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The publication of the Mediterranean Journal of Social & Behavioral Research (MJOSBR) is going to be an important contribution for social and behavioral sciences. This journal has emerged as a result of international collaboration among academic scholars throughout the world. The editorial board consists of different academics from many countries. We welcome submissions to bring international quality of MJOSBR. The strength of any good journal arises from interdisciplinary academic perspectives represented by the members of its editorial board. With the launching of our new publication, we invite readers to submit their manuscripts to the MJOSBR, and welcome all articles contributing to the improvement of social and behavioral sciences. We would like to thank to the editorial board of MJOSBR for their voluntary support. The Mediterranean Strategic Research Center is also a supporting association in collaboration with the journal which publishes books in the related fields. Please do not hesitate to send us your valuable comments and suggestions. The journal will publish refereed papers, book reviews and selected papers from conferences as well as special issues on up-to-date problematic topics. MJOSBR is a platform for exchanging views related to social, behavioral and educational research. We welcome authors with the warm senses of Mediterranean culture and share the common global ethical views of our academic world.

Best Regards

MERT BASTAS, PhD.

Editorial Board

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Ethnomathematics in Kafa, Ethiopia: Number Sense and its Level of Inclusion in School Curriculum

Desta Geneme Gebre [1]*, Solomon Areaya Kassa [1], Kassa Michael Wodeyesus [1]

[1]Addis Ababa University, ETHIOPIA
***Corresponding Author:** destagenemegebre@gmail.com

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ABSTRACT

The purpose of this study was to find out the indigenous number and number sense of people in Kafa and to explore its level of integration to school curriculum. To this end, the study followed a qualitative research method which utilized ethnographic case study (embedded) design. Data were collected from 22 key participants through interview, observation, and focus group discussion. In addition, content analysis was used to investigate the level of integration of number and number sense to school curriculum. Accordingly, the study found that base six (maqoo) and base sixty (uddoo) counting systems, fractions and measurement related mathematical systems are found embedded in Kafa agricultural setting. The study further found that indigenous number and number sense of Kafa people were partially integrated in school curriculum. The implication of the finding is that there is a need to improve the existing school curriculum in a way it covers indigenous number and number sense of the people in Kafa.

Keywords: indigenous counting, indigenous number, people of Kafa, ethnomathematics, integration

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INTRODUCTION

School mathematics that students are learning today in Africa is the mathematics of mathematicians (Ayalew & Areaya, 2021; Bishop, 1988; Mosimege, 2017). According to Shizha (2014), the African education system today has been built on the view that mathematics is objective and culture free. As a result, students have very low interest to learn mathematics (Kaino, 2013) which in turn resulted low achievement of mathematics at school (Orey & Rosa, 2011; Shizha, 2014; Webb, 2013). Nowadays, there is worldwide initiative to re-construct indigenous knowledge and to integrate into school curriculum.

Currently, the Ethiopian education system has recognized the significance of integrating contextual knowledge of people into school curriculum. It was indicated in mathematics education guideline documents in that mathematics is a product of modelling real situations (Ayalew & Areaya, 2021; MoE, 2002).

According to socio-cultural perspective of education, the inclusion of human language, rules and agreement in school mathematics curriculum is one of the strategies to make mathematics meaningful to learners (Ernest, 1991). Furthermore, researchers in Ethiopia agree that mathematics is interconnected with people's practice and it is cultural (Ayallew & Areaya, 2021; Hilluf, 2015; Faris, 2012; Tesfamichael et al., 2021).

Different empirical evidences conducted on mathematics education also indicate that social life related mathematics education helps children's mathematics learning to be meaningful (Bishop, 1988; Kaino, 2013; Orey & Rosa, 2006, 2014). For example, a study conducted in Africa by Kaino (2013) in Tchkwe tribe cultural setting in Angola showed that Ethnomathematical curriculum was found to promote mathematizing by students which lead students to determine mathematical rules and laws.

According to Kaino the curriculum design process in Africa should include indigenous knowledge of a society for clear understanding of concepts and for long term retention of mathematical knowledge on the side of learners.

Mathematics used outside of school is a type of modelling; it is a way of representing reality so that further knowledge about reality can be obtained. In this regard, integration of Ethnomathematics to school curriculum creates an opportunity for learners to mathematize the cultural practices (Kaino, 2013, Menon, 2013; Nunes, 1992; Tesfamichael et al., 2021). Thus, in connection to this, Nunes (1992) argues that brining out-of – school indigenous mathematics into the school is important and this is possible when it is integrated into school curriculum. Therefore, identifying indigenous knowledge in general, indigenous number and number sense in particular is important in this regard. Furthermore, exploring the level of inclusion is among important issues of investigation, in the current study.

Ethnomathematics

There are two fundamental conceptions on Ethnomathematics: general and specific. In general view, Ethnomathematics has been conceived as program of study consisting of history, pedagogy, philosophy and research activities in mathematics education (D'Ambrosio, 1990; Orey & Rosa, 2011). By extension, Ethnomathematics has been defined as a program of study that explores varying forms of mathematics that emanates from different group of people with different modes of thought. Similarly, Orey and Rosa (2011) defined Ethnomathematics as a program of study that deals with what and how we teach mathematics in the context of the school, culture and society. In this regard, the conception of Ethnomathematics has been connected with research program, subject of study, philosophy of mathematics and social theory of mathematics that deal with inter-connection between culture, language, epistemology and mathematics. On the other hand, Ethnomathematics has been conceptualized as mathematical idea, concept of a certain society or group of people at a specific cultural setting (D'Ambrosio, 1985; Frankenstein, 2014). However, there exists a debate on the boundary of cultural group used in the definition of Ethnomathematics. While some associated the cultural group with "illiterate, colonized and irrelevant" (Asher & Asher, 1997), some others associated the cultural groups with "people that have similar context, language and socio-cultural background" (D'Ambrosio, 1985; Frankenstein, 2014; Orey & Rosa, 2011). The center of this disagreement fundamentally depends on the individuals' attempt to extend or stop the former colonization agenda in the developing countries like Africa (Faris, 2012; Nsamenang & Tchombe, 2011; Shizha, 2014). In this regard, those who conceptualize Ethnomathematics, as mathematics of illiterate perceive mathematics as objective and universal, and, thus, they attempt to transmit their culture and their knowledge to the society of developing countries (Orey & Rosa, 2011; Shizha, 2014). To the contrary, those scholars who are attempting to actualize real development in the developing countries struggle to integrate Ethnomathematical knowledge to mathematics education. Pertaining to this; researchers of this article believe that integrating Ethnomathematics to school curriculum is providing complete view on mathematics and bridging the gap between mathematics and cultural practices.

School Curriculum

The conception of curriculum is many things to many people. As Ornstein and Hunkins (2018) point out, the definition of curriculum perpetuates some assumptions and beliefs. The purpose of school, how students should learn, who should learn what and how school learning should be organized are among the issues of concern when scholars define the term curriculum (Pinar, 2004). According to Pinar (2004, p. 186), the conception of curriculum is highly symbolic. It contains issues of history, race, gender, phenomenology, autobiography, aesthetic, theology and international issues. Due to these multifaceted issues implicitly attached to it, it has complicated conversation. These dialogues and conversations create multiplicity with respect to its conceptions and definitions. According to Oliva (2005), the definition of curriculum in schools differs due to the purpose, context and strategies that schools adopt to follow. In this regard, Oliva (2005) described curriculum as an elusive, almost *esoteric* term that always need operational definition guided by the basic assumptions of schools. Oliva further indicated that *the amorphous nature of curriculum that ranges from simple to broad has resulted in multiple interpretations and conceptions (Oliva, 2005, p. 3).* Ornestein and Hunkeins (2018, p. 19) also described that the definition of curriculum is influenced by multiple factors as educational philosophy, politics and culture of society. Based on the fundamental issues of education, its definition contains multiple variable components. Pertaining to this, they described the curriculum as a field of study that has been characterized by elusive, fragmentary, and confusing which stretches from very narrow as subject thought at school to broad as the experience of students (Ornestein & Hunkeins, 2018, p. 19).

As Kelly (2004) described curriculum is equated with syllabus which is limited to contents and body of knowledge that schools intend to transmit (p. 4). Further review on the detail of curriculum shows that curriculum definition encompasses very simplistic ideas as contents in the textbook and training manuals (Faris, 2012). According to Areaya (2008), major variations on the definitions of curriculum are attributable to variations on the meaning and values of education emphasized in general. Oliva (2005) indicated the multiplicity of definitions on curriculum when the author said the curriculum definition can be conceived as *content* thought in schools in narrower sense and as both planned and hidden experiences of learners in the school and outside school setting (Oliva, 2005, p. 3). Despite these multiple definitions and conception, in the current study, curriculum refers to the textbooks, teacher's guide and the syllabi of school curriculum. Accordingly, school curriculum in this paper refers to lower primary school mathematics syllabi, textbooks and teachers' guide designed to teach mathematics in primary school in Kafa, Ethiopia.

Integration

Integration connotes different ideas for different person. It has multiple conceptions and definitions. However, it is conceptualized on the assumption that learning is not an isolated event and that connecting ideas across subjects, concepts and themes is an important component of deep understanding (Munro, 2017). According to Albeta Education (2007), integration in curriculum refers to the approach in which curriculum experts purposively draw together knowledge, skill, attitudes and values from or across subject areas to develop a more powerful understanding of ideas (p. 2). Loepp (2000) further described the importance of setting boundary for the issue of integration when saying integration should be conceived within a particular subject than wider. According to Schumacher (2016), the process of bringing two or more ideas within or among subject/s in order to make learning meaningful and full for understanding is termed integration in curriculum. Despite variations evident in the definitions, it deals with connecting ideas, concepts and themes of subjects together in order to make curriculum more meaningful, complete and valuable. Integration, in this paper, refers to the process of including indigenous mathematics to school curriculum so that students learn mathematics meaningfully.

According to Loepp (2000), integration should be standard based, meaningful and consistent. The approach should have underlining principles in order to make the curriculum relevant and should have a positive add to students' learning. In this regard, Davison, Miller and Methny (1995) pointed out that well planned integration creates opportunity for learners to apply scientific knowledge in real situations, assist students to deal with contexts, contents and problems from variety culture (p. 226). Integration, in this case, is providing complete view, knowledge, skill and attitude from multiple knowledge systems

so that learners get full package of knowledge from different knowledge systems.

Integration of indigenous mathematical knowledge to school curriculum is about making school mathematics contextual in terms of its contents, methods and processes that predominantly take the owners and users of the education system at the center. According to Ronah (2017), integration of indigenous knowledge to school curriculum provides alternative ways of solving problems, eases understanding and making the learning environment rich and aspiring to learners.

We believe that school curriculum need to be built on the assumption that Indigenous knowledge integration to school curriculum makes students' learning meaningful. According to Adam, Alangui and Barton (2003), school curriculum need to be constructed in consideration with students' experience, knowledge and ways of life. The epistemology, the content, the classroom culture and the approach to learning mathematics should be connected with students' experience and their prior knowledge.

The school curriculum, in the current study refers to primary school mathematics syllabi and students' textbooks. Despite it contains four strands: number, geometry, measurement and statistics (MoE, 2002); this study attempted to explore the incorporation of number and number sense in the curriculum. To this end, contents of primary school curriculum in Kafa were analyzed to explore the level of integration of indigenous number and number sense in school curriculum.

Statement of the Problem

In Ethiopia, both the former education and training policy (1994) and the current education road map (2018) acknowledge that Ethnomathematical knowledge of people in Ethiopia should be integrated to school curriculum so as to make students' learning meaningful. It is indicated that school curriculum should be organized in a way it contains students' prior mathematical experience and indigenous knowledge of the society (MoE, 2014; MoE, ESC, 2018). However, we argue that integration is beyond recognition. It needs exploring and identifying mathematical knowledge of people within a particular context. In Ethiopia, Indigenous mathematical knowledge of people is not documented in the way it could be integrated in school curriculum (Ayalew & Areaya, 2021; Hailu, 2016). Our study was planned to fill this gap through exploring and documenting number and number sense of Kafa people in Ethiopia. Furthermore, some general studies conducted in Ethiopia (Nasir & Tefera, 2017; Solomon, 2012) reported that Ethiopian education system does not contain indigenous knowledge of people in Ethiopia. On the other hand, Hilluf (2015) based on a study conducted in Khmira people's setting reported that Ethnomathematics in the setting is integrated in lower primary school curriculum but it is infrequent in upper primary. Despite Hilluf's study was not related to primary school curriculum, the authors of this paper believe that exploring lower primary school curriculum and identifying the level of integration is paramount in Ethiopia. In addition to this, absence of study conducted in Kafa together with very few study conducted in Ethiopia initiated the authors of this study to undergo this research in Kafa, Ethiopia.

