Woodworkers' Perceptions of Most or Least Popular Water-borne Wood Preservatives and Age (n = 199)

	Teen			**Young-Adult**			**Total**		
Type	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**
Dursban	44(54)	24(29)	14(17)	86(74)	17(14)	14(12)	130(65)	41(21)	28(14)
CCA	20(25)	38(46)	24(29)	17(14)	65(56)	35(30)	37(19)	103(52)	59(29)
ACC	38(46)	17(21)	27(33)	33(28)	38(33)	46(39)	71(36)	55(27)	73(37)
Total	102(42)	79(32)	65(26)	136(39)	120(34)	95(27)	238(40)	199(33)	160(27)

Note: For age differences, the Chi-square test value for Dursban was $\chi^2 = 8.88$, p= .012, Cramer's V=.211; for CCA was$\chi^2 = 3.32$, p= .190, Cramer's V=.129; and for ACC was $\chi^2 = 7.39$, p= .025, Cramer's V=.193.

Tables 2, 3, and 5 showed cross-tabulations between demographic characteristics and perceptions of popular water-borne wood preservatives in use. The row percentages indicated that, out of 199 woodworkers, the proportion who rated water-borne wood preservatives used most popular ranged from 19 % of CCA to 65 % of Dursban and averaged 40 % across the sample. These results indicated that Dursban was the most popular water-borne wood preservative. However, the proportions that rated water-borne wood preservatives least popular ranged from 21 % of Dursban to 52 % of CCA, averaging 33 % across the sample. These results indicated that CCA was the least popular water-borne wood preservative. Furthermore, the proportions unsure of water-borne wood preservatives ranged from 14 % of Dursban to 37 % of ACC and averaged 27 % across the sample. These results indicated that woodworkers might not be familiar with ACC.

From Table 2, 54 % of teen woodworkers and 74 % of young adults rated Dursban most popular, but the difference between the two proportions was significant; Chi-square = 8.88, p = .012, Cramer's V =.211. This finding was not significant after conducting a Bonferroni adjustment. Conversely, 46 % of teen woodworkers and 56 % of young adult woodworkers rated CCA the least popular. The association between age and perceived popularity of CCA was not statistically significant; Chi-square = 3.32, p = .190, Cramer's V = .129. This finding indicated no significant association between age and perceptions of popular water-borne wood preservative use in the housing industry.

Education and Perception of Most or Least PopularWaterborne Wood Preservatives

To determine whether there was any association between education and perceptions of the most or least popular water-borne wood preservatives in the housing industries.

Ho: There was no significant association between education and perceptions of the housing industries' most or least popular water-borne wood preservatives.

H1: There was a significant association between education and perceptions of the housing industries' most or least popular water-borne wood preservatives.

In this section, woodworkers were classified in two ways: by types of preservatives and by education levels. The results of cross-tabulation and Chi-square are shown in Table 3.

Table 3. Cross-Tabulation of Woodworkers' Perceptions of Most or Least Popular Water-borne Wood Preservatives and Education (n = 199)

	Basic			**Second**			**Total**		
Type	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**
Dursban	37(42)	30(34)	21(24)	93(84)	11(10)	7(6)	130(65)	41(21)	28(14)
CCA	29(33)	37(42)	22(25)	8(7)	66(59)	37(33)	37(19)	103(52)	59(29)
ACC	41(47)	14(16)	33(37)	30(27)	41(37)	40(36)	71(36)	55(27)	73(37)
Total	107(40)	81(31)	76(29)	131(39)	118(36)	84(25)	238(40)	199(33)	160(27)

Note: For education differences, the Chi-square test value for Dursban was$\chi^2 = 37.77$, p= .000, Cramer's V=.436; for CCA was $\chi^2 = 21.59$ p= .001, Cramer's V=.329; and for ACC was $\chi^2 = 13.15$, p= .001, Cramer's V=.257.

From Table 3, 42 % of woodworkers with basic education and 84 % of those with secondary education rated Dursban most popular, but the difference between the two proportions was significant; Chi-square = 37.77, p = .000, Cramer's V = .436. This remained significant after Bonferroni's corrections. This result indicated a statistically significant association between education and perceptions of Dursban as the most popular water-borne wood preservative and that the association appeared strong. However, 42 % of woodworkers with basic education and 59 % of those with secondary education rated CCA the least popular. The association between education and the perceived popularity of CCA was statistically significant; Chi-square = 21.59, p = .000, Cramer's V = .329. This finding indicated a significant association between education and perceptions of CCA being the least popular water-borne wood preservative and that the association appeared moderate. Thus, a significant and strong association existed between education and perceptions of popular water-borne wood preservative use in the housing industry.

Profession and Perception of Water-borne Wood Preservatives

To determine whether there was any association between profession and perceptions of the most or least popular water-borne wood preservative in the housing industry.

Ho: There was no significant association between profession and perceptions of the most or least popular water-borne wood preservatives in the housing industries.

H1: There was a significant association between profession and perceptions of the most or least popular water-borne wood preservatives in the housing industries.

In this study, woodworkers were classified into two ways: by types of preservatives and by profession. The results of cross-tabulation are shown in Table 4.

From Table 4, 86 % of carpentry woodworkers and 43 % of those of building technology speciality rated Dursban most popular, but the difference between the two proportions was significant; Chi-square = 40.56, p = .001, Cramer's V = .451. This remained significant after Bonferroni corrections were conducted. This result indicated a statistically significant association between profession and perceptions of Dursban being the most popular water-borne wood preservative and that the association appeared strong. However, 59 % of carpentry woodworkers and 44% of those of building technology speciality rated CCA as the least popular. The association between profession and perceived (least)popularity of CCA was statistically significant; Chi-square

= 30.33, p= .000, Cramer's V = .390. This finding indicated a significant association between profession and perceptions of CCA being the least popular water-borne wood preservative and that the association appeared to be strong. Thus, a significant and strong association existed between profession and perceptions of popular water-borne wood preservative use in the housing industry.

Table 4. Cross-Tabulation of Woodworkers' Perceptions of Most or Least PopularWater-Borne Wood Preservatives and Profession (n = 199)

	Carpentry			Build Technology			Total		
Type	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**
Dursban	88(86)	8(8)	6(6)	42(43)	33(34)	22(23)	130(65)	41(21)	28(14)
CCA	4(4)	60(59)	38(37)	33(34)	43(44)	21(22)	37(19)	103(52)	59(29)
ACC	24(24)	36(35)	42(41)	47(48)	19(20)	31(32)	71(36)	55(27)	73(37)
Total	116(38)	104(34)	86(28)	122(42)	95(33)	74(25)	238(40)	199(33)	160(27)

Note: For professional differences, the Chi-square test value for Dursban was $\chi^2 = 40.56$, p= .000, Cramer's V=.451; for CCA was $\chi^2 = 30.33$, p= .001, Cramer's V=.390; and for ACC was $\chi^2 = 14.25$, p= .001, Cramer's V=.268.

Experience and Perception of Most or Least Popular Water-borne Wood Preservatives.

To determine whether there was any association between experience and perceptions of the most or least popular water-borne wood preservative in the housing industries.

H0: There was no significant association between experience and perceptions of the housing industry's most or least popular water-borne wood preservatives.

H1: There was a significant association between experience and perceptions of the housing industry's most or least popular water-borne wood preservatives.

In this study, woodworkers were classified in two ways: by types of preservatives and by number of years of experience. The results of cross-tabulation are shown in Table 5.