Objectives of the Study

The objective of this study was to explore indigenous number and number sense in Kafa, Ethiopia and find out how the knowledge is integrated in primary school curriculum of Kafa, Ethiopia.

Research Questions

By way of addressing the aforementioned objectives, the study answered the following research questions:

1. What number and number sense is available in the agricultural practices of people in Kafa?
2. Which indigenous number and number sense of Kafa people is/are integrated in primary school curriculum?

METHODOLOGY

This study was qualitative which explored number and number sense of people in Kafa, Ethiopia and described the inclusion of number and number sense of Kafa people in primary school curriculum. As indicated in the intent of the study, data collection was done through qualitative methods followed by directed content analysis run on primary school curriculum in Kafa, Ethiopia. There were two phases of data collection. The first data collection was done through interview, observation and FGD. The second data was collected through content analysis template designed to explore primary school curriculum. For this section data was collected through directed thematic analysis.

Data Collection Instruments

We used multiple data collection tools such as observation, interview, focus group discussion and document analysis. Accordingly, data was collected from 22 key informants. The second phase of data was collected through content analysis template. This assisted the researchers to explore the inclusion of indigenous number and number sense in primary school curriculum.

Methods of Data Analysis

Data analysis in qualitative study involves the process of coding, categorizing and building analytic description. There were two portions of data analysis in the current study. The first phase dealt with the analysis that investigated indigenous number and number sense of the people in Kafa, Ethiopia and the second phase dealt with exploring the integration of the knowledge to school curriculum. To analyze the data, we used Yin's (2011) data analysis framework followed by Bishop (1988)'s classification of universal mathematical practices.

Analysis of the Text of School Curriculum

Content analysis can be done qualitatively. It is the process in which the researcher carefully examines the contents in the data of text (Creswell, 2007). To this end, words and phrases that reflect indigenous number and number sense were counted and percentage was used to determine the level of inclusion of Indigenous number and number sense. Furthermore, qualitative descriptions using words were used to visualize the way how indigenous number and number sense were integrated in the school curriculum.

RESULTS

Number and Number sense in Agricultural practices of people in Kafa

Counting in Maqqoo and Uddoo

People of Kafa use counting in *maqqoo* and *uddoo* as part of day-to-day practice. There is strong societal need to use this mathematical knowledge. In this regard, they use number words from one to five as

Table 1. *Maqqoo* and base six numerations

Number	Name in *Kafinoono*	In base six	Number	Name in *Kafinoono*	In base six	Number	Name in *Kafinoono*	In base six
1	*Ikkoo*	1	7	*Ikkee Maqqaa ikkoo*	11	13	*Guttee maqqaa ikkoo*	21
2	*Guttoo*	2	8	*Ikkee Maqqaa guttoo*	12	14	*Guttee maqqaa guuttoo*	22
3	*Keemo*	3	9	*Ikkee Maqqaa keemo*	13	15	*Guttee maqqaa keemo*	23
4	*Awuddoo*	4	10	*Ikkee Maqqaa awuddoo*	14	16	*Guttee maqqaa awuddoo*	24
5	*Uuchoo*	5	11	*Ikkee Maqqaa uuchoo*	15	17	*Guttee maqqaa uuchoo*	25
6	*Ikkee Maqqoo*	10	12	*Guttee maqqoo*	20	18	*Keejjee maqqoo*	30

Table 2. *Uddoo* and base sixty numerations

Number	Name in *Kafinoono*	In base sixty	Number	Name in *Kafinoono*	In base sixty
60	*Ikkee uddoo*	10	102	*Ikkee uddaa aabba guttoo*	*1(42)*
61	*Ikkee uddaa ikkoo*	11	103	*Ikkee uddaa aabbaa keemo*	1(43)
62	*Ikkee uddaa guttoo*	12	104	*Ikkee uddaa aabba awuddoo*	1(44)
63	*Ikkee uddaa keemo*	13	105	*Ikkee uddaa aabbaa uuchoo*	*1(45)*
64	*Ikkee uddaa awuddoo*	14	106	*Ikkee uddaa aabbaa shirittoo*	1(46)
65	*Ikkee uddaa uuchoo*	15	107	*Ikkee uddaa aabbaa shabaattoo*	1(47)
66	*Ikkee uddaa shiittoo*	16	108	*Ikkee uddaa aabbaa shimittoo*	*1(48)*

Table 3. Fractional terms in Kafa Culture

Fractional term	Description in English	Mathematical symbol
Qato	*Half of an object*	½
Heecoo	*Quarter of an object*	¼
Woocoo	*One eighth of an object*	*1/8*
Wollicoo	*One sixteenth of an object*	*1/16*
Qachaa heecoo	*Half and quarter (½ + ¼ = ¾)*	¾
Heecaa Woocoo	*Quarter and one eighth (¼ + 1/8 = 3/8)*	*3/8*
Woocaa Wollicoo	*One eighth and one sixteenth (1/8 + 1/16 = 3/16)*	*3/16*
Wocaacilloo	*One thirty second (1/32)*	*1/32*
Wollicaa wocaacilloo	*One sixteenth and one thirty second (1/16 + 1/32 = 3/32)*	*3/32*

Table 4. Description of indigenous units of length measurements and their approximation

Local unit of length	Description	Estimation in Western unit
yafero	The thickness of one middle finger	1 finger ≅ 2.5 cm
Ciixo	Distance from the tip of thumb to the tip of middle finger	1 finger span ≅ 25cm
Hiroo	Distance from elbow to the tip of middle finger	1 hand ≅ 50cm
Shaadoo	One step or stride	1 stride ≅ 1 m
Matoo	Hug – distance from the tip of middle finger in the left hand to the tip of middle finger in the right hand when stretched.	1 hug ≅ 2m

ikkoo (one), *guttoo* (two), *keemo* (three), *awuddoo* (four) and *uuchoo* (five), *maqqoo* (six), *ikkee maqqaa ikkoo* (seven); *ikkee maqqaa gutto* (eight), *ikkee maqqaa keemo* (nine), *ikkee maqqaa awuddoo* (ten), *ikkee maqqaa uuchoo (11), guttee maqqoo (12).* We have presented the relationship between *maqqoo* counting to base six numeration systems as in **Table 1**.

In Kafa culture, there is inter-connection between *maqqoo* and *uddoo* counting systems. *Aashiree maqoo* (ten groups of six) represents *ikkee uddoo* (one sixty).

As indicated in the table, people in Kafa use number in mathematical words. These number words and descriptions assist every individual to easily understand the numeral in base six. For example, 17 in *maqqoo* counting can described as two *maqqoo* and five. It shows that 25 in base six (*maqqoo*) numeration. Similarly, *uddoo* counting is used in the cultural setting. Examples of *uddoo* numeration are given in **Table 2**.

These mathematical systems are well connected with base six and base sixty numeration systems. For example, the name *guttee uddaa aaraa shirittoo* describes the number 2(16) in base sixty which is the same as 136 in base ten.

Fraction and Fractional Terms

Fractions represent part of a whole. As Baratto, Bergman, and Hutchison (2009), indicates the history of fraction was related to the Latin word *fractio* which is attached to breaking objects into pieces. Thus, it refers to a whole divided into its parts. In Kafa cultural setting, these mathematical ideas and practices are exercised interwoven both in the language of communication and in the cultural experiences. **Table 3** presents descriptions of fractions in Kafa people.

As presented in **Table 3**, the study confirmed the existence of specific mathematical ideas like fractional terms described in the language and convention of people of Kafa in the socio cultural setting.

Conversion and Unit of Measurement

The result of this study showed that people practice specific cultural units of measurements that have specific relationships among each other. The following table presents each indigenous unit of measurement as summary of the results of the study.

As **Table 4** presents, *yafero, ciixo, hiroo, shaaadoo* and *matoo* are common units of length measurements in Kafa people's agricultural setting.

Table 5. Description of indigenous area units and their relationships with standard units

Area units	Relationship between the units	The estimate measure of area in Western units
Haaroo		One *haaroo* = 50 M^2
Ikkee Angoo (ox plow)	*One angoo = 20 haaroo*	One ox plow = 1000 M^2
Shanee goyo (One week's farm)	One week's farm = 5 ox plow	5000 Square Meter
Ikke hektaaro (One *Hectare*)	One *Hectare* = two weeks farm = 10 ox plow	One *Hectare*= 10,000 M^2
Ikkee gaachoo (one gaachoo)	One *gaachoo* = 40 hectare = 400 ox plow	One *gaachoo* = 400,000 M^2

Table 6. Summary of indigenous units of weight

Local unit of weight	Description	Estimation in Western unit	Remark
Kubaayo	A device that people measure the amount of cereals and agricultural products	One *kubaayo* = 1Kg	
Qunno	A device that contains six *kubaya* of cereal	One *Qunno* = 6Kg	
Daawulloo	A bag that contains 20 *qunna* of cereal	One *Daawulloo* = 120Kg	
Farasulloo	The amount of honey or coffee equivalent to 17Kg	One *Farasulloo* = 17Kg	

Table 7. Summary of content analysis on the integration of indigenous number and number sense (INNS) in primary school curriculum

Sub content themes on number and Number Sense (NNS)	No of Content	Grade level				
		G1	G2	G3	G4	Total
Counting, ordering, pattern and operation	Total content	17	22	8	8	56
	IC	0	0	0	0	0
	% of IC	0	0	0	0	0
Fraction and Operation on Fractions	Total content	2	5	6	7	20
	IF	2	2	2	4	10
	% 0f IF	100	40	33	57	50
Measuring and units of measurement	Total content	3	14	10	24	51
	IM	3	3	3	6	15
	% of IM	100	21	30	25	29.41
Total	Total	22	41	24	40	127
	INNS	5	5	5	10	25
	% of INNS	22.7	12.2	20.8	25	19.69

Area and relationships among area units is another mathematical practice observed in the agricultural setting of Kafa with regard to conversion and comparison. **Table 5** presents indigenous units of area in Kafa people.

As **Table 5** presents, people of Kafa use different indigenous units for area measurement in agricultural setting. In this regard, the study investigated that *haaroo* (section of ox-plow land), *angoo* (ox-plow), *shane goyoo* (week's farming), *hektaaroo (hectare)* and *gaachoo* as indigenous units for measuring agricultural field. Another important finding of this study was people's cultural units of weight measurement. **Table 6** presents the summary of the results of weight measurement units in the area.

As the summary table presents, people of Kafa use *kubaayo*, *qunno*, *daawulloo and farasulloo* for measuring weight of objects. The finding of the study further showed that the local units of weight measurement in Kafa are dependent on the type of agricultural product. For example, the weight of one *kunna* of *coffee (ikke qunnee bunoo) with hull* is different from the weight of one *kunna* of *teff*. While the weight of one *kunna* of *teff* is estimated as 6kg, that of one *kunna* of coffee with hull is 3.36kg.

Indigenous Number and Number Sense in School Curriculum

Indigenous number sense in this paper refers to counting, number pattern and algorithms related to *maqqoo* and *uddoo* counting, fraction and fractional terms and measurement and units of measurement included in primary school curriculum.

The result of content analysis as depicted in **Table 7** showed that indigenous counting (IC) in *maqqoo* and *uddoo* were not included in school curriculum as content. The analysis further showed that the percentage of inclusion of indigenous fraction (IF) and indigenous measurement (IM) in primary school curriculum were 50% and 29.41% respectively.

The result of overall indigenous number and number sense (INNS) contents included in primary curriculum, however, was 19.69%. This shows that the level of inclusion of indigenous number and number sense in primary curriculum could be levelled as low.

More specifically, indigenous counting in six (*maqqoo*) and in sixty (*uddoo*) were the overlooked dimension in the strands of number in primary school curriculum. Our key informants involved into our study also confirmed that indigenous way of counting in *maqqoo* and *uddoo* were not included in the curriculum. For example, Mr. Gawo, a lower primary school teacher described the issue as follows "*the idea of counting in indigenous ways such as maqqoo and uddoo are not included in the curriculum materials (Mr. Gawo, March 31/2019".*

Teachers involved in our study confirmed that indigenous way of counting was not integrated in school curriculum of Kafa, Ethiopia. Our key informants also confirmed the inclusion of fractional ideas found in the cultural setting in to school curriculum as content. For example, Ms. Gaboogi, one of our teacher informants had the following to say.

> When I see the detail of contents in the texts that I am teaching, among numbers and number related concepts, fraction and fractional concepts are well connected with the cultural mathematical descriptions (Ms. Gaboogi; March 26/2019).

Table 8. Percentage of Indigenous Units of Measurement in school curriculum

No	Category Codes	Grade One			Grade Two			Grade Three			Grade Four			Total		
		Total No	IU Content	%	Total No	IU Content	%	Total No	IU Content	%	Total No	IU Content	%	Total No	IU Content	%
1	IUL	1	1	100	4	0	0	2	0	0	6	0	0	13	1	7.69
2	IUC	1	1	100	2	0	0	2	0	0	4	0	0	9	1	11.11
3	IUW	1	1	100	1	0	0	2	0	0	3	0	0	7	1	14.29
4	IUA															
4	IUM				2	2	100	2	2	100	4	4	100	8	8	100
5	IUT				5	1	20	2	1	50	7	2	29	14	4	29
Total		3	3	100	14	3	21	10	3	30	24	6	25	51	15	29.41

The extract of the teacher's interview confirmed that contents on number and number sense contained the indigenous fractional terms of Kafa people in its curriculum. In this case, the data shows the curriculum material contains indigenous fractional terms as content under the strand as part of number. However, the analysis of the contents arrangement indicated that 1/3 was included as content prior to ¼ which is against the principle of socio cultural theory of learning which promotes the curriculum content organization based on children's prior experience. Culturally sensitive pedagogy advices curriculum workers to present contents inter connected with people's culture prior to the new content to the culture of people (Shizha, 2014). Furthermore, some of fractions and fractional descriptions such as *qachaa-heecoo* and *heecaa-woocoo* were nonexistent in the primary school curriculum material. Teachers involved in our study argued that the problem occurred it was because contextualization was done only on the language of the curriculum. For example, regarding the issue Mr. Gawo said the following.

> The difference between the content of lower primary school mathematics in Kafa and the nationally prepared curriculum materials is only on the language of the content (Mr. Gawo, March 31/2019).

Teachers involved in our study confirmed that mere focus only on the translation of the nationally prepared curriculum affected meaningful contextualization, in this regard.

As indicated in **Table 7**, 29.41% of the whole measurement related contents of school curriculum was related to indigenous units as content. However, further observation on the detail of the content analysis table shows that indigenous measurement related contents included in the curriculum material were skewed to money and time units.

The result depicted in **Table 8** indicates that the percentages of indigenous units of money and time were 100% and 29% in primary curriculum. On the other hand, the percentage of inclusion of indigenous unit of length (IUL), capacity (IUC), weight (IUW) and area (IUA) were 7.69%, 11.11% and 14.29% respectively. This shows that the level of inclusion of indigenous units in primary curriculum was skewed to money and time units than others. Despite this, our informants had confirmed that indigenous units were integrated in school curriculum in gross. Ms. Gaboogi described

> When people in Kafa measure the length of rope, they measure using their hands. When they measure the distance between two poles inside their farm field, they measure using their strides. These types of length measurement units are included in grade one students' curriculum material (Ms. Gaboogi; March 26/2019).

As indicated in the above extract, Ms. Gaboogi indicated that indigenous units of length are among indigenous contents included in the lower primary school as content. Mr. Gawo, a teacher in one of lower primary schools of Kafa, described the inclusion of indigenous units of length and capacity in the lower primary school curriculum when he pointed out the issue of inclusion as indicated below.

> In house construction; xaamo (foot), hiroo (hand), ciixo (finger span) and yaferoo (finger) are common. In measuring capacity the objects they use doolloo (cup), qondoo (pitchers), goto (granary) and the like. These units of measurements are part of school curriculum (Mr. Gawo., March 25/2019).

As the extract indicates indigenous units of length measurements were included in the lower primary school curriculum as content. Having identified the indigenous number and number sense integrated in lower primary school curriculum, we have explored the details of the activities and exercises included in the curriculum if the indigenous number and number sense were consistently integrated in the details of the exercises.

The result of content analysis in **Table 9** indicates that 21.29% of the whole contents of examples, exercises and activities were related to indigenous fraction. Furthermore, 4.61% of the activities and exercises on measurement contained indigenous units and practices related to indigenous measurements.

However, the overall percentage of inclusion of indigenous number and number sense in exercises and activities was 5.87% which shows that the level of inclusion was very low.

DISCUSSION

The intent of this study was to explore indigenous number and number sense integrated in the school curriculum and to find out its level of inclusion in the curriculum. The key issues pertaining to the finding of this study are offered in the following sub sections.

Indigenous Number and Number Sense in Agricultural Setting of Kafa, Ethiopia

According to Fisher (1993), number and number sense refers to mathematical systems related to concepts, rules and algorithms that emanate as a result of counting and number pattern. In this regard, this study found that base six and base sixty numeration systems, fractions and measurement related concepts are found connected with people's cultural practices.

Table 9. Percentage of indigenous number and number sense in the exercises and activities of school curriculum

Sub content themes on number and Number Sense (NNS)	No of exercises and activities	Grade level				Total
		G1	G2	G3	G4	
Fraction and Operation on Fractions	Total exercise	15	72	88	182	357
	IFR	11	15	44	6	76
	% of IFR	73.3	20.8	50	3.3	21.29
Measuring and units of measurement	Total exercise	65	1710	2350	216	4341
	IMR	45	45	94	16	200
	% of IMR	69.23	2.63	4	7.41	4.61
Total	Total	80	1782	2438	398	4698
	INNSE	56	60	138	22	276
	% of INNSE	70	3.37	5.66	5.53	5.87

Counting in *maqqoo* and *uddoo* as Base Six and Base Sixty Numeration System

According to Landon (1993), numeration system is a set of rules for establishing the names of numbers. In Kafa culture, the conventional names in *maqqoo* and *uddoo* counting systems have systematic rules which are built on base six and base sixty numeration systems. This finding can be seen as an extension of the work of Bishop (1997) who indicated that counting as a socio-cultural activity includes "mental abilities of numerical methods".

Fractions and Fractional Descriptions as Cultural Practices

Fractions represent part of a whole. As Baratto et al (2009), indicates the history of fraction is related to the Latin word *fractio* which is attached to breaking objects into pieces. The study found that such experiences are evident in Kafa as embedded in their activities. In Kafa culture, fractional ideas are used in connection with day-to-day activities and cultural convection such as *machago* of shared cattle keeping in Kafa, Ethiopia. Accordingly, the study confirmed what was reported in the former studies that specific mathematical ideas are found interwoven in the language, convention and agreement of people in the socio-cultural setting (Bishop, 1988; Ernest, 1991, Sriraman & English, 2010).

Conversion and Unit of Measurement

The finding of this study showed that people in Kafa use their body parts and physical objects for measuring objects. The study found that *yafero, ciixo, hiroo, shaaadoo* and *matoo* as indigenous units of length in Kafa. Furthermore, it was found that *haaro*, ox plow (*angoo*), week farming (*shanee goyo*), *hectare (hektaaro)* and *gaachoo* are indigenous units of area and k*ubaayo*, *qunno*, *daawulloo and farasulloo* as indigenous unit of weight in agricultural setting of people in Kafa, Ethiopia. There are also studies conducted in other setting that reported people's use of local and contextual tools and units of measurement. For example, a study conducted by Amit, and Qouder (2017) indicated that body parts of people in *Bedoli* is common unit of measurement for length. Similarly, a study by Hilluf (2015) from a study conducted in Khimra people of Ethiopia reported similar finding. Though this study investigated additional units such as *haaroo, shanee goyo* (week farm) and *gaachoo* as area units, the study agrees with Hilluf (2015)'s finding in that people of Khmra people in Ethiopia use pair of oxen to measure land area which is comparable with *angoo* of the Kafa people. Regarding indigenous units of weight our study's finding disagrees with Amit, and Qouder (2017)'s study conducted in Bedouins in Israel reported that people use *reten* (3 kg), *wakeh* (2509kg), and *gentar* without considering the type of crop for weight measurement.

Indigenous Number and Number Sense of Kafa People in School Curriculum

Empirical studies conducted in Africa regarding Ethnomathematics (Arcavi, 2003; Mogari, 2014; Mosmege, 2017; Orey & Rosa, 2011) recommended that mathematics curriculum should encompass the cultural mathematical knowledge without selective validation so as to assure students' meaningful learning. For example, Orey and Rosa (2011, p. 42) argued that school mathematics should value, reinforce and include the knowledge of students instead of disregarding. With respect to this, our study found that among number and number related knowledge of people in Kafa, indigenous fraction and fractional terms were highly emphasized and integrated in the lower primary school curriculum in Kafa, Ethiopia. On the other hand, the study identified that indigenous units of measurements of time and money were the overtly recognized and included indigenous units of measurements in school curriculum than others. Such representation reflects partial validation of indigenous mathematical knowledge in the curriculum (Phiri, 2008, p. 68). Partial validation, in this case, refers to the inclusion of some of the indigenous contents leaving some equally important contextual contents in the curriculum.

The finding of this study extended the result of study conducted in Africa. Phiri (2008) who based on a study conducted on representation of Indigenous science to school science concluded that in African school curriculum, Indigenous Knowledge is partially validated. In addition, Magni (2017, p. 443) pointed out that school mathematics should keep equilibrium in validating both local and non local knowledge systems. Our study found that there exist variations among contents of primary school curriculum pertaining to its level of inclusion of indigenous number and number sense. It was found that indigenous counting was less recognized and ignored dimensions among indigenous number and number sense included in school curriculum in Kafa, Ethiopia.

The result of the study indicated that there existed the problem of consistency in laying foundation to use indigenous number and number sense in the lower primary school curriculum. The result of content analysis showed that some Indigenous number and number sense and indigenous units were largely acknowledge and included in the curriculum as content but excluded from the exercises, activities and examples of the school curriculum.

The study thus found that there existed variations in curriculum workers' attempt to integrate indigenous number and number sense of Kafa people in school curriculum. For example, while indigenous unit of money and time cover higher coverage from the content section to exercises, indigenous unit of length and capacity were limited to content alone. In this regard, contextualization of contents of the

curriculum which was echoed in the syllabus did not work for every strand and to all indigenous number related content properly.

Despite contextualization entails the use of content, examples and applications of scientific principles to situations that are familiar to students; lived experience and world views (Gwekwere, 2016); contextualization has been exercised in lower primary school curriculum of Kafa, Ethiopia in its limited sense. In the primary school curriculum preparation process, contextualization of primary school mathematics relied on the use of local language, local pictures and local names as major tools. In addition, the level of recognition given to indigenous knowledge varies from specific content to content. For example, while all non indigenous units of measurements were used in the activities and word problems, most indigenous units of measurement were excluded from word problems and practice exercises. Thus, in the continuum of indigenization of school curriculum, the attempt to integrate indigenous number and number sense is inconsistent and can be labelled as low level which calls for curriculum improvement.

CONCLUSION AND IMPLICATION

Indigenous number and number sense, as a system of mathematics in a particular setting, deals with pattern, order, structure and relationships among number and counting related mathematical concepts (Fisher, 1993; FitzSimons, 2002, p. 17). In this regard, our study found that base six and sixty numeration system, fraction and fractional descriptions and relationship among local units of measurement as number and number sense in agricultural setting of people in Kafa. The implication of the finding is that mathematical concepts are found interwoven the cultural practice of people. Therefore, mathematics education in Ethiopia needs to be geared towards mathematizing.

According to Ronah (2017), curriculum should reflect society's values and knowledge systems and its development should regard the indigenous knowledge and day-to-day experiences as point of opening. In this regard, our study found that indigenous number and number sense is selectively validated in the primary school curriculum of Kafa, Ethiopa. More specifically, the study showed that of the different indigenous contents, only indigenous fraction and some indigenous unit of measurements were included in the school curriculum. This shows that indigenous number and number sense of people in Kafa was partially validated and included in school curriculum. At this juncture, it is concluded that the inclusion of some of indigenous number related contents was not well planned and organized but it was random in Kafa. They were integrated as sudden match of contents occurred in the process of curriculum preparation. The implication of this finding is that school curriculum of Kafa, Ethiopia need to be revised in a way it contains Indigenous number and number sense.

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Research Article **OPEN ACCESS**

Effect of Tutorial on Students' Communication Skill in Google Classroom in University of Port Harcourt

Sandra Eberechukwu Augustine [1]*, Lois Nkechi Abraham [1]

[1]Department of Curriculum Studies and Educational Technology, University of Port Harcourt, NIGERIA
***Corresponding Author:** sandra.augustine@uniport.edu.ng

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ABSTRACT

This study established students' communication skills level in Google classroom in the Faculty of Education, University of Port Harcourt. The study used one group pretest-post-test pre-experimental research design and a sample size of 70 students from the Department of Educational Management, selected via purposive sampling technique. Two (2) research hypotheses guided the study. Google Classroom Communication Skills Test (GCCST), with a reliability coefficient of 0.87, was the instrument for data collection. Sign test and Quade's Analysis of Covariance were for analyzing data. The results showed that the students' communication skill level in Google classroom increased and significantly higher due to the tutorial on Google classroom utilization. However, the students' communication skills level in Google classroom did not significantly differ based on gender. The results led to the recommendation that instructors expose students to the basic skills required to use and communicate effectively in every online learning platform before adopting such for instructional purposes.