Table 5. Cross-Tabulation of Woodworkers' Perceptions of Most or Least Popular Water-borne Wood Preservatives and Experience (n = 199)

	<=2			>2			Total		
Type	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**	**Most**	**Least**	**Unsure**
Dursban	39(41)	33(35)	23(24)	91(87)	8(8)	5(5)	130(65)	41(21)	28(14)
CCA	31(33)	41(43)	23(24)	6(6)	62(60)	36(34)	37(19)	103(52)	59(29)
ACC	47(49)	16(17)	32(34)	24(23)	39(38)	41(39)	71(36)	55(27)	73(37)
Total	117(41)	90(32)	78(27)	121(39)	109(35)	82(26)	238(40)	199(33)	160(27)

Note: For experience differences, the Chi-square test value for Dursban was$\chi^2 = 47.31$, p= .001, Cramer's V=.488; for CCA was $\chi^2 = 23.68$, p= .001, Cramer's V=.345; and for ACC was $\chi^2 = 17.81$, p= .000, Cramer's V=.299.

From Table 5, 41 % of woodworkers with at most two years experience and 87 % of those with over two years experience rated Dursban most popular, but the difference between the two proportions was significant; Chi-square = 47.31, p = .001, Cramer's V = .488. This remained significant after Bonferroni corrections. This result indicated a statistically significant association between experience and perceptions of water-borne wood preservative use, and the association appeared to be strong. However, 43 % of woodworkers with at most two years of experience and 60 % of those with over two years of experience rated CCA as the least popular. This result indicated that proportionately more over two years experience, woodworkers rated CCA the least popular than those at most two-year experience. The association between experience and perceived popularity of CCA was statistically significant; Chi-square = 23.68, p = .001, Cramer's V = .345. These findings revealed a significant association between experience and perceptions of CCA being the least popular water-borne wood preservative used and that this association appeared to be strong. Thus, there was a significant and strong association between experience and perceptions of popular water-borne wood preservative use in the housing industry.

4. Discussion

In this study, we explored the associations between the demographic status and the perceptions of woodworkers concerning the popularity of water-borne wood preservatives (ACC, CCA, and Dursban). Findings indicated that the woodworkers in Accra generally rated Dursban as the most popular water-borne wood preservative, and CCA is the least popular. Nearly 54 % of teen woodworkers and 74 % of young adults rated Dursban most popular. Furthermore, 42 % of woodworkers with basic education and about 84 % of those with secondary education rated Dursban most popular. About 86 % of carpentry woodworkers and 43 % of those of building technology speciality rated Dursban most popular. In comparison, 41 % of woodworkers with at most two years of experience and almost 88 % of those with over two years of experience also rated Dursban as the most popular preservative.

The popularity of Dursban use among the younger adult population, those with secondary education, carpentry woodworkers, and woodworkers with over two years of experience could be linked purely to its effectiveness. For example, a study by Mensah et al. (2022) clearly showed that Dursban is popular in Ghana and is effective as a chemical preservative for oil palm lumber. Although little evidence exists regarding these different choices and perceptions, it is interesting that about 57 % of the highly skilled building technology specialists did not see it as the most popular chemical option. This finding may not be surprising as Dursban has been identified in some studies as being toxic to human health, although effective as an insecticide (Hachemaoui et al., 2019; WHO, 2010).

Our study also noted that for the selected woodworkers who participated in our research, CCA is Ghana's least popular wood preservative. Results from our study showed that 42 % of woodworkers with basic education and about 59 % of those with secondary education rated CCA the least popular. Nearly 59 % of carpentry woodworkers and 44 % of those of building technology speciality rated CCA as the least popular. Almost 43 % of woodworkers with at most two years of experience and about 60 % of those with over two years of experience rated CCA the least popular. However, this perception conflicts with the findings of Ofori and Bamfo (1994), which indicated CCA as the most widely used wood preservative in Ghana. Recent studies on CCA have shown that most countries prohibit using this chemical preservative because of its associated environmental and human health problems (Morais et al., 2021).

5. Conclusion and Recommendations

We conducted a cross-sectional study among a convenience sample of 199 woodworkers. Overall, woodworkers rated Dursban most popular, CCA least popular, and ACC unsure. More specifically, young adults, secondary educated, carpentry speciality, and over two years of experienced woodworkers rated Dursban as the most popular water-borne wood preservative used in the housing industry. However, young adults, secondary educated, carpentry specialists, and over two years experienced woodworkers rated CCA as the least popular water-borne wood preservative used in the housing industry. There is no significant association between age and perceptions of popular water-borne wood preservative use in the housing industry, which seems contradictory. However, the other findings underscore the anticipated results, which portray significant and strong associations between education, profession, and experience with their perceptions of popular water-borne wood preservative use in the housing industry. Manufacturers must produce more environmentally friendly water-borne wood preservatives that can substitute CCA and ACC wood preservatives that have been banned in some advanced countries and are not being produced enough for the users. The authors recommend researching oil-born and water-borne preservatives to ascertain which is more popular.

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8. Conflict of Interest Statement

There is no conflict of interest to declare by the authors.

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Gendered Roles in Traditional Musical Practice: A Study of Pondo Women Drummers

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Abstract

Studies in various countries on gender roles in traditional musical practices portray women as people whose music-making potential is dictated by their role and status in their various communities, among other factors. This article examines the gendered roles of Pondo women drummers in the traditional music played among the Pondo people, a sub-tribe of the Xhosa people in the Eastern Cape Province of South Africa. This article presents a discussion of the Pondo community's gender ideology and how gender-related behaviours affect its musical thought and practice, and how traditional music functions in communities to reflect Pondo women's musical roles in traditional ceremonies. This article outlines the role played by Pondo women in traditional ceremonies and their drumming in those ceremonies. The research method adopted was a secondary data analysis of the study by Nombeko Ndzobongo (2007) titled "Women drumming among the Pondo people of Eastern Cape Province of South Africa: implication for gender music education". Her study outlined several factors that directly and indirectly affect Pondo women's musical activities. As indicated in the study, these reflect society's perception of these women; as women and as female musicians. Their place in the community, their role and their value in making music were also discussed.

Keywords: Pondo women, drumming, gender, traditional music.

1. Introduction

Gender roles have been an important and recurring topic in the global conversation since the last decade of the twentieth century. This trend may be based on the anticipated benefits realised if gender equality was ever attained. While efforts are made every day to address the visible inequalities, certain factors such as religious beliefs, cultural views and social variables tend to serve as barriers to eradicating inequality in African society (Aluede, 2005). Despite women's crucial functions in society, the division of roles between males and females prescribed by most cultures often assigns the subordinate position to women. Consequently, women are subjected to various forms of discrimination and inequality. According to Ekwueme (2005, p. 231), men have superior functions, and women have inferior functions in society because gender functions have been structured in such a way that these roles are perpetuated. People have absorbed these positions throughout time, and they have become customs and traditions. The gendered role of making music in traditional and cultural music practices is highlighted in several studies (Doubleday, 2008; Kgafela, 2009; Koskoff, 1995; Omibiyi-Obidiki, 1988; Samuel, 2005; Scharfenberger, 2011; Stein Hunt, 1993; Teffera, 2006).

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In modern times, women are fighting for equality in all settings and changing gender roles and expectations by breaking the taboo of traditional musical practices such as drum playing in their cultural settings. Research that describes the dynamism of culture and women adopting roles originally assigned to men, for example, female Dùndún drumming in Yorubaland, Nigeria, has been undertaken by several authors (Mullins, 2003; Samuel, 2005, Samuel, 2014a, Samuel, 2014b). These studies documented how the Anlo-Ewe women of Ghana adopted the djembe drum from Guinea and started their Takada dance drumming – performed for themselves and their daughters – to express their right to free speech. While this seems to be making an impact, many societies still adhere to centuries-old customs that prevent women from playing particular instruments, one of which is the drum.