Keywords: online learning, Learning Management System (LMS), Google classroom, communication skill, tutorial

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INTRODUCTION

Education should be made accessible, flexible, and sociable to contemporary learners, whose frequent presence in the digital space is unquestionable, with brains wired over the social networks. Digitalization of education remains the best way of improving teaching/learning in this technological age. The era when teaching/learning is restricted purely to the physical classroom environs has long eluded owing to the proliferation of Information and Communication Technologies (ICTs) and online instructional platforms. Online teaching/learning, as one of the trending innovations in the education system, has necessitated the development of many online instructional platforms or Learning Management Systems (LMSs) in recent years to facilitate online course development, delivery, and management of courses and learners' progress. Most of these LMSs (Google classroom, as a sample) are free and available for teachers to adapt for online instructional purposes.

Google Classroom is a classroom that was created and hosted by Google for online teaching and learning. Google Classroom is a tool in the Google Apps for Education (GAFE) that works with other Google applications such as Google Mail (Gmail), Doc, Drive, Form, sheet, among others. It is accessible via a Google account. Google Classroom can be downloaded and installed as an application in android and smartphones from Google Play and Apple stores, respectively, or accessed directly through the website https://classroom.google.com/ using whichever browser in an Internet-connected computer. Teachers can use this online classroom to create a class where they can add learning materials (in textual, hyperlinks, video, audio, or image formats), discussion questions, assignments, and quizzes with due dates, post announcements, grade assignments, and provide students with timely feedback. Students can join a class through each class-generated code or by email invitation from a teacher. Google Classroom gives students easy access to course contents, allows them to share learning materials, post information or comment on other people's work, turn in assignments, and access their grades and teacher's feedback. Google classroom, therefore, promotes a paperless education system and serves as an online platform where teachers and students meet to exchange ideas and interact in real and odd times. Bell (2015) affirms that Google vendors created Google Classroom to assist educators and learners to have limitless opportunities for online collaboration, communication, management of paperless assignments, and organize their teachings. Unicheck Team (2017) noted that Google classroom helps students to utilize learning time effectively and to learn at a faster rate.

Google Classroom has many features that promote effective class communication and learning for both learners and teachers. The most visible features available to students joining the online classroom are Stream, Classwork, People, and Grade pages. Stream page contains class notifications on announcements, course works, and posts or comments starting from the most recent. Students can equally use the Stream page

to submit assignments, share questions or information to the class through posts or comments. The Classwork page contains course works, assessments, and questions organized by units or topics. The people page has the names and pictures of all the teachers and students who are members of a class, and this page allows class members to establish private communication with one another through email. The Grade page is where students see their scores on any assignments or answer questions they have submitted to the class. The grade page is where students can see their scores on any graded questions, quizzes or assessments, and filters the status (such as grade, missing, or turned in) of their works.

Google classroom also contains symbolic features that allow students to attach and upload images, files, videos, or links, either from Google Drive or computer to their posts when clicked. From other features available in Google classroom, students can delete posts or comments they have created, reply to comments, send private comments to their teachers from the assignments in the Classwork page, mention their class members in their posts, answer questions, and also see assignments and notifications and in the class calendar. Google Classroom serves as a platform to manage assignments in paperless form. Students have great opportunities to submit their assignments to their teachers online, either with or without a file attachment. Submitting an assignment with a file attachment requires clicking the 'Turn in' feature; submitting an assignment without a file attachment requires clicking the 'Mark as done' feature. Students can also edit assignments submitted before the assignment due date by clicking the Unsubmit button, effect corrections, and resubmit the assignment.

Nevertheless, for students to understand the features and affordances of Google classroom and use it for interactions and learning effectively, it might be expedient for them to develop adequate online communication abilities. Communication is the exchange of information from one person to another through a medium like Google classroom. Therefore, students' high communication skills level in any online instructional tool may go a long way to prove their readiness to study using such a tool.

Previous researchers have conducted some studies related to students' communication skills level. Among these are those of Quail et al. (2016), who examined students' communication knowledge, skill, and assurance in online, standardized patients, and conventional training environments. Their results indicated that the students' communication knowledge, skill, and assurance were higher after they were placed across the different learning environments. Bin Mohd Jalaludin and Bin Ihkasan (2014) carried out a study in a Malaysian University to investigate undergraduates' interpersonal communication skills level and found that students' interpersonal communication skills' level is high with a significant difference de gender. Iksan et al. (2012) investigated students' communication skills level in the University of Kebangsaan Malaysia and discovered that the students' communication skill level was good. Jannatul-Ferdows and Ahmed (2015) investigated the University of Dhaka undergraduates' information skills and their findings indicated a poor level of students' information skills, which differed significantly based on age, gender, and computer literacy. Negin et al. (2016) investigated the effectiveness of person-to-person communication skills on Karaj city students' social development and established that at pre-test, there was a positive and significant effect of training on interpersonal communication skills on experimental group's social growth. Critical examination of the above studies showed that none has looked into students' communication skills level in Google classroom, which resulted in this study.

Statement of the Problem

Adopting online instructional tools is necessary for every teacher to bridge the communication, inflexibility, social interaction, and time restriction gaps inherent in the conventional classroom system. Many educators have utilized different online learning tools (especially the free ones) to blend their courses and make students have online learning experiences. Although these online learning platforms may serve their purposes, one could easily observe the difficulties learners and even teachers face in trying to understand their various features and functionalities, navigate around the environment to access learning content and interact with others, answer questions, submit assignments, and even access their grade. All these may take learners some hours (for faster learners), days to weeks (especially for slow learners) to understand where proper orientation and guidance are absent. The inability to understand online learning platform features may cause unserious students to abandon their studies and hinder effective communication and full participation in an online learning experience. Therefore, mere choosing and using any online instructional platform may not adequately facilitate students' learning, but the students' ability to communicate and use it may help to yield a better result.

This study, therefore, asked, can exposing students in the Faculty of Education at the University of Port Harcourt to a tutorial on Google classroom utilization help them acquire the adequate communication skills level they need in the learning platform?

Aim and Objectives of the Study

The general aim of this study was to ascertain the effect of a tutorial on students' communication skills level in Google classroom in the Faculty of Education, University of Port Harcourt. In specific terms, the study sought to:

1. determine the effect of a tutorial on students' pretest and post-test communication skills levels in Google classroom.
2. find out the effect of a tutorial on male and female students' pretest and post-test communication skills levels in Google classroom.

Hypotheses

The null hypotheses' testing was at 0.05 alpha level.

1. The tutorial effect on students' pretest and post-test communication skill levels in Google classroom did not differ significantly.
2. The tutorial effect on male and female students' pretest and post-test communication skills levels in Google classroom did not differ significantly.

METHODOLOGY

Research Design

The design of this study was one group, pretest-post-test pre-experimental research design.

Table 1. Sign t-test of students' pretest and post-test communication skills levels

		N	df	Z	P-value	Effect Size (r)	Decision
Posttest - Pretest	Negative Differences[a]	5					
	Positive Differences[b]	62	69	6.84	0.00	0.82	Reject
	Ties[c]	3					
	Total	70					

a. Posttest < Pretest

b. Posttest > Pretest

c. Posttest = Pretest

Population of the Study

The population was 140 students from the Department of Educational Management, Faculty of Education at the University of Port Harcourt in the 2019/2020 academic session.

Sample and Sampling Technique

The study used a sample size of seventy (70) students selected through a purposive sampling method because they had android phones where they downloaded and installed Google classroom application.

Statistical Analysis

Sign test and Quade's Analysis of Covariance (Non-parametric ANCOVA) were the statistical tools used to test hypotheses 1 and 2, respectively. Sign test suits hypothesis 1 because it tests the differences in the pretest and post-test median values for the one group of students on a continuous scale measurement and non-symmetrical distribution. Quade's ANCOVA suits hypothesis 2 because it tests the gender effect on students' communication skills after removing the pretest (covariate) with unsymmetrical data. Kolmogorov-Smirnov and Shapiro-Wilk normality tests with 0.00 p-value (see Appendix 3) and Levene's test of homogeneity of variance (for covariate) with a 0.42 p-value based on median (see Appendix 4) proved that hypothesis 2 met the assumption for Quade's ANCOVA.

Research Instrument

The researchers constructed a twenty (20) item-test instrument titled Google Classroom Communication Skills Test (GCCST) and used it for data collection. GCCST contained two sections (A and B). Section A was for students' demographic data collection, and section B contained twenty objectives questions, which centered on students' ability to communicate in, navigate around and use the Google Classroom. Nineteen (19) of the objective questions have options a, b, c, and d, with one correct answer and three distracters, while one objective question had True or False options. Each correct answer in section B of the GCCST carries five (5) marks, giving 100 percent for all correct answers. Therefore, a mean value of 50 and above indicates a high communication skill level, and a mean value below 50 indicates a low communication skill level. QGCCST was face and content validated by giving it to two Educational Technologists in the Department of Curriculum Studies and Educational Technology at the University of Education who provided suggestions that helped the researchers to improve the instrument. QGCCST was tested for reliability through the Kuder-Richardson 21 method to get an alpha reliability coefficient of 0.87.

Procedure

The researchers administered GCCST to the respondents as a pretest before training them on Google classroom usage. The researchers gave the respondents training on how to communicate and use the Google classroom for one week. The researchers exposed the respondents to graphics-filled PowerPoint presentations that explain Google classroom's meaning, how to install the classroom on mobile devices, sign in to Google classroom, join a class; identify the Google classroom features, share information to the classroom with and without file attachment; submit assignments; answer questions; see grades and classwork in one place; and email teacher and classmates from the Google classroom. During the presentation, the researchers asked the respondents to create a Gmail account (for those who did not have one), download the Google classroom into their mobile devices, sign in and join a class on the Computer in Education course that the researchers already created. The researchers gave the respondents five days to navigate and get familiarized in the classroom, interact among themselves by posting information on the classroom, answer questions and perform other activities they desire in the Google classroom. After the training period, the researchers re-administered the GCCST to the respondents as post-test, collated, and subjected for analysis. The researchers received help from two research assistants during the data collection process.

RESULTS

Hypothesis 1: The tutorial effect on students' pretest and post-test communication skills levels in Google classroom did not differ significantly.

Table 1 shows that 5, 62 and 3 of the students had decreased, increased and no change, respectively, in their online communication skills levels at post-test. There is also a p-value of 0.00, which is higher than the 0.05 alpha value at df of 69 with a 0.82 effect size (see Appendix 3 for effect size calculation). This 0.00 p-value led to the rejection of the hypothesis that states that the effect of a tutorial on students' pretest and post-test communication skill levels in Google classroom did not differ significantly. Thus, there is a positive and significant effect of tutorial on students' communication skill level in Google classroom with a high effect size of 0.82.

Hypothesis 2: The tutorial effect on male and female students' pretest and post-test communication skills levels in Google classroom did not differ significantly.

Table 2 shows that the p-value of 0.56 is higher than the 0.05 alpha value. This 0.56 p-value leads to the acceptance of the hypothesis that states that the tutorial effect on the male and female students' pretest and post-test communication skill level in Google classroom did not differ significantly. Thus, the tutorial effect on the students' communication skills level in Google classroom did not significantly differ based on gender.

Table 2. Quade's ANCOVA on students' pretest and post-test communication skills levels based on gender

Dependent Variable: Unstandardized Residual							
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**	**Decision**
Corrected Model	134.549[a]	1	134.55	0.34	0.56	.005	
Intercept	.439	1	.44	0.00	0.97	.000	
Gender	134.549	1	134.55	0.34	**0.56**	.005	Accept
Error	26849.270	68	394.84				
Total	26983.819	70					

DISCUSSION

Table 1 showed that the students' communication skill level in Google classroom increased and was significantly higher at post-test with a high effect size. This implies that the tutorial on using Google classroom gave the students more knowledge and skills on how to use and communicate adequately in the Google classroom. Thus, exposing students to some training on the use of an online learning application before utilization helps them to acquire necessary skills that promote their smooth transition to online learning experiences. These results tally with that of Quail et al. (2016), Bin Mohd Jalaludin and Bin Ihkasan (2014), and Iksan et al. (2012) that reported higher levels of students' communication knowledge, skill, and assurance after placement in the different learning environments; and that of Linjawi and Alfadda (2018) who noted that students had a high level of computer skills. The results of Bin Mohd Jalaludin and Bin Ihkasan (2014), Jannatul-Ferdows and Ahmed (2015), Linjawi and Alfadda (2018) studies, and Negin et al. (2016), who found that at post-test, there was a positive and significant effect of training on interpersonal communication skills on experimental group's social growth agreed with this study's findings. These results differed from that of Jannatul-Ferdows and Ahmed (2015), who reported that students had a poor information skills level.

Table 2 has shown that the tutorial on Google classroom utilization has an insignificant effect on the male and female students' communication skills levels in Google classroom. This result signifies that gender does not determine students' communication skills when using online learning platforms. This finding differs from that of Jannatul-Ferdows and Ahmed (2015) that students' information skills differed significantly based on gender.

CONCLUSION

This study has investigated the effect of a tutorial on students' online communication skill level in Google classroom. The findings proved that giving tutorial on Google classroom utilization was significantly effective in increasing students ability to use and communication effectively in the online learning platform. The gender does not have any significant effect on how the students learn and utilize the Google classroom. Thus, tutorial play a significant role on improving students' rate of communication, involvement, and use of online learning platforms for learning purposes irrespective of their gender.

RECOMMENDATION

The recommendations that support the findings of this study include:

1. Students should be exposed to the basic skills required to use and communicate effectively in every online instructional platform before adopting such for instructional purposes.
2. University lecturers should use online learning tools such as Google classroom in their instructional process so that all students, irrespective of their gender will be adequately acquainted with online communication skills.
3. Future researchers should investigate the effect of tutorials on other online learning platforms.
4. Future researchers should study students' perceptions for using the Google classroom for learning purposes.

LIMITATION OF THE STUDY

1. There was an insufficient sample size for the study since all the students in the Department of Educational Management, Faculty of Education do not have smart/android phones, laptops, and Internet access to participate in the study. The researchers overcame this problem by employing a purposive sampling technique that gave room for only those who met the study's requirements to form the study's sample size.
2. Most of the students did not have a Google mail (Gmail) account that would have enabled them to access the Google classroom. The researchers overcame this problem by assisting many respondents in creating Gmail accounts.

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Declaration of interest: Authors declare no competing interest.

Data availability: Data generated or analysed during this study are available from the authors on request.

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APPENDIX 1

Google Classroom Communication Skills Test (GCCST)

Instruction: Answer all questions.

Mat No: _____

Gender: Male ☐ Female ☐

1. _____ is an online learning platform.
   a. WhatsApp b. Google Classroom c. Streaming d. Skype
2. Online learning platform promotes all of the following except_____
   a. collaboration b. communication c. streamlining of assignment d. movement
3. Google Classroom can be accessed through the following except _____
   a. Computer b. Tablets c. Smart/Andriod phones d. Mp3 Player
4. _____ is the Web address a user can go to in order to sign in to Google Classroom.
   a. classroom.google.com b. google.classroom.com c. googleclassroom.com d. classroomgoogle.com
5. To sign in to Google classroom, a user must have _____
   a. gmail account b. ymail account c. email account d. mmail account
6. To add yourself to a class as a student, you must click _____ in Google classroom.
   a. Add a class b. Join a class c. Start a class d. Create a class
7. All of these are the major features of Google classroom except.
   a. Submit b. Classwork c. People d. Stream
8. To post information on the Stream page, click _____
   a. Share something with your class b. Post something to your class c. discuss something with your class d. communicate with your class
9. You can add an image, file, video, or link to a post on the Stream page from the following sources except _____
   a. Computer/phone b. YouTube c. Drive d. Paper
10. You can delete a comment another person created in Google classroom.
    a. True b. False
11. You can send a private comment to your teacher in Google classroom by clicking _____
    a. assignment/question b. stream page c. comment d. people page
12. Assignments in Google classroom often appear in the _____
    a. Stream page b. Grades c. Post d. People
13. _____ feature appears when you want to submit an assignment with files attachment.
    a. Turn in b. Mark as done c. Submit d. Unsubmit
14. _____ feature appears when you want to submit an assignment without file attachment.
    a. Turn in b. Mark as done c. Submit d. Unsubmit
15. _____ feature helps you to answer questions or quiz directly from Google classroom.
    a. Turn in b. Mark as done c. Submit d. Unsubmit
16. The grade page in Google classroom helps you to see all the following works assigned to you except _____
    a. assignments b. questions c. quizzes d. comments
17. Which of these cannot be a status of assigned work in the grade page?
    a. turned in b. done late c. missing d. post
18. To email your teacher or classmates in Google classroom, you must click the following.
    a. People and email b. Email only c. People only d. Stream and email
19. _____ must be clicked to access your grades in Google classroom.
    a. Grade page b. Classwork page Stream page d. People page
20. All files or attachments sent to Google classroom can also be accessed directly from _____
    a. Google Drive b. Phonebook c. Email folder d. Photo gallery

APPENDIX 2

Effect Size (r) for hypothesis 1 = z/√N

Z=6.84

Group (N)=70

r = 6.84 = 6.84 = 0.82

√70 8.37

APPENDIX 3

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Posttest	.176	70	.000	.895	70	.000

a. Lilliefors Significance Correction

APPENDIX 4

Levene's Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	.153	1	68	.697
	Based on Median	.672	1	68	.415
	Based on Median and with adjusted df	.672	1	67.126	.415
	Based on trimmed mean	.324	1	68	.571

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Research Article **OPEN ACCESS**

COVID-19 Virulence: Hinderances to Observing the Preventive Measures

Ivy Kesewaa Nkrumah [1]*, Millan Ahema Tawiah [1], Kofi Ayebi Arthur [1], Lebbaeus Asamani [1], Ebenezer Takyi-Wadieh [1]

[1]University of Cape Coast, GHANA
***Corresponding Author:** ivy.nkrunmah@ucc.edu.gh

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ABSTRACT

The Coronavirus disease (COVID-19) is the defining global health crisis in contemporary times. To date, there is no particular cure for COVID-19 and prevention remains the chief approach in tackling the pandemic. Social distancing, hand sanitising, wearing of nose masks and handwashing have been imposed by the government of Ghana to limit the disease spread. However, research (e.g., Bonful et al., 2020) shows that some sections of Ghanaians do not fully adhere to the COVID-19 preventive measures. This study sought to examine the extent to which university students observe each of the aforementioned government-imposed COVID-19 preventive measures and the factors that impair students' efforts to observe these measures. Using a multi-stage sampling procedure, a total of one hundred and eighty-three students (88 males and 95 females) with mean age of 26 participated in the study. A cross-sectional survey design was employed for the study, and a questionnaire was used for data collection. Whereas most respondents reported wearing their nose masks and sanitising their hands quite frequently, a significant few also declined practicing these. Maintaining social distancing was the least and most infrequent practiced preventive measure. The barriers to observing the preventive measures included the number of students the university maintains in a room, unavailability of the needed materials and inappropriate positioning of the handwashing and hand sanitising stations, the expressed discomfort associated with prolonged use of facemasks, and the social behaviours of students not taking such actions in response to normative group influence. It was recommended that the university management invest more resources to increase and equip the handwashing and hand sanitising stations, modify the existing policy on room intake in the university halls and review the policy on instructional periods to facilitate student's efforts in observing the preventive measures. In addition, awareness creation in terms of billboards and screen teasers are needed on the campuses to sensitise and engender students to do the needful.

Keywords: COVID-19, barriers, preventive measures

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INTRODUCTION

The World Health Organisation (WHO) describes COVID-19 as a contagious disease caused by a new coronavirus referred to as SARS-CoV-2 (2019-CoV). COVID-19 outbreak is believed to have started in Wuhan, China in December 2019 (WHO, 2020a; Holmes, 2020). Persons infected with the COVID-19 virus show discernible symptoms such as difficulty in breathing, fever, tiredness, nasal congestion and dry cough, and these signs appear at approximately two to fourteen days after a person has been infected. The COVID-19 virus can spread from an infected person's mouth or nose in small liquid particles when they sneeze, sing, speak, cough or breathe heavily. These liquid particles appear in varied proportions, ranging from larger 'respiratory droplets' to smaller 'aerosols'. Current evidence suggests respiratory droplets among people in close contact with each other as the main way that the virus spreads. The virus can also spread after infected persons sneeze, cough on, or touch surfaces, of such objects as tables, doorknobs and handrails. Other people could become infected by touching such polluted surfaces, and later touching their eyes, noses or mouths without having cleaned their hands first. Aerosol transmission can occur in specific settings, predominantly in indoor, crowded and poorly ventilated spaces, where infected person(s) stay for long periods of time, including classrooms, restaurants, choir practices, fitness classes, nightclubs, offices and/or places of worship.

COVID-19 is hurriedly spreading across the world (Chen, Zhou, & Dong, 2020; Li, Guan, & Wu, 2020; Gorbalenya et al., 2020) and it has been acknowledged as a pandemic by WHO (2020a). Since there is no cure for COVID-19, appropriate alternatives are required for preventing the transmission of the virus in the form of public health and social initiatives. Currently, measures such as case isolation, contact tracing and quarantining, social distancing, foreign travel measures, and vaccinations (WHO, 2020b) have been employed by governments

across the world. It is suggested that the most effective preventive measures have been maintaining physical distance (a minimum of 1 metre) from other people, and performing hand hygiene often with an alcohol-based hand rub, and if hands are not perceptibly dirty then wash with soap and water. Other measures include wearing a medical mask if one has respiratory symptoms and performing hand hygiene after disposing off the mask; and routine cleaning and disinfection of environmental and other frequently touched surfaces. All these preventive measures are meant to limit the spread of the virus.

As at 24th July, 2020, Ghana's COVID-19 cases stood at 30,000 and 153 deaths, and that placed Ghana third highest, on the list of countries in Africa that had reported COVID-19 cases and 54th globally (WHO, 2020a). In spite of efforts by the government of Ghana to reduce the spread of the virus, the number of reported cases appear to be rising. The current COVID-19 statistics in Ghana shows 79766 cases and 572 deaths (Ghana Health Service, 2020), indicating that the situation of the pandemic is not improving. Due to numerous and varied sensitisation and awareness programs in Ghana concerning COVID-19, it is expected that the entire citizenry would make efforts on their part, to arrest the spread of the disease. However, it has been reported that some sections of Ghanaians especially people who find themselves in unrestricted and crowded places like the markets and lorry parks, do not fully observe the recommended safety and prevention protocols (Joy News, 2021). Even university students who are assumed to possess a better knowledge of the dynamics of the virus spread (since they have access to internet and can read more about COVID-19 happenings in other countries), have been reported as not fully adhering to the protocols (Atlantic FM, 2021). The few students who do, are selective in terms of the restrictions that are convenient to them. This perhaps, explains why government's efforts to reduce the spread of the virus has not yielded the expected outcome. It is worth mentioning that the first shot of COVID-19 vaccines arrived in Ghana on May 7, 2020, and the doses received was 350,000 (Ghana Health Service, 2021) for a population of over 31,000,000. As at the time of this study, most people had not been served the vaccine yet and prevention remains the principal focus of COVID-19 sensitisation programmes in Ghana.

In this study, the researchers explored the extent to which university students adhere to the recommended COVID-19 protocols and more importantly, the factors that impair students' efforts in observing the protocols. The parameters of the recommended protocols of interest were washing of hands, use of hand sanitisers, wearing of nose masks and keeping social distancing. The University of Cape Coast was chosen as the study's locale because all the researchers are staff of the university and they had made such cursory observations of student's attitudes towards the protocols, as imposed by government, and enforced by the university's proctor. The main objectives of the study were to: (i) explore the extent to which students adhere to the COVID-19 protocols (handwashing, hand-sanitising, wearing of face masks and social distancing), (ii) examine the factors that impair students abilities to adhere to the COVID-19 protocol of hand washing (iii) assess the factors that impair students abilities to observe the COVID-19 protocol of hand sanitising, (iv) examine the reasons students assign to their inability to observe social distancing, (v) examine the reasons that impair students efforts in wearing nose masks in the midst of COVID-19.

METHODOLOGY

Design

The cross-sectional survey design was employed in this study because the researchers aimed at casting light on the present phenomenon of COVID-19 prevention scheme through a process of data collection that helps the researchers to describe the situation comprehensively than will be possible without using this method (Fox, 2007). The population for the study was students from the University of Cape Coast in Ghana. A total of 190 students in the university participated in the study. The participants consisted of 88 males and 95 females. The respondents belonged to the various colleges and departments in the university. Their age range was 18 to 41 with mean a mean age of 26.

Instrument

A self-structured questionnaire, consisting of closed-ended items was the main instrument for the study. The questionnaire consisted of two sections (A and B). Section "A" sought for the demographic data of respondents in addition to two questions on duration and frequency at which respondents observed each of the COVID-19 protocols on a daily basis. Section B sought for information on the factors that impaired respondent's efforts in responding to the COVID-19 preventive measures.