The drum has always been an important facet of oral tradition in Africa and is the instrument most commonly associated with African traditional music (Davis-Craig, 2009; Teffera, 2006). In East Africa, drums are used for signalling, as accompaniment for singing and dancing, for processions, state proclamations and royal coronations (Teffera, 2006: 37). Each culture has developed unique ways of communicating through the drums, and as most drum sounds mimic the tonal language of the tribe's culture, rhythms not only vary according to the occasion but also the location (Davis-Craig, 2009). According to Koskoff (1995) and Johnson (2018), in many African cultures, it is taboo for women to be seen at or actively participate in some cultural events or ceremonies that require drumming, making it challenging for women to play the drums. Traditionally, women were the dancers and singers, and the men played the drums. Women's domestic responsibilities and expectations did not allow them to perform such important roles as playing the drums in their society. It was unlikely for a girl to abandon her home to pursue a drumming career at the cost of learning how to run a household, from older women that were also unable to leave their homes and families to attend and perform at events. It was easier for men to fill those positions as they were socially acceptable and available. Anku (2009, p. 38) and Kgafela (2009, p.31) opine that musical practices in any given culture are limited by tradition and history, and where culture defines the limits of social and cultural life, particular traditions, for example, drumming, tend to be similarly confined in most African societies.

According to Kayode (2014, p. 29), female drummers are uncommon in both Dùndún and batá, two well-known drum ensembles in Yorubaland. Kayode (2018, p. 161) discusses how it is frowned upon for women to play the Dùndún drum in Yorubaland. The Yorùbá indigenous music profession has always prioritised men over women because patriarchal ideas tend to foster a gender-based power imbalance. Similarly, women are not permitted even to touch the djembe drum in Guinea because it is customary for men to play it (Flaig, 2010: 3). In Guinea, it was prohibited for women to learn how to play the djembe drum; punishment can include their families disowning them, being asked to find another job and having their performance costumes burnt (Conde, 2002).

Despite these taboos, there is a growing trend to reconstruct many of the traditional gender roles due to the transformative responses to the current order within each community, and numerous women now play the djembe drum among the Guinea people (Flaig, 2010: 3; Sue, 2007) and the Dùndún drum among the Yorùbá people of Nigeria (Kayode, 2014: 29). The dynamism of culture has allowed women to gradually challenge the male-controlled gender ideologies in many civilisations, including the societies mentioned above, through adaptation, contestation and transformation. Musical events may be offshoots of a community's social structure, and changes to performance styles can provide a window into contemporary African society's evolving gender dynamics and ideologies. Although more women are emerging as traditional drummers in public spaces, music scholarship in most African societies lacks discussion of their participation.

The exploitation of African gender practices and female participation in drumming have been relegated to the background by numerous researchers who have either deliberately overlooked or dismissed these facets (Samuel, 2005; Samuel, 2018; Scharfenberger, 2011). This research, which explored the role of women in traditional African music practices with a focus on female Pondo drummers in the Eastern Cape Province of South Africa, is situated in the academic discourse of redressing the exclusion from the scholarship of the role of women as players of musical instruments in traditional culture.

2. Theoretical Framework

This article utilised the functional theory of social stratification proposed by Davis (1948) and Davis and Moore (1945), which accounted for what they termed the 'common requirement' for social inequality in any social order. According to the hypothesis, multiple social roles exist in every culture, which are not all appreciated equally. The unequal distribution of power, influence and reputation, among other factors, is caused by diverse societal positions. According to this theory, inequality is a natural result of society's value consensus on the one hand and individual differences on the other.

The functional theory of social inequality is applied to this study to understand the gendered roles in traditional music practices. Women in most traditional African societies are believed to belong to a lower class. The theory implies that women, whose way of life has been influenced or determined by society, would be disadvantaged in performing as musicians. A further consequence of the theory is that women on this unfavoured side will suffer due to the unequal distribution of roles and influence.

3. Results and discussion

Women Drumming

Ndzobongo (2007) posits that among the Pedi people in South Africa, women are recognised as excellent drummers; they are believed to be the custodians of drumming. According to Malan (1982, p. 362), cited by Ndzobongo, "Women who are the chief exponents of their percussion instruments, play the *meropa* with a sharp staccato movement of the tips of their fingers, palm or heel of the hand, or in the case of their large wooden timpani bowl-type drums using a stick with a flattened beating end". The *meropa* is a wooden drum the Pedi uses to accompany their singing and dancing. This accompaniment is essential for women's dance songs. The drums traditionally used for social and ceremonial music were conical, usually open at the base, and had a single skinhead. They were made from a single, hollowed block of wood from the marula tree, found in abundance in rural parts of South Africa and associated with various legends and beliefs in African culture.

The Venda tribe in South Africa is another example of a society where women play the drums. Kruger (1996, p. 54) asserts that the *wada* drum is used in the *tshikona* dance, and *tshikona* drummers are traditionally female. *Tshikona* has been dubbed the Venda national dance and was performed on all significant occasions, including the coronation of a new monarch, commemorating a ruler's death and the sacrificial rituals at the graves of a ruler's ancestors. *Tshikona* exemplified the importance of the Venda's communal life to which people felt a sense of belonging (Kruger, 2007, p. 36). Other occasions in the Venda culture when women drum are girls' initiation ceremonies. In Venda culture, the *ngoma, thungwa* and *murumba* drums are played by women and girls except in possession dances when they are played by men (Kirby 2013: 39-41). Further evidence of women's drumming traditions can be found in the Wagogo community in Tanzania. Howard (2014) describes *muheme,* as a specific drumming style in which women participate.

In the study upon which this article is based, the researchers investigated women's roles in a predominantly male tradition in other African cultures by describing ceremonies in which Pondo women's performative masculinity is displayed. The researchers describe how female drummers transcend gender boundaries by simultaneously contesting yet maintaining established practices within the traditional Pondo culture. This article argues that women's roles in this regard are hedged by the prevailing practices in the traditional music realm that have provided the basis for challenging traditional limitations to gender-related musical practices.

The approach to this research was partly a secondary analysis of Nombeko Ndzobongo's (2007) study titled "Women drumming among the Pondo people of Eastern Cape Province of South Africa: implication for gender music education". This article explored the traditional ceremonies and rituals women perform as chief drummers. In so doing, the study aimed to extend the debate surrounding the issue of gendered authenticity by arguing that the emergence of female involvement in the art of drumming is a continuum and not necessarily a breach of a time-honoured music profession among African societies.

The Pondo people are a group of Nguni-speaking peoples who have for several centuries occupied the area between the Mthatha and Mtamvuna rivers in the Eastern Cape Province bordering KwaZulu-Natal in the north (Mcetywa, 1998: 15). The Pondo people occupy the areas of

Bizana, Port St Johns, Lusikisiki, Ngqeleni, Ntabankulu and Lidobe. Pondoland was divided into seven areas. Eastern Pondoland comprised four regions, namely Lusikisiki (Qaukeni), still considered the capital of Eastern Pondoland, Flagstaff (Spareni), Bizana and Ntabankulu. Western Pondoland comprised three regions, namely Ngqeleni, Libode and Port St Johns (Nyandeni), with the latter serving as the capital of western Pondoland (Kepe, Ntsebeza, 2011).