Procedure

The researchers initially introduced themselves to the participants. The participants were told that the study was meant to gather information about their attitude towards the government-imposed measures for mitigating the spread of COVID-19, as it was meant to strengthen management decisions. They were assured of anonymity of their responses and this was further emphasised in print on the questionnaire. The questionnaires were distributed by the researchers among the participants and they were given one day to complete questionnaires and return them to the researchers at an agreed place. The respondents were verbally assured of confidentiality of their responses and this was emphasised in writing. All the participants were above 18 years so they provided informed consent by themselves.

Population

The University of Cape Coast was chosen as the study's locale because one of the reports on non-adherence to COVID-19 protocols cited observations made specifically at the University of Cape Coast (ATL FM, 2020). In addition, all the researchers in the present study are staff of the University of Cape Coast and they had also made cursory observations that the students were not conforming to the COVID-19 preventive measures as imposed by government, and enforced by the university's proctor. The accessible population was the cohort of students from the College of Education Studies who had come to campus to complete their courses (students had to go on break due to the closedown of schools in the middle of the semester at the height of the COVID-19 pandemic), and were living specifically in the university accommodation. The total number of these students was 359 (171 males and 191 females).

Sample Size and Sampling Techniques

Using Krejcie and Morgan (1970) table for determining sample size for a given population, the ideal sample for the population of 359 is approximately 186 [s=X2NP(1-P)÷d2(N-1)+X2P(1-P)]. In order to get

Table 1. Age and gender of respondents

Age	F	%
18.00	31	17.0
19.00	39	21.3
20.00	39	21.3
21.00	29	15.8
22.00	19	10.4
23.00	4	2.2
24.00	5	2.7
25.00	5	2.7
26.00	4	2.2
27.00	2	1.1
29.00	2	1.1
30.00	2	1.1
32.00	1	0.5
41.00	1	0.5
Sex		
Male	88	48.1
Female	95	51.9
Total	**183**	**100**

a proportionate number of male and female respondents, a proportional sampling method was used to target 89 males and 99 females. A convenience sampling method was used to get the final respondents to the questionnaire.

Data Analysis

A total of 190 questionnaires were distributed for this study and 183 were retrieved which indicates a response rate of 96%. The results are presented in the results and discussion section. The preliminary analysis (A) covers the demographic data of the respondents while Section B looked at the research questions which are presented in frequencies (f) and percentages (%).

RESULTS AND DISCUSSION

Preliminary Analyses

AI. Analysis of the background data of respondents showed that 95 (51.9%) were females and the rest were males. Most of the respondents were between 19 and 22 years old, and this indicates to a large extent, a true representation of regular undergraduate university students in Ghana. Most of the students enter university by age 18 and for those who go on four-year programmes, they leave at about age 22. The few (~10%) medical students who stay for seven years exit the university around ages 25. The specific age information is reported in **Table 1**.

AII. *To what extent do students observe the COVID-19 preventive measures?*

Participants were asked to specify the extent to which they observe each of the COVID-19 preventive measures under study (handwashing, wearing of nose masks, social distancing, and hand sanitising). These were on a scale of 1 to 4. With 1 representing Not at All, 2 representing Sometimes, 3 representing Often and 4 representing Very Often. The results are presented in **Table 2**.

The results in **Table 2** indicate that respondents differed on the degree or extent to which they practice the COVID-19 preventive measures. Regarding handwashing for example, a considerable number of respondents (39) reported not observing this at all and some others do it in rare cases (89). Only a few respondents agreed that they do wash their hands regularly as needed, in response to the fight against the pandemic. Similar to the current findings, Fielmua, Guba and Mwingyine (2021) studied the hand hygiene and safety behaviours in response to COVID-19 at shopping centres in the Wa township in Ghana, and they reported that adherence to COVID-19 safety protocols at shopping centres were very poor even though the shops had provided the necessary handwashing facilities. Specifically, the researches mentioned that approximately 91.3% of shoppers did not practice handwashing before entering the shops. On the contrary, Dwipayanti, Lubis, and Harjana (2021) examined the current hand hygiene behaviours during the COVID-19 pandemic, post pandemic behaviour intentions, and the relationship between behaviour, psychosocial and contextual factors among 896 Indonesian citizens over 18 years old. The results were that the majority of respondents did increase their frequency of hand hygiene practices during COVID-19 pandemic. In a related study, Mieth et al. (2021) reported that in their study to examine the prevalence estimate for the compliance with the COVID-19 measures, 94.5% of participants in their direct questioning group claimed to practice proper hand hygiene, whereas in their indirect questioning group a significantly lower estimate of only 78.1% was observed. However, the researchers concluded that estimates of the degree of commitment to measures designed to counter the spread of the disease may be significantly inflated by social desirability in direct self-reports. In summary, the present findings coupled with some of the mentioned existing studies suggest that handwashing is an infrequent practice among individuals in the age of COVID-19. It has been shown that, even among nurses handwashing has not always been taken as seriously as it should, with compliance and adherence in clinical settings far from optimal over time (Bezerra et al., 2020; Pittet, 2001). Multiple reports from diverse countries show that hand hygiene compliance rate has been estimated at only 40% (Erasmus et al., 2010) while the rate of adherence in critical care units is only 46.25% (Bezerra et al., 2020). Even though handwashing is an easy and lifesaving task, it is not, regrettably, always practiced (Doronina et al., 2017). The present pandemic has drawn attention to handwashing beyond the clinical settings and this focus has to endure.

Most of the respondents in the present study conceded to wearing their nose mask often and very often, although a few (1.1%) and 12% reported to not wearing their facemask at all and sometimes respectively. The contextual transfer of face mask use from healthcare settings to public spaces is precisely the aspect of making the "outside world" closely resemble scientific apparatus. Wearing nose masks as a recommended personal protective equipment and as a public health measure to prevent the spread of COVID-19 pandemic, has been deeply

Table 2. Extent to which students observe the basic-four COVID-19 protocols

Extent to which students observe the following protocols	Not At All		Sometimes		Often		Very Often	
	F	%	F	%	F	%	F	%
Handwashing	39	21.3	89	46.8	48	26.2	45	24.6
Wearing of nose mask	2	1.1	22	12.0	59	32.2	100	54.6
Social distancing	39	21.3	89	46.8	38	20.8	17	9.3
Hand Sanitising	9	4.9	59	32.2	62	33.9	53	29.0

Table 3. Barriers to maintaining social distance

Statements	Disagree		Agree	
	F	%	F	%
There are more than two occupants in a room and the space is not enough for the recommended social distance	35	19.1	148	80.9
Keeping a distance from my friends appear hostile	57	31.1	126	68.9
The nature of course works such as group assignments make it difficult to keep distance from friends	35	19.1	183	80.9
None of the people I know has been infected so there is no point keeping distance from them	93	50.8	90	49.2

associated with social and cultural practices and has generated diverse social meanings (see, Martinelli et al., 2021). In spite of the such social and cultural implications, the current findings suggest that most individuals wear their nose mask on a frequent basis. In a related study, Machida et al. (2020) examined the prevalence of wearing masks to prevent COVID-19 and compliance with appropriate measures for the correct use of face masks among the general public in Japan where wearing medical masks is a "cultural" normality. Participants were asked to indicate how often they wore masks for prevention and to what extent they practiced appropriate measures suggested by the World Health Organization. The prevalence of wearing masks was 80.9% and compliance rates with appropriate measures ranged from 38.3% to 83.5%. In an alternative account, Purushothaman, Priyangha, and Vaidhyswaran (2020) reported that prolonged use of facemasks induces difficulty in breathing on exertion and excessive sweating around the mouth to the healthcare workers and thus, there is poorer adherence and increased risk of susceptibility to infection. Again, in Fei et al. (2021) the researchers observed that approximately 78% of the shop attendants they observed did not wear nose masks themselves. The present findings contradict some of the existing reported compliance to the use of nose mask in the fight against COVID-19 spread. In Fei et al.,'s (2020) study among shoppers, it is possible that these shoppers refused to wear their nose mask because they do not interact with other shoppers or do not stay in the shops for long as the case may be in a typical school situation. Agyemang, Agyei-Mensah, and Kyere-Gyeabour (2021) have however reported that most drivers they observed in Ghana, showed a high vulnerability perception to Covid-19, and that older drivers, in particular, consistently wore face masks and insisted on other persons in their commercial vehicles to follow suit. The trend of the results seems to suggest that wearing of nose mask is predominantly practiced by individuals who stay with others at a single location over an extended period of time, such as travellers on a bus, students in school but may not be strictly observed by shoppers who are passing through a location or stay in a certain location with others for a short period of time.

Handsanitising was reported as a somewhat frequent observed protocol among respondents with a greater number of participants agreeing to sanitising their hands often and very often.

However, in a study by Bonful et al. (2020) among transport organisations in Ghana it was reported that almost all stations (93%) did not have alcohol-based hand sanitizers available for public use (see also, Islam et al., 2021) and that consequently reduces the frequency of hand sanitising practices among people. Herein, students report sanitising their hands frequently so it is possible that even if the university management do not provide hand sanitisers, they probably will purchase their own. Finally, the degree of maintaining social distance was assessed among respondents. Social distancing was the least observed protocol with a significant number of respondents not doing it at all, and others occasionally maintaining a distance. Only a few reported keeping social distance often and very often. In study among residents in North London on their social distancing behaviours, Hills and Eraso (2021) reported that the vast majority (92.8%) of participants did not adhere to all social distancing rules, and nearly half (48.6%) engaged in intentional non-adherence of rules.

In summary, the current findings provide a fair knowledge of the extent to which each of the 4-basic government imposed COVID-19 protocols are practiced among university students. The rest of the data reported in the subsequent research question hinges on the factors that impair individual's ability in observing the COVID-19 preventive measures.

AIII: *What are the barriers to observing social distancing in efforts to restricting the spread of COVID-19?*

In relation to factors that make it difficult to observe the social distancing protocol, the main issues raised were that (1) there are more than two occupants in a room (relatively small room) and the space is not enough for the recommended social distance (2) keeping a distance from friends appear hostile and (3) the nature of coursework (group assignments, groups presentations, and other group works) make it difficult to keep distance from friends. It is worth noting that social distancing is one of the most difficult COVID-19 preventive measures for a collectivistic country like Ghana. In most Ghanaian homes, more than three people share a single room and that in itself does not pave way for social distancing. For example, Ofori (2020) has shown that adequate supply of housing remains a challenge in developing countries, especially Ghana. A room occupancy rate of 5.51 indicates that households are congested and a population of 4,603 accommodated in 496 housing units is evident. That is, even if students want to maintain social distancing, the system in itself makes it undoable. In a related study however, Williams et al. (2020) found that observing social distancing protocols led to a loss of social interaction among residents of the UK, because the suddenness and extensiveness of the lack of face-to-face contact had 'taken a toll' on people, leaving them to feel 'alienated'. The current study also found that despite the factors such as overcrowding in halls, the desire to be perceived as a friendly companion makes it difficult to observe the recommended social distancing protocols even in the absence of factors that students may have no control over such as having more than two roommates. Furthermore, Ghana is classified as a collectivist culture and this is demonstrated by its tight, long-standing dedication to the "group" of the person, whether family or other social ties. This means that most students prefer carrying out their daily activities such as attending lectures, going for lunch, working on assignments, etc, in groups. This 'need to belong' to groups within the school context makes it challenging to adhere to social distancing protocols. Another ritual to maintaining social relationships in Ghana is through the practice of the cultures and norms like warm greetings, handshakes, and hugs. These actions in themselves make it difficult to practice social distancing and the results herein suggest that most people will prioritise their cultural norms over the COVID-19 protocols even if it endangers their lives. For example, the Akan specific aspects of greetings in its basic form,

Table 4. Hindrances to handwashing practices

Statement	Disagree		Agree	
	F	%	F	%
Washing of hands				
Inadequate handwashing basins on campus	70	38.3	113	61.7
There is no need to wash your hands	162	88.5	21	11.5
One cannot make extra budget to buy additional soap for handwashing	104	56.8	79	43.2
My friends do not wash their hands frequently too	79	43.2	104	56.8
Sometimes there is no water or soap in the hand washing stations	56	30.6	127	69.4
Handwashing basins are located at far distances	83	45.4	100	54.6
It is difficult to remember washing hands repeatedly	69	37.7	114	62.3

Table 5. Barriers to hand sanitising practices

Statements	Disagree		Agree	
	F	%	F	%
The sanitizers have unfriendly smell	104	56.8	79	43.2
Some of the hand sanitising dispensers do not work well	62	33.9	121	66.1
There are inadequate hand sanitising dispensers around	67	36.6	116	63.4
The hand sanitising dispensers are located far	90	49.2	93	50.8
The sanitisers cause itching around hands	142	77.6	41	22.4
Dysfunctional hand sanitising dispensers	88	48.1	95	51.9
Hand sanitisers are costly	70	38.3	113	61.7

incorporates a verbal component and hand shaking and it is not enough to just stand afar and greet by shouting, or even waving. One can only be pardoned for just waving if he/she has legitimate reasons not to draw nearer for a handshake (*see* Agyekum, 2004a, 2004b, 2005; Obeng, 1997, 1999; Yankah, 1991, 1995). Greetings in most cases are used as ritualized pre-sequences that come before the actual message in a lot of communicative interactions. They serve as signals, attention getter and preparatory grounds for the possible openings of conversations, discussions and public speeches (see Mey, 1993). Greetings are so frequent and important that when a person enters to greet, normal conversation and other communicative activities are suspended (see Agyekum, 2008) and the aforementioned dominant nature of greetings described here have subtle ways of inhibiting social distancing.

BI. Research Question 1*: What are the factors that impair student's abilities to obey the COVID-19 protocol of handwashing?*

Research Question 1 sought to find out factors that make it difficult for students to adhere to the government-imposed COVID-19 protocols of hand washing. The results are presented in **Table 4**.

Table 4 largely suggests that students acknowledge the need to wash their hands in the midst of the pandemic, because most of them disagreed with the notion that there is no need to wash your hands. However, there are key management and a few within-student factors that inhibit this action. First, the respondents admitted to the statement that there are inadequate hand washing stations on campus which presupposes that in some cases a student have to queue to access this facility. They also added that the few handwashing stations are not always resourced, because in many instances there is no water or soap there. The World Bank (2020) have reported that about three billion people around the world have no access to a handwashing facility with water and soap at home and that the small action of frequent handwashing to prevent infection remains out of reach (see also, WaterAid, 2020; WHO/UNICEF, 2019). Thus, vehemently speaking most places in the world including Ghana have no access to water to even help combat the disease spread. Notwithstanding, the respondents also showed that the handwashing stations have been mispositioned. In locating handwashing stations, the amount of space the handwashing station occupies should has to be considered, especially in crowded informal urban settings or camps. The handwashing station has to be strategically placed so they cannot be missed, and they must also be difficult to avoid even during daily routines (e.g., at entrances of buildings, near toilets, etc.). Where possible stakeholders are advised to use locations for handwashing stations that are already accessible for persons with disabilities, i.e., flat level ground, ramps, no steps and door widths that are 800 mm (UNICEF Fact Sheet, 2020). Unlike certain universities in the Western world and some other places, the university of Cape Coast and many other public universities in Ghana did not have handwashing stations before the COVID-19 pandemic. These facilities came into play following the government's measures to restrict the spread of the virus and the universities seem to be grappling with this new policy of resourcing the campuses with such materials, perhaps due to financial reasons or inadequate expertise in implementing such measures. In addition to these management constraints, there were two critical attitudinal factors that the respondents agreed to: that it is difficult to remember washing hands repeatedly and because their friends do not wash their hands. Looking at the number of courses and assignments required of students, they are more likely not to remember washing their hands since this has not been a practice on campus. Moreover, these students usually are in groups so if the group members do not wash their hands, then there is the implied social influence of the entire group not doing it.

Research Question 2: *What are the barriers to handsanitising in efforts to restricting the spread of COVID-19?*

From the results presented in **Table 5**, the main reasons students are unable to sanitise their hands were predominantly management factors of malfunctioning handsanitisers, inadequate handsanitising stations, improper positioning of handsanitising stations. However, one student factor that was mentioned was that the student saw it expensive acquiring their own sanitiser. The COVID-19 has brought about global fall in business and economic hardships (Horowitz, Brown, & Minkin, 2021) and that will make it difficult for parents to make financial provision to cover hand sanitisers for their wards. Hence, most

Table 6. Reasons students assign to their inability to wear nose masks

Statements	Disagree		Agree	
	F	%	F	%
Disposable nose masks are expensive	115	62.8	68	37.2
Washable nose masks do not last long	119	65	64	35.0
Wearing masks hides your beauty	95	51.9	88	48.1
I cannot breathe through the nose masks easily	66	36.1	117	63.9
Nose masks deform my dressing.	132	72.1	51	27.9
It is boring to put on nose mask after wearing a nice makeup	96	52.5	87	47.5
Wearing the nose mask does not help prevent the virus in anyway	137	74.9	46	25.1
It is irritating to wear the nose masks for extended period of time:(e.g., 2 hours)	48	26.2	135	73.8
My friends and roommates do not wear their nose masks	105	57.4	78	42.6

students will depend on the hand sanitisers that are provided by the university.

Research Question 3: *Which factors make it difficult for students to wear nose masks in adherence to the COVID-19 preventive measures?*

The main reasons that respondents indicated as inhibiting their efforts in wearing the nose masks were the discomfort experienced in the prolonged use of the mask and the fact that they said they could not breath through the masks easily. Quite intriguing, the additional costs evoked by the nose masks was not a barrier to its use. In a previous study of public response to the 2009 influenza A H1N1 pandemic, 71% of United States respondents supported the recommendation to wear a mask during the flu outbreak. However, in attempts to identify barriers to the wearing of masks among adults in the United States, the most common perceived barrier among the participants was product satisfaction and 85.71% of the participants agreed that wearing face masks is uncomfortable (Hung, 2018). Rosner (2020) has reported that prolonged use of N95 and surgical masks by healthcare professionals during COVID-19 has caused adverse effect such as headaches and that has led to poor adherence to nose masks use among the healthcare professionals. In a related study however, Spitzer (2020) says that face masks can prevent the spread of the virus SARS-CoV-2, in particular as this spread can occur from people with no symptoms. However, covering the lower half of the face reduces the ability to communicate, interpret, and mimic the expressions of those with whom we interact. Positive emotions become less recognizable, and negative emotions are amplified. Emotional mimicry, contagion, and emotionality in general are reduced and (thereby) bonding between teachers and learners, group cohesion, and learning – of which emotions are a major driver. Thus, in addition to the health risks imposed by the nose masks.

CONCLUSIONS

Results from the current study suggest that university students generally observe the four-basic recommended COVID-19 preventive measures, but the extent of practice vary across the four measures. Wearing of nose mask was found to be frequently practiced, whereas hand washing and hand sanitising are largely also observed. However, the degree of adherence to social distancing was quite low and some students do not either do it at all, or in rare circumstances. Regarding the barriers to practicing the preventive measures, the main hinderances to social distance were the management action of taking more than the numbers of students required to make room for social distancing in the halls. Also, the nature of most courses requires such group works as projects, assignments and group presentations and such exercises require that students gather and work together and closely to complete such tasks. Quite intriguing, there was a barrier that bordered on the social implications of maintaining distance from friends. With regards to hand washing, the main barriers were the fact that there are inadequate hand washing stations and the available few have not been situated properly and, in most cases, not resourced. Also, because handwashing practice is a new behaviour they have adopted, there is difficulty in remembering the need to wash hands repeatedly. Like the handwashing stations, it was also found that there are insufficient numbers of hand sanitising stations and again, the locations of such stations are inappropriate.

IMPLICATIONS FOR PRACTICE

Based on the findings elicited here, it is recommended that the university management trains personnel to manage the handwashing and hand sanitising stations on the campuses, increase the number of hand sanitising and hand washing stations and engage expert advice on the appropriate places to locate these amenities that will be easily accessible and compel students to maintain the protocols. Currently, most course instructions (lectures) span for a period of two hours and some instances, three hours. Since students get uncomfortable with prolonged use of the nose masks, it is suggested that the lecture periods are further broken down such that students are given about ten minutes break after every fifty minuets. Management should make extra efforts to boost finances and ensure that hand sanitising dispensers are well resourced at every time. The digital screen and billboards on the campuses should project teasers on the protocols to COVID-19 prevention in order to remind and sensitise students on the need to adhere to them. Finally, the current room intake in the university halls could be reduced to a number that will make it possible for students to maintain social distance.

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Research Article OPEN ACCESS

Reduction in Children's Impulsivity Enhances Performance in Mathematics, but not English language: Evidence for Impulsive Behaviour Modification Using Cognitive Modelling

Eunice Torto-Seidu [1], Ivy Kesewaa Nkrumah [1*], Lebbaeus Asamani [1]

[1]University of Cape Coast, GHANA
***Corresponding Author:** ivy.nkrunmah@ucc.edu.gh

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ABSTRACT

Test responses are mostly the chief basis for diagnosis, but educational appraisals of learners who experience difficulties mostly fail to account for the length of time the learner employs to respond to cognitive tasks. Impulsive children have been shown to experience challenges in school, not because they are less intelligent than the non-impulsive ones, but because of their fast conceptual tempo. This study employed a cognitive modelling procedure in attempt to reduce impulsivity in children, and subsequently enhance their performances in English language and Mathematics. A total of 93 primary four pupils who had been identified as impulsive, participated in the study. They were divided into four groups using the Solomon Four Group Experimental Design. The findings were that the experimental groups showed a reduction in impulsivity relative to the control groups at posttest and delayed posttest measures. The reduced impulsivity in the experimental groups translated into improved performance in Mathematics but this was not observed in the subjects' performances in the English language. The results provide preliminary support for the efficacy of cognitive modelling training intervention as a mechanism for reducing impulsivity in children and enhancing their performance in Mathematics.

Keywords: impulsivity, cognitive modelling, academic performance

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INTRODUCTION

Investigations on school-age children have demonstrated the intra-individual stability and inter-task generality of a disposition called 'impulsivity'. Impulsivity is the generic term that describes the tendency to act on the spur of moment without deliberation, planning and weak self-regulation capacity (Carver, 2005). Impulsive children seldom stop to think before they completely understand instructions, tend to come forth with the first answer they can think of, and call out repeatedly in class (typically with wrong answers). It is even not rare to spot children who after signalling intention to respond, stand up and stare blankly at the teacher- apparently having forgotten the purpose for standing up in the first place. Impulsive patterns are the core features of hyperactivity (Barkley, 2006), some kinds of aggressiveness (Fontaine & Dodge, 2006), risky health behaviours (Zapolski, Cyders, & Gregory, 2009) and other illogical actions. Impulsivity as a behaviour has also been associated with various psychological, social and health related outcomes, especially, problematic ones (Kangro, 2011).

Like other attention and activity behaviours, researchers point to possible yet multifactorial causes of impulsivity. For example, it has been reported that as the brain develops in a foetus, it experiences complex and sensitive changes. If a pregnant woman smokes during this period, she can massively affect the foetus's brain chemistry, by predisposing the foetus to impulsivity (Deliz, 2008). A particular gene, 5HT2A102 which is known to be critical in the regulation of impulses by contributing to serotonin regulation, has also been implicated in Attention Deficit Hyperactive Disorder (ADHD), aggression and suicidal behaviours. People who possess two of such genes on paired chromosomes score higher on personality tests of impulsivity relative to those with one or no copies of this gene (Kreisman & Straus, 2004). Werback (1995) has also shown that deficiencies in such vitamins as niacin, panthothenic acid, thiamine, and vitamins B and C could be associated with irritability and impulsivity. Further, Electroencephalograph (EEG) and Position Emission Tomography (PET) scans show that impulsive children have decreased blood flow, glucose utilisation and EEG activation (Woods & Ploof, 1997). Impulsivity has also been shown to be caused by watching too much television, excessive sugar intake, and poor discipline. Inadequate mental stimulation, lack of attention and rejection all exacerbate signs of impulsivity (Deliz, 2008).

Children diagnosed of impulsivity are at risk of school failure (Fredriksen et al., 2014); they have been associated with poor grades (DuPaul et al., 2016) and low academic achievements (Spinella & Miley, 2003), relative to their peers without impulsivity. In her seminal study, Olasehinde (1991) reported that subjects with impulsivity were considerably more likely to have repeated a grade or dropped out of high school, compared to those without impulsivity, even after adjusting for social status, intelligence quotient, and learning disabilities. In the Special Attention Project (2011) conducted in Ghana, the researchers reported impulsivity as the main cause of school failure and subsequent drop-out among Ghanaian students. However, in efforts to enhance academic successes in Ghana, educational researchers have largely focused on such factors as school environment (e.g., Etsey, 2005), teaching and learning materials (Asikhia, 2010; Cooper & Robinson, 2010) and parent's socio-economic status (Obese, 2019). Learner factors such as the learner's approach to cognitive task (*technically referred to as cognitive style*) appear to have been largely ignored.