Gender Roles and their Effects on Women's Musical Practices

A society's gender structure displays culturally maintained relationships based on culture-specific gender norms, and structures and beliefs vary significantly from society to society and within societies (Bullindah, 2002; Stein Hunt, 1993). Every society has its method of doing things, which is the key feature of culture. According to Taylor (1973), not everyone in a society acts the same way, and men and women are expected to behave differently in any community due to gender differences. These differences are also reflected in their musical roles. Hoffman (1990, p. 116), Stein Hunt (1993, pp. 41-43) and Bullindah (2002), in writing about the concept of music and gender in society, opine that the division of labour according to gender is a basic as the organisation of musical roles in the society.

Burns (2009) explains the cultural backdrop of female musicians in Eweland in Ghana by observing that women's roles as custodians and nurturers of Ewe culture have not been rewarded with a comparable social status. With this research, Burns lends credence to female musicians who have been marginalised in West Africa. In Akan and Ewe cultures in Ghana, women are traditionally forbidden from drumming despite making up most of the mixed-gender ensembles and men providing backup as drummers in female ensembles (Anku, 2009). According to Ampene (2005), numerous African societies are affected by this issue. The Kpelle and Vai of Liberia, as well as the Akan and Ewe of Ghana, regard chorus singing as a feminine activity and playing instruments as a male activity, as is true in most African traditions. This influence explains why men are assigned to play instruments while women sing and dance (Bullindah, 2002).

Burns (2009, p. 59) asserts that women may not have an environment that encourages them to pursue creative music aspirations. Nonetheless, the contributions of female Ewe musicians to society are viewed as simply procreative. It is perceived that women's input regarding music does not entail significant development or make use of their creative faculties due to gender-restrictive practices and cultural taboos in some societies. Women may struggle to excel in traditional music practices because they do not have the forum to challenge their creative music skills.

Ndzobongo (2007), while describing how gender roles affect Pondo women, posited that women perform a variety of roles in musical performance; these roles vary from community to community depending on the traditions of the community they live. She states that women play a major role in traditional music practices among the Pondo people and construct and play local musical instruments during cultural ceremonies. For instance, Pondo women make and play the *ingqongqo* drum during the initiation ceremony of their sons into manhood. The drumming performance often accompanies the dances or songs the male initiates perform during the ceremony. Ndzobongo continues, "Pondo women are renowned for their dexterity in playing of drums, and this is the reason why they are the main people responsible for making and playing of drums". This is contrary to the practices of other nations or tribes. Mbonyingingo and Constantin (2020) assert that in recent times, the absence of women is noticeable in the field of drumming in Burundi. Traditional drums in Burundi have been recognised as the "Intangible Cultural Heritage of Humanity" by UNESCO since 2014, but in 2017 the Burundi Government banned women from participating in traditional drumming practices.

The preceding discussion explains why women's roles in traditional musical performances rely on their fundamental social obligations, which are important to women's gender identity. These social roles are referred to as a society's gender belief, and every society has its own set of built-in beliefs. These factors all have an impact on women's participation in musical activities.

Gender Roles and Musical Practices among the Pondo People

The study of gender roles in traditional musical practice is not new in the field of music, but the study of gender and Western music has been the dominant focus. As a result, academic literature is scarce on African music and gender in general. Historians have defined African music in Western terms by overemphasising sound structure even though music and gender are

inextricably linked in most African societies. Limited attention has been paid to the interaction of music and gender and the consequences for understanding social processes in societies (Nannyonga-Tamusuza, 2013).

Gender roles strongly influence the types of musical performances of any ethnic group. This is evident in the gender-defined roles among the Pondo people. Men have their music, and women have theirs, but mixed-group performances also occur without any restrictions. Mixed group performances are mainly for entertainment and leisure, normally organised according to age, clubs and associations. Men's visions and ideologies are well-articulated in the type of music they perform. Among most African tribes, men have advantages over women in musical performances involving ritual, wrestling, hunting and war.

Pondo women excel in musical performances, focusing mainly on the rites of passage due to their gender roles. For instance, among the Pondo people, women dominate musical practices from the time children are born until they become adults, music dominated by women accompanies each stage of their development. This differs from other groups in which women's musical roles are connected mainly with womanhood and are related to birth, initiation and marriage as well as work activities, which reflect their role in food production in society (Stein Hunt, 1993: 41-42).

Traditional Events in Which Women Play Dominant Musical Roles in Pondoland

Within the complex dynamics of gender relationships and roles among African peoples, women often exercise power through musical performances. Such is the case among the women of Pondoland in the Eastern Cape Province of South Africa, who, in their drumming performances during ceremonies, serve as custodians of knowledge and tradition and transmitters of culture. To grasp the significance of women dominating the traditional musical practice space among the Pondo, one must first understand the events or ceremonies that warrant women playing a dominant role and how this is expressed in various religious and cultural practices. The Pondo people, like other African peoples, have a belief system grounded in nature and human contact. Still, within the complex structures of gendered roles in traditional African musical practices, Pondo women exercise power through drumming, thus serving as the custodians of Pondo drumming traditions. They document and enact the history and culture of their people as they relate to traditional musical practices, in addition to being a source of knowledge about the people's artistic practices. The events or traditional ceremonies in which women play the dominant musical role are discussed hereunder.

- ***Ibhundele*** is an event to raise funds for the hosting household. It consists of an assemblage of *amadikazi* and *amatshawe* who raise funds for the household they meet (Ndzobongo, 2007). Historically, Pondo women had several means of helping one another, such as money games (*ibhundela*). This fundraising event is seen as a way of helping one another and redistributing wealth amongst the people. During this event, women compose songs about whoever or whatever event may have occurred within the community. They voice their grievances through the songs they compose. The singing is accompanied by traditional instruments such as the *igubu* and *umasengwana* (traditional musical instruments) (Ndzobongo, 2007).

- ***Intonjane,*** which according to Ndzobongo (2007) is "an initiation of a girl into womanhood"; the ritual bonds a prospective umkhwetha (initiate) with the ancestors. It is a means of awakening *umbilini* (intuition), marked by several rituals and events signifying the rite of passage from girlhood to womanhood. During the ceremony, a girl is secluded at her homestead, where she is taught the values and norms of femininity and prepared for marriage. The young girls are taught the responsibilities and rights of being a wife, mother and leader. On the day, a girl is taken out of the initiation hut by various female groups who perform the traditional *umxhentso* dance accompanied by the *igubu* drum played by women (see Figure 1). They also perform *umngqungqo,* a traditional dance and take charge of the musical performance and display during this ceremony (Ndzobongo, 2007).

- ***Intlombe yamaGqirha*** – This ceremony is the central ritual for all the ceremonies and/or activities performed by *amagqirha*. According to Mlisa (2009, p. 206), this ceremony is dominated by singing, clapping hands, clan praises and dancing, all demonstrating a shared sense of belonging; the songs reflect the lifestyles and historical and existential experiences of the people. According to Ndzobongo (2007), the ancestors tell the *amagqhira* (diviners) about future occurrences and tasks the ancestors would like to be undertaken. If the ancestors are displeased

about something, they will communicate with the *amagqirha* who will, in turn, relate their displeasure to the relevant people and inform those people what has to be done to appease the ancestors.

- The diviners, who are women, dance in a circle, or if inside a house, they dance around the *iziko* (fireplace) in the middle of the house. According to Ndzobongo (2007), this is a sacred place where the ancestors live and where the Pondo people observe traditional religious and social practices. The circle also resembles the form of a full moon, a symbol of completeness and togetherness. The diviners form a linked chain when dancing around the *iziko* (Mlisa, 2009: 207). The *amagubu* (drums) are played during the gathering to evoke the ancestors. A sick diviner is cured by playing the *amagubu*. The ancestors become excited upon hearing the *amagubu* and rejoice because having the *amagubu* played for them is a sign that they are recognised, and their presence is still felt (Ndzobongo, 2007).

Drumming tradition among Pondo women

Drums have been an intrinsic part of the cultural life of the Pondo people for countless generations; ancient instruments used to celebrate all aspects of life – are decorated in various colours and kept at the chief's residence. Traditionally, drums hold a deep, symbolic and historical significance for the Pondo people, and women dominate the drumming during traditional and religious events. Among the Pondo people, drums have a unique and more profound symbolic meaning when compared with Western music. Various types of drums are used by Pondo women, representing the community's soul. They are used for celebrating ceremonial events and rituals within the community. Depending on the ceremony, the importance of these drums changes. Several popular drums used among Pondo women during performances are described hereunder.

- Igubu. The *Igubu* is cylindrical and double-headed, with the heads laced onto the ends of the cylinder, which is made from tin or (less common) wood. According to Levine (2005), the instrument was a wooden drum made from a hollowed tree trunk sculpted into a cylindrical shape before European influence. A stretched cow or goat skin is used on both ends. It is beaten with two sticks that may be padded at the ends, unpadded, and slightly curved or straight. Some drummers utilise curved strips of rubber cut from a vehicle tyre. The beaters are called *umphini*, with the plural form being *amaphini* (meaning a handle, helve, or paddle) (Hansen, 1981). Diviners and Zionists mainly use this drum. According to Dargie (2015), the modern *igubu* is modelled on the European bass drum. Players are usually women or girls and, less commonly, men or boys (Hansen, 1981). The drum is played on various occasions and for a variety of ceremonies, particularly in the Zion church (Levine, 2005). In the Zion church, the *amagubu* are used to communicate with God, with the *amagubu* creating a connection between the church members and God. Praising the Lord is facilitated by the *amagubu*. Playing the amagubu in a church is based on the belief that it heals sick players (Ndzobongo, 2007).

Fig. 1. Igubu drum
Source: Malonde (2019)

- *Isidiphu*. This is a friction drum found around the Flagstaff area, according to Dargie (1988), who described *isidiphu* as a drum with one skinhead to which a stick is attached. The drum is played by rubbing the attached stick with a wet hand or cloth, producing a loud fricative sound. Pondo women play the *isidiphu* at weddings and traditional celebrations.

- *Ikawu*. This drum is like a shield made from ox skin that is beaten with a knobkerrie and slammed onto the ground with force. The skin is cut to be the widest in the middle, narrowing towards the top and bottom. A small piece of skin is sewn near the top, in the middle of which is a hole designed to receive and hold the knobkerrie (Kirby, 2013). The *ikawu* is traditionally played by women during boys' initiation ceremonies during the *abakhwetha* dance, a special dance performed by the boys. Women form a semi-circle when playing the *ikawu,* mostly as an accompaniment to their chants and songs. The beating of the *ikawu* is accompanied by battle cries (Levine, 2005). Traditionally, playing the *ikawu* represents the survival of the ceremonial use of the shield, which at one time was a weapon used by the Pondo people in battle (Kirby, 2013).

- *Ingqongqo*. The *ingqongqo* is a local drum made from a stiff dried ox hide and beaten with sticks *(amagoga)* by a group of women (See Figure 2). The skin is alternatively placed on the ground; the women sit on it and beat it with sticks as an accompaniment to their singing during events celebrating the initiation of boys into manhood (Ndzobongo, 2007). This basic beat is accompanied by handclapping *(ukuqhwaba)* and dance movements, alternately striking the thighs with the palms of the hands. This was sometimes done during performances of the divination song. In the past, it was widely used by women during male circumcision and diviners' ceremonies (Levine, 2005: 81). According to Ndzobongo (2007), women are experts at dramatisation and must therefore take the lead role in the drumming performance.

Fig. 2. Women playing the *ingqongqo* while sitting
Source: Levine (2005)

Pondo women and drum-making expertise

Technically, drums are described as membranophones and consist of animal skin stretched over the open end of a frame constructed from wood or tin. The sound is generated by striking the drumhead with hands or a stick. Their form can be circular, bowl-shaped or round within a frame. Making drums is a specialised skill and is sometimes gender-restricted, determined by the cultural beliefs and ethos of the specific ethnic group. Among the Pondo people, drums are mostly made by women and often played by women. These drums are made from animal skins and vary in size. For instance, the *ingqongqo* (ground drum) is made of a series of poles stuck in the ground with a membrane stretched across them (Beck, 2013). The skin of a ritually-slaughtered ox or buffalo is dried in the sun and then stretched but left sagging slightly between sticks at about a metre above the ground or held with one hand by the women standing in a circle (Levine, 2005). Holding a stick in the other hand, the women hit the skin, which they then put aside for ceremonial use after the

dance. The *ingqongqo* drum has no trunk (Nkosi, 2013), while the *ikawu,* an equally ancient ritual instrument, was a shield once used as a war device, the membrane covering which was beaten with sticks (Levine, 2005). Methods employed to tune the different drums include exposing the skin to heat (fire or sunshine), dampening the skin with water, pulling and loosening the skin (as with the *ingqongqo* drum), pulling or loosening the tuning strings and hitting the tuning pegs with a brick or mallet to tighten the skin (Nkosi, 2013).

Artistry And Aesthetics Of Pondo Women's Drumming

Art includes a wide range of human activities, crafts and expressions that appeal to the minds of an individual or a community. The term 'art' may refer to various artistic endeavours, including singing, dancing, drumming and other forms of creativity. In general, art is a product of human activity, created to stimulate the human mind and transmit emotions. Female Pondo drummers use their drumming skills to add artistic elements to events and ceremonies. The various types of decoration on the drum frame define the Pondo people's traditional artistic elements and characteristics of beauty. These characteristics are present on drums not only as a means of stimulating the human senses but also as a functional phenomenon that aids in differentiating the various drums. Female Pondo drummers undergo a variety of processes as drummers. They must master the rhythmic arrangements of the different drums, the development and use of rhythmic spaces through alternating drum players, the creation of additional sounds from non-core sound sources such as the drum frame and the creation of silences and variations within drumming phrases by constant practice.

The art of drumming is a communal asset that illustrates Pondo women's cultural and social expressions. These expressions provide satisfaction for the performers and spectators, enabling them to engage in mystical experiences, convey their imaginings, articulate ideals, and perform ritualistic and symbolic functions.

Fig. 3. Pondo women playing the *ingqongqo* while standing.
Source: Levine (2005)

Pondo women's drumming artistry is not just for show; it has a place in the human or social fabric, showcasing mysterious cultural creations and highlighting often-overlooked artistic precincts. Drumming is a tangible expression of its creators' imaginations and a part of everyday life. Drum players are affected by their cultural contexts and individual life experiences, while cultural customs have a role in uncovering hidden potential and promoting both creativity and improvisation. The drummers do not seek to entertain the hypothetical worlds of their imagination. Instead, they wish to share their cultural history. According to Ndzobongo (2007),

drumming has the power to call on the ancestors, and this power stems from the drum's cultural significance in Pondo society.

Implications of Gender in Musical Performances

Gender has been defined as a state of being male or female and influences the types of roles one performs as an individual or as a group and invariably affects or has some implications for the type of musical performances engaged in by either of the sexes. It is uncommon in African tradition for one to play a role contrary to one's gender. For instance, childbirth songs, weaning songs and lullabies are purely women's business due to the type of bond between mother and child. As such, any man who indulges in such a performance may be perceived as displaying aberrant behaviour. Domestic activities such as scrubbing floors, grinding and pounding spices, and cooking are all women's responsibilities. All of these activities are normally interspersed with corresponding music that is purely the purview of women (Ibekwe, 2009).

Similarly, it is unusual for women to engage in any music solely utilised by men. In some societies, women are forbidden to watch such music, let alone play or perform it themselves. According to Ibekwe (2009), while demonstrating Egwu Omaba of Nsukka – (xylophone music), "women are strictly banned from watching or taking part. It is not considered proper in Igbo tradition for women to overstep their boundaries or do the obvious in matters or roles strictly meant for males. All these check the type of music being performed by any categorised group, male or female." Despite the changing times, most African tribes still practice traditions that exclude women from important cultural and musical performances. African tribes maintain ancient practices that prevent women from excelling in traditional musical performances. Ironically, women are marginalised musically and culturally within the very culture to which they are integral.

4. Conclusion

This study aimed to examine the gendered roles in traditional musical practice with specific reference to female Pondo drummers in the Eastern Cape Province of South Africa. In the Pondo culture, women take on the role of drummer, a role traditionally assigned to men in numerous African cultures. Their role as drummers is not restricted to rituals associated with womanhood. Still, it extends to all aspects of communal life and includes performances for female initiation, male initiation, weddings, traditional and religious celebrations and diviners' rituals. Besides being active drummers, women also manufacture drums. This article will hopefully be useful in providing a platform for further study of the gendered role in musical performance in other traditional communities in South Africa and elsewhere in Africa. The study also opens the discussion on the changing roles of gender in making music, which traditionally restricts women, as most African societies strictly adhere to gender roles and any defiance is viewed as a taboo and may attract either sanctions or cleansing.

5. Declaration of Competing Interest

The authors of the manuscript declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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Efforts to Patch Ghana's Leaky Educational Pipeline' for Promoting Gender Equity in STEM Field of Study: A Position Paper

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Abstract

This position paper aims to highlight some progressive steps by successive Ghana governments to patch the leaks in Ghana's educational pipeline for training females for careers in the field of Science, Technology, Engineering and Mathematics (STEM). Documentary analysis techniques were employed to review the literature to follow the line of discussions on the topic. After the review, it was found that at the end of British rule in 1957, Ghana adopted various science and technology policies geared towards pushing it into the class of front-runners in modern science and technology. Adopting policies became necessary after Ghana assessed the pivotal roles that science and technology would play in its economic development agenda. The Gender Parity Index in the primary and secondary school enrollments in Ghana between 2011 to 2020 increased from 0.96 to 1.01, indicating that the differences in the rates at which males and females were admitted to reading STEM programmes closed up. Through the government of Ghana's interventions, the gender gap was reduced, a situation that supported the stands of the authors against that of some social critics who were of the view that Ghana is among the countries that are still struggling to patch 'leaks' in its educational pipeline for promoting gender balance in STEM education.

Keywords: equity, gender parity, Ghana, Leaky Educational Pipeline, STEM education.

1. Introduction

During the last century, Ghana came out of colonist rule and experienced varying political, social, and economic upheavals (Amankwah-Amoah, 2016). Getting to the end of *British Rule* in 1957, Ghana started adopting various technological and scientific programmes geared toward increasing agricultural and industrial production (Ankoma-Sey et al., 2019). Thus, the importance of science and technology in production and re-development processes gained much acceptance. Forerunners of development, such as Dr. Nkrumah, then set out comprehensible policies to support the agricultural and industrial sectors using the scholarly outputs of universities and national research institutions (Amankwah-Amoah, 2016). The formulation of science and technology policies started a few years after Ghana's independence to help bolster traditional ways of production.

By 1960, Ghana was at the cutting edge of finding and infusing modern technological devices and methods in production (Anderson, Kim, 2006). This happened because, before 1960, the manufacturing sector was on the verge of collapse, and the disturbing effects of the industry on the development processes in related sectors had already been detected (Anderson, Kim, 2006).

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The Government of Ghana resorted to some *'politician-led'* management styles for running key industries, which later caused inefficiencies in many of its interconnected production sectors (Opoku, 2004). Sequentially, the high levels of managerial inefficiencies again became a significant hindrance to the growth of industries in the manufacturing and processing sectors (Opoku, 2004). A few years after 1970, the position of Ghana as far as technology adoption is concerned was made known on several international platforms. That position was declared because the industrial sector (of Ghana) was still stagnating in terms of performance and productivity, a situation which caused the lowest growth rate of 3.5 % per annum found in the historical records of Ghana (Adei, 1990).

Years after, Ghana rebounded, bounced back into promoting technology, and emerged as one of the stable democratic nations in Africa with a high rate of traditional inventions that caused the Gross Domestic Product (GDP) to grow by 16.30 % (Boso et al., 2013). In 2013, the country was declared lower-middle-income, a testament to its known ability to utilise many of its natural resources for development (Fosu & Aryeetey, 2008). One of the possible explanations for the growing industrialisation that finally pushed economic growth and development (Amankwah-Amoah, 2016) was the shift from social policies to the promotion of science education and local innovations. Thus, the need to move away from social policies and utilise scientific expert ideas and inventions in production was considered by incumbent governments (Amankwah-Amoah, 2016). Afterwards, there were growing concerns for Ghana to develop information and technology structures to help bridge the scientific and technological gaps between Ghana and many advanced economies. Since 2000, science and technology's importance as production engines has gained much attention in the policy space. Technology outsourcing hotspots have emerged in various parts of the world, giving Ghana signals to pay attention to STEM education to deal with the challenges of low production in the agricultural and industrial sectors (Casad et al., 2017).

2. Purpose of the study

Several authors have asserted that there are leaks in Ghana's pipeline for training and developing girls in STEM fields of study and careers. Against this assertion, this study focuses on reporting some programmes and projects implemented by the Government of Ghana to patch the leaks along the educational pipeline for training females in STEM fields of study or careers.

3. Results and discussion

Reasons for Promoting STEM Education and Training in Ghana

There are many reasons why the world's scientific community has encouraged girls' participation in and contributions to STEM fields of study. Gender-equity reasons alone constitute a strong argument. On several platforms, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2018) has announced the progress that some developing countries have made in promoting balanced gender participation in STEM programmes of study. In its 2018 Annual Toolkit Newsletter, UNESCO gave the main reason why growing economies must improve the rate of girls' education and participation in STEM fields of study. According to the Organisation, the increased numbers of girls and women at lower levels can potentially be translated into increased numbers at higher employment levels. Still, on the international front, the UNESCO International Symposium and Policy Forum 'Cracking the Code: Girls' Education in STEM, held on 28-30 August 2017 in Bangkok, (proposed that STEM training for females and their representation in STEM careers should be balanced contributions) to economic growth and development. The above indicates that training females in STEM fields to transfer their scientific qualifications into scientific occupations to increase production to the same degree as men have gained international acceptance and must therefore be of much concern to Ghana.

Furthermore, the focus of SDG 5 is to promote gender equality and empowerment of girls and women. Concerning the main focus of SDG 5, UNESCO is poised to remove all forms of discrimination against females and discourage gender-based violence. And also, campaigning against the marriage of underage girls, promoting female involvement in decision-making at all heights, and growing worldwide access to reproductive and sexual well-being (UNESCO, 2017). The African Union (AU) also got involved in the campaign to help to address issues related to gender inequality in many areas of growth and development of nations. In its Agenda 2063, the AU supported teaching and learning institutions in countries in sub-Saharan Africa (SSA) to enrol more girls in STEM subjects to bridge the gender gap in STEM for balanced participation in

development (AU, 2015). Following the advice, Ghana has attempted to bridge the gap between males and females to build capacity in STEM training.

Daddieh (2003) observed that several factors constrain progress and access to higher education among Ghanaian women. According to Daddieh (2003), attrition, subject choices for areas of specialisation, and recruitment preferences in higher educational levels have gendered solid motivations. At the basic level, choices for programmes to be studied at the Senior High levels are mainly based on gender-traditional home influences, with more females than males being motivated by their parents and peers (Mastekaasa, Smeby, 2008). For example, the traditional belief that boys are more competent in mathematics-related subjects than girls usually results in more boys moving towards STEM-related subjects (Boateng, Gaulee, 2019). A report by the Global Education Monitoring Team (2018) has emphasised that in Ghana, women go in for less than one-quarter of all Science, Technology, Engineering, and Mathematics (STEM) degrees. Though permitting girls an equal opportunity to read STEM-related subjects is a fundamental right supported by the laws of Ghana (European Commission, 2012; Marginson et al., 2013; Lee, Pollitzer, 2016), there are so many challenges that await the woman, particularly when she has entered the career field and is not supported to combine marriage responsibilities with job demands (Ankoma-Sey et al., 2019).

The UNESCO Institute for Statistics (2022) data on Gender Parity Index (GPI) from 2011 to 2020 for Ghana, presented in Table 1, shows that both males and females have equal access to primary and secondary education. In the case of tertiary education, this access is yet to be achieved, though they have been improvements over the years. As illustrated in Table 1, the parity index on gender difference for the 11 years is below 1 for enrollment into tertiary institutions. GPI below 1 indicates that access to education favours males. Otherwise, access to education favours females if the gender parity index is above 1. Although the index has improved over the years due to some interventional programmes introduced by stakeholders and successive governments, it has not grown to bridge the gap in STEM education since the GPI is less than 1 (equal access to education among females and males).

Table 1. Gender Parity Index (GPI) for School Enrollment at Primary, Secondary and Tertiary (gross) levels in Ghana

YEAR	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GPI for Primary and SHS Enrollment	0.96	0.96	0.97	0.98	0.98	1.00	1.00	1.00	1.01	1.01
GPI for Tertiary Enrollment	0.62	0.63	0.65	0.67	0.70	0.72	0.73	0.77	0.85	0.90

Source: UNESCO Institute for Statistics (2022).

The gender gaps in Ghana's primary and secondary school enrollments in 2011, 2013, 2015, 2017, and 2019 were 0.96, 0.97, 0.98, 1.00, and 1.01, respectively, indicating differences in the rates at which males and females were admitted to reading STEM programmes were closing up. Again, at the tertiary level, UNESCO Institute for Statistics (2022) observed a narrowed gender disparity in the enrollment of students from 2011 to 2020 (see Table 1). Earlier, Nguyen and Wodon (2013) reported a vast gender disparity in participation in education among people in the age class of 21 to 24 years in Ghana. Furthermore, the authors mentioned that 84.1 % of females, compared to 90.7 % of males, enroll in primary school with a completion rate of 86.5 % for females and 92.7 % for males. Similarly, Nguyen and Wodon (2013) noted that the completion rate of females and males from junior high school was 51.2 % and 65.1 % respectively. Interestingly, according to Dune et al. (2007), before enrolment and completion of education, accessibility is a negotiated gendered process that is a common practice among parents, families, schools, and society at large (Humphreys et al., 2015). Moreover, McClelland and Holland (2015) sum up by saying:

"Not only do women have less probability of getting access to education in Ghana but also have fewer odds of presenting themselves for programmes in STEM as a result of stereotype thinking held over the years.".

Much evidence of females' low involvement in STEM-related subjects in secondary and tertiary education is partially due to the dislike for STEM-related jobs (Xie, Shauman, 2003). That is, it is worthwhile for one to say that few females are in STEM-related occupational areas because relatively few females enrol in STEM-related programmes at the lower levels of study. For this agenda of more girls enrolling in STEM to materialise, more girls must enrol in STEM-related programmes in higher education (Daddieh, 2003; Dunne et al., 2007; UNESCO, 2017). In Ghana, the decision to enroll more females in STEM-related is crucial at the Senior High School (SHS) level. After completion, students are sometimes forced to select a variety of programmes for their further studies at the tertiary level (Boateng, Gaulee, 2019). Extensively, other studies on gender and STEM have been conducted using various populations (female faculty and students already in STEM, including students of both sexes in STEM fields of study and those not in STEM-related occupations) (Acheampong, 2014; Awan et al., 2017; Bahar and Adiguzel, 2016; Boateng, 2017; Boateng, Gaulee, 2019; Edzie, 2014).

Essentially, the key presentations of UNESCO (2017) indicate factors that hinder girls' participation in STEM in Ghana include stereotype thinking, low creation of awareness on the relevance of STEM, gender, and unfavorable insensitivity to the understanding needs of girls during the teaching of STEM-related subjects. Other factors, as identified by UNESCO, were inadequate funds from the government through the gender unit of Ghana Education Service (GES), unclear gender policy guidelines in the education sector, and limited inter-sectoral partnerships among the several government agencies and ministries in promoting STEM training for females. Scholars like Erinosho (2019) have ascribed the low participation of females in STEM to social, biological, and psychological factors. Considering the biological factors, Erinosho (2019) listed issues concerning the phenotypical formation of females in connection with their visual-spatial and analytical skills required for intangible.

The social point of view hinged on the crucial roles of the home, society, and school in indoctrinating females with feminine ideologies (Ankoma-Sey et al., 2019; Erinosho, 2019; Witt and Wood, 2010). These social activities, for some time, manifest in psychological traits (personality) in the form of self-concept, interest and attitude (Moss-Racusin et al., 2012). Thus, the above points have been made to support the that most girls in Ghana are trained to develop emotions, concern, and feelings for nature more than for mechanical associations with physical substances (Erinosho, 2019). The social, psychological, and biological issues display dismal statistics about female engagement in STEM in Ghana. At various educational levels females in STEM bump into a conscious teacher bias due to issues of gender (Moss-Racusin et al., 2012). However, their male counterparts are given greater chances in the education process because of their active participation of teachers (Hall, Sandler, 1982; Johnson, 2007). Of particular concern in the discussion on widening STEM participation are the under-representation of females, racial minorities, and students of low socioeconomic status (SES) (Anderson, Kim, 2006; Herrera, Hurtado, 2011; Schultz et al., 2011).

Position on Attempts to Promote STEM Education in Ghana

In the debate on promoting gender balance in STEM education in Ghana, social critics argue that there is a yearly reflection of a consistent decrease in female representation (Bissell et al., 2003). Others also believe that data insights from industrial and occupational studies show that women's temporary or short-term work rate is greater than that of men (Aikenhead, 2003), citing examples where women are paid significantly less than their male counterparts for the same work done. This problem has been described and endorsed by UNESCO in the Organisation's Annual Toolkit Newsletter for 2018 as the *'leaky educational pipeline'* for developing girls in STEM fields. To confirm the existence of the leaky educational pipeline, Lukas and Mattews (2018) observed it to be steady attrition of girls and women from Science and Technology arenas at primary education levels to tertiary levels and in decision-making for future choices of work. Though Ghana is listed among the developing countries that Aikenhead (2005), Alsop and Watts (2005) have predicted to have a problem *'leaky pipeline'* in promoting gender balance in STEM education, I object to the prediction because there are some exit points in the '*Ghana educational pipeline'* for developing girls for STEM careers fields that are being patched. The following is the discussion on the steps taken by successive Ghana governments to deal with the *'leaky educational pipeline.'*

The first leak identified by social researchers in the field of education, such as Aikenhead (2005), is the deliberate creation of *'gendered trends'* to allow boys to learn STEM subjects and ignore their female counterparts. In line with the above discovery, Clewell and Campbell (2012) conducted a study on approaches to promote gender equity in Ghana and discovered that the preference for male children to pursue STEM subjects is high, particularly in rural communities. After a rigorous gender analysis, Asuma (2017) concluded that the male child is preferred to the female in the first place in traditional Ghanaian societies. We argue that even if the female fetus is fortunate to escape abortion, the social customs of feeding the male child first is enough signal to her to know that they are incapable of dealing with mathematically inclined subjects, which essentially forms a core part of STEM subjects. This assertion, which is primarily supported in many traditional societies, is refutable on the basis that the education of females in STEM-related courses or subjects became an issue of concern for successive governments from the mid-80s and even at present.

It is worth noting that a few decades ago, Ghana was identified as one of the West African countries that made meaningful progress towards increasing access for girls to learn STEM subjects. For example, the National Vision for Girls was implemented in December 1995 after Ghana participated in the Beijing Conference (Fredua-Kwarteng, Ahia, 2005). Afterwards, the country Ghana designed the National Plan of Action (NPA), which led to the establishment of the Girl-Child Education Unit (GEU). This unit was mandated to ensure equity in girls' education regarding access, participation, retention, and achievement in STEM fields (MoE, 2003). In addition, a renewed commitment towards achieving parity in science education was reechoed in the policy Goals One and Ten of the Education Strategic Plan (ESP) (2014–2018) is being followed to provide girls an equal opportunity to read STEM programs at all levels. For example, through the Ministry of Education's collaboration with World Vision, UNESCO, and Campaign for Female Education (Camfed), STEM clinics have been developed in all Tertiary Institutions in Ghana to address the challenges of females pursuing STEM-related degrees. In 2017, the Kwame University of Science and Technology developed a *Science and Mathematics* clinic to address some critical academic challenges of females in pursuing science-related programmes.

The second leak believed to be causing a leak in Ghana's educational pipeline for training girls in STEM fields of study was identified by Armah et al. (2018). In a documentary review, Armah et al. (2018) revealed that teachers have the habit of answering males more often than females in mathematics and pure science classes and pay more attention to females in non-science classes. According to the authors, the practice sent clear signals to girls in the class to find other alternative subjects for themselves. The findings of Armah et al. (2018) are questionable because some programs are designed to sensitise girls to move towards learning STEM subjects for greater career opportunities. To cite a few are the *Robo Competition in Robotics and the Best Data Bundles Program,* designed to improve girls' knowledge in STEM-related courses (Hasan, 2016).

Nonetheless, there is also some evidence that teaching materials, textbooks, and lectures have now been structured to depict S & T as a female domain, making science attractive for girls. Gyedu (2017) writes, 'there is increasing evidence that girls benefit from teaching methods that emphasise the excellent application of knowledge from science and technology domains. Gyedu's (2017) statement support that the leaky pipeline is being patched as girls have been given support through teaching to learn STEM subjects.

Third, analysts in the Educational Resource Administration and Management field have said that the lack of equipment to support girls in learning STEM subjects is one of the clear leaks in the Ghanaian educational system. The UNESCO (2019) Education Statistics Report listed four African countries, including Ghana, that was found to have a serious dearth of "functional laboratories" in most schools in Ghana. The Report showcased some schools without laboratories for practical work. It concluded that the situation forced teachers to largely stick to the theoretical curriculum for teaching STEM subjects (Ministry of Education, 2011). Even though the assertion cannot be rejected entirely, the word 'serious' presents a very high degree of absence of functional laboratories, which can be debated. An examination of Ghana's educational hierarchy, namely junior high, senior high and technical/vocational and tertiary education levels, reveals some practical steps governments took to restore science laboratories.

To substantiate the above, reference can be made to the 76 million pounds approved by the government for the delivery and installation of Basic Science Technology, Engineering and

Mathematics equipment and training to improve the quality of Science and Mathematics Education within the basic education system in Ghana after the government introduced engineering and technology into the syllabus of basic schools. Also, a colossal amount of GHS 88 million was approved by parliament in 2019 and was used for the construction, provision of equipment, and training of trainers for regional science Technology Engineering Arts and Mathematics Centres for the SHS System in Ghana (Mathews, 2019).

Finally, factors such as poverty, traditional cultural beliefs, and traditional gender roles have been advanced to support the argument that the female child has not been promoted in the STEM fields of education. Key among the factors largely advanced against the motion that "females are less promoted in STEM fields of education" is traditional. Critics argue that traditional beliefs have caused many parents to prefer sons to daughters. This stand has been supported by Ananni-Akoller (1999), who has re-iterated that many girls engage in extensive household chores or work in the markets alongside their mothers and care for younger siblings while their brothers attend school to study and play. As a result, if parents have to choose between educating their daughter or son, they will more than likely select their son, who will have access to civil service work compared to his sister's agricultural and informal economy work. Gender-biased curricula in schools train women to be petty traders, farmers, housewives rather than scientists, professionals, and civil service workers. Several females lack role models and mentor teachers to guide them to higher achievement. A lot of them are the first females in their immediate families to attend school, and most of their teachers are male. According to such critics, although they attend school, females are still expected to "perform their everyday family duties such as laundry, cooking, and selling goods in the market" (Ananni-Akoller, 1999).

In connection with the belief in the previous paragraph, Clewell and Campbell (2012) conducted a study on 'Approaches to Promote Gender Equity in Ghana and discovered that the preference for male children to pursue STEM subjects is high, particularly, in rural education settings. In a related study, Asuma (2017) found that the male child is preferred to the female in traditional Ghanaian societies. The author argued that even if the female fetus is fortunate to escape abortion, the social customs of feeding the male child with proper nutritious foods are enough signals to a female child to know that she is less critical. The author pointed out this as a factor affecting the child's self-esteem. To strengthen the argument, Asuma (2017) added many similar examples of demoralising comments about the female child that makes her feel inferior or have reduced self-confidence, which, according to him, is among the reasons why girls are unable to take bold decisions to study STEM subjects. The above incidents commonly found in many traditional societies are refutable because the campaign for promoting girls in STEM subjects that started way back in the mid-80s has yielded some expected results (Asuma, 2017). Much of the results by Asuma (2017) show that the persistent breaks in the implementation of national STEM programmes in Ghana for promoting girls to higher levels in the study of S & T subjects have been detected and are being reversed.

4. Conclusion

In conclusion, several authors have argued that there are leaks in Ghana's pipeline for training and developing girls in STEM fields of study. To the assertion, the above write-up has brought out some programmes and projects against the argument. The contradictory view has been expressed in a discussion that highlighted the major steps taken by the government of Ghana to block the exit points where leaks have been observed while developing girls' skills. Four exit points have been identified, and arguments have been advanced to show that they are being blocked to pave the way for girls to have equal opportunities to develop their skills for STEM occupations.

5. Declaration of Competing Interest

The authors of the manuscript declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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