Research (eg., Franco et al., 2016; Peckham & Johnson, 2019) shows that impulsive behaviours can be reduced using behavioural training strategies. Whereas such strategies appear to have been extensively explored in the Western, Asia and the Oceania, there is a large paucity of research on the use of cognitive behavioural strategies in modifying impulsive behaviour among children in Africa, especially, Ghana. Owing to differences in cultural and socialisation processes, which inadvertently shapes individual thoughts and behaviours, it is difficult to conveniently import results of studies conducted elsewhere for policy formulation and decision making in Ghana without any ecological test. Herein, the researchers attempted to reduce children's impulsive problem-solving tendencies using the cognitive modelling strategy. This strategy was chosen because it has been shown to be effective in children (*see* Nwamuo, 2010). The chief objectives of the study were to: (1) examine the efficacy of a cognitive modelling procedure in the reduction of children's impulsive problem-solving approaches (2) assess the sustainability of the cognitive modelling procedure after the cessation of treatment (3) assess the relationship between a reduction in children's impulsivity and their performance in English Language and Mathematics. Three hypotheses were raised and tested in the study based on the objectives: (i) There is no significant effect of cognitive modelling in the reduction of impulsivity among children (ii) there is no sustainable effect of cognitive modelling in the reduction of children's impulsivity after the cessation of treatment (iii) there is no significant relationship between a reduction in children's impulsivity and their performance in English language and mathematics.

Cognitive Modelling Training and Impulsivity

Modelling is a form of observational learning in which adults or peers demonstrate appropriate problem-solving strategies to a client. It is a behavioural technique used by clinicians and psychologists alike, to modify the feelings and behaviours of a client by influencing the client's pattern of thought. Bandura (1969) pioneered the use of modelling to treat phobias, especially for fear of animals such as snakes and dogs. The theory is useful in explaining how individuals acquire new behaviours by observing other people perform such behaviours. Many studies have shown the effectiveness of modelling in behaviour modification. For example, Gorrell (1993) randomly assigned undergraduate students to one of four experimental groups and provided them with two types of instructional procedures (direct instruction and cognitive modelling) and two types of rule presentation (explicit and implicit) of classroom management procedures. When presented with hypothetical classroom management problems, subjects were expected to apply the behaviour analysis rules they learned. Results showed significant effects favouring cognitive modelling and implicit rule presentation on both problem-solving measures and self-efficacy measure. Odoemelam (1994) also used peer modelling to reduce behaviour problem and increase self-concept of her pupils. The treatment was effective on children with minor, mild and moderate behaviour problems. Further, Nwamuo (2010) employed cognitive modelling to modify impulsive behaviour of some primary school children. Results were that modelling was effective in reducing the impulsiveness of participants, and improving their academic performance, with the modified behaviour being sustained a month after the withdrawal of intervention. Further, Nkrumah, Olawuyi, and Torto-Seidu (2015) used cognitive modelling to train impulsive children to delay responses and improve their performance on the Matching Familiar Figures Test (MFFT-20) cognitive task. In the present study, the modelling technique employed, required an instructor (described as a model) to systematically and carefully reveal his or her thoughts and reasoning during the execution of a task. The learner is trained and encouraged to use similar thinking processes. Such modelling procedures have the potential for strengthening applicable rules by providing additional personal associations that make the rules more relevant to the learner, by tying the examples presented in training to later problems, and by emphasising similarities between training and transfer tasks (Gorrell, 1993). According to Pedersen and Liu (2002) externalisation of these normally internal cognitive events allow students to see how an expert uses domain specific knowledge and a range of problem-solving strategies to perform tasks within a given context. In the study by Pedersen and Liu (2002) they used hypermedia program that offered modelling of pertinent strategies as students were engaged in problem-solving situations. While the classroom teacher could also model his or her cognitive processes for the class, presentation of this modelling through hypermedia had the distinct advantage of adding some excitement to the learning process. The result was that the cognitive modelling offered by the expert tool not only led experimental students to apply effective problem-solving strategies to their work, but in addition, it impacted the quality of their reasoning and their ability to present it in a convincing rationale for their solutions. In addition to improving certain kinds of academic performance, cognitive modelling increases the learner's expectations of success or perceived self-efficacy in performing similar procedures because the higher one's self-efficacy beliefs, the greater one's persistence and effort in attempting to learn new skills, acquire new knowledge, or solve problems (Bandura, 1977, 1982).

Impulsive Behaviour Modification and Academic Performance

During childhood, children are expected to develop cognitive, behavioural and social skills that are essential for school success as well as later adult living. Children need to learn such skills for effective communication with their peers as well as adults; they need to learn how to pay attention in various situations and to follow rules. In order to achieve these skills, cognitive constructs such as inhibiting impulsive behaviour, self-regulation in which immediate gratification is delayed, responding to tasks in a manner that exhibits planning and problem solving, are essential (Barkley, 1997). Therefore, impulsive children who are usually hyperactive and have attentional capacity and impulse

control difficulties, are bound to, among others, have problems with learning and achievement. Lower class and "culturally deprived" children tend to be impulsive (Kagan, 1966a), and the inferior intellectual performance displayed by such children could be a result of an impulsive attitude, in addition to deficits in cognitive resources. Although impulsivity is not the sole cause of errors, a child who consistently attacks a problem with impulsive approach may experience repeated failure (Olasehinde, 1991). Problem solving ability and solving problems have usually been the way to test performance in education and the most frequent areas of performance target has been in English and Mathematics (Ammer, 1983; Ashori & Jalil-Abkenar, 2015; Cameron & Robinson, 1980; Kano, Ayana, & Chali, 2017; Nwamuo, 2010; Olasehinde, 1986; Schunk, 1981). In the present study, English language and Mathematics were employed because the educational objective of basic education in Ghana is to train learners in numeracy and accuracy (herein described as English and Mathematics).

Impulsive individuals by their nature suffer greatly on standardized testing and classroom assignments, and in many situations, the MFFT performance has been found to correlate reasonably well with academic achievement (Haskins & McKinney, 1976). In a study to indicate strategic and efficient performance on a problem-solving behaviour of children in grades two, four, and six in a pattern matching (PM) task, it was confirmed that reflectives were more strategic than impulsives (Cameron, 1984). A task-analysis assessment conducted identified the sources of inefficient PM performance to include failure to retain instructions, failure to formulate appropriate solution strategy, and failure to consistently implement a good strategy. The latter two were related to conceptual tempo in the sense that children who were more impulsive tended to report lower quality solution strategies, and if they formulated effective solution strategies, they did not consistently implement those strategies. Not only was Cameron and Robinson's (1980) study successful, but the subjects achieved high accuracy in Mathematics which also generalised to other non-trained areas in oral reading. Most of the aforementioned studies reported improvement in academic performance of children (following impulsive behaviour modification) both with classroom impulsivity as well as clinical cases. For Lawry et al. (1983), the question remains as to what extent processing differences between the two dimensions (reflectivity/impulsivity) influence performance across a variety of problem-solving contexts. The conditions under which speed and/or accuracy differences emerge have not been specified fully. For example, it is not known whether quick response is generally indicative of impulsive performance in the majority of problem-solving tasks or only those that require visual comparisons. Similarly, it is not clear if slow response is generally characteristic of reflective performance across problem-solving tasks that vary in difficulty and amount of analytic reasoning involved. The importance of any group differences must be assessed over the full range of performance observed within the groups. Data suggests that modification of the decision strategy of the child may have subsequent effects on his problem-solving ability (Kagan, Pearson, & Welch, 1966b; Yando & Kagan, 1968), and finally of his academic achievement. Herein, the researchers assumed that a reduction in children's impulsivity would have a positive impact on their academic achievements in English and mathematics.

METHODS

Subjects

Ninety-three (47 males and 46 females) children from the Tamale Cluster of Schools in Ghana, took part in the study. The children were aged 9 to 11 years, with an average age of 10. They were purposively selected as subjects based on their scores on the behavioural rating scales employed in the study.

Instruments

The instruments for the study were grouped into three, namely; Screening tools, Training Package and Assessment tools. The screening tools were used for identifying the impulsive children from the non-impulsive ones. The training package was used as intervention in the experimental groups, aimed at reducing subjects' impulsive tendencies. The assessment tools consisted of tests employed in assessing the entry behaviour of the research subjects, then tests used in ascertaining whether impulsivity had been reduced (or otherwise) after intervention and finally test used to check whether a reduction (or otherwise) in impulsivity has any effect on pupil's performance in English language and Mathematics. The instruments are briefly described below:

Screening tools

- National Initiative for Children's Healthcare Quality-Vanderbilt Assessment Scale-Teacher Informant (NICHQ-VAS-TI)- this is a detailed measure that contains impulsivity characteristics that children usually present at school. It was completed by teachers for each pupil in their class.
- Checklist on Impulsiveness for Parents (CIFP) - The CIFP was used by parents to measure pupils' behaviours in their homes. The scale consists of items that correspond to various characteristics of impulsivity which children display in their homes.
- Impulsive Related Questionnaire for Children (IRQC)- This is a self-report questionnaire that elicited information from the pupils on their own behavioural characteristics. The pupils ticked in the column that they felt matched their personal descriptions.

Treatment package

- Training Package in Cognitive Modelling- this was a training programme carefully designed by educational psychologists and instructors to help pupils adopt reflective approaches in problem solving. The training procedure engaged pupils on observation skills and in reflective problem-solving skills in which they had to make careful comparison among and between objects based on properties (such as weight) and physical features (such as colour, shape, size); grouping and sorting similar objects and identifying similarities and differences among objects based on common characteristics; sequencing events; putting together parts of a whole, etc. Close observation to give as detailed a description of objects as possible was emphasized. They were shown videos of impulsive children and the behaviours they show such as blurting out incorrect answers before being called, finishing exercises quickly but with many errors, making careless mistakes, impatience in having to wait their turn etc, and a discussion was held on the causes and effects of such behaviours based on the scenarios. They were then asked to describe some other distracting behaviours (eg. looking out of the window, leaving their seats, playing while others were working, not following instructions as they were given etc.). To break these behaviour chains, they were

encouraged to listen attentively in class as they could be called by the teacher at any time to respond to questions.

Assessment tools

- Matching Familiar Figures Test-20 (MFFT-20)- The MFFT-20 consists of many items each of which was similar to a standard figure. For each figure called the standard, there were five other figures called variants. Although the five variants were similar to the standard, only one was exactly the same as the standard. The task of the pupil was to select from among the variants the one figure that matched the standard. Three versions of the MFFT-20 (sixty items) were used in the study and they were grouped as MFFT-20 (I), MFFT-20 (II) and MFFT-20 (III) for use in pretest, posttest and delayed posttest measures respectively.

- Academic Performance Tests in English Language and Mathematics- These were two sets of teacher-made performance tests in each of the subjects (English and Mathematics) that were used to test problem solving skills of all pupils. *It must be noted that all the instruments employed here underwent standardisation procedures of face and content validation.*

Design

The Solomon-Four Group experimental design was employed. Subjects were randomly divided into four groups of A, B, C and D. **Table 1** shows the assignment procedures.

Procedure for Data Collection

The initial stage of data collection involved the filling of the NACHQ-VAS-TI by the class teachers in the school. The parents also completed the CIFP on behalf of their wards, and finally the children filled the IRQFP by themselves. Since most of the parents could neither read nor write, they were assisted by trained research assistants who translated the English statements on the rating scale into their local dialects (Dagbani, a native language of Ghana, Africa), then the parent told the assistant the option that they felt related to their ward. Likewise, the children were assisted by the research assistants in filling their rating scales, using the same procedure as used with their parents. Scores on the three ratings scales; NICHQ, CIFP and IRQFP were analysed and pupils who got the required scores on all the three instruments were deemed impulsive and they constituted the study's sample. Ninety-three pupils out of the 539 pupils who were screened were described as impulsive and they formed the sample for the study. The ninety-three subjects were randomly posted into one of the four groups (see **Table 1**) adopted in the study. As shown in **Table 1**, subjects in Group 1 were pretested, given intervention and then post-tested. Group 2 were pretested but received no intervention and then post-tested. Group 3 subjects received no pre-test but were given intervention and then post-tested, and finally those in Group 4 were not pretested, did not receive intervention but were posted. All the four groups were also given performance test in English and Mathematics, after post-test. The control groups were given placebo in creative arts exercises and drawing whereas the experimental groups received training in cognitive modelling during the intervention period. The intervention procedure lasted for eight weeks (Nkrumah et al., 2017), three days in a week. The contact periods for both the experimental and control groups were one hour a week, three times in a week.

Table 1. Solomon four group distribution

Key

Test group	Pre-test	Treatment	Post-test
1	O_1	X	O_2
2	O_1	-----	O_2
3	-----	X	O_2
4	-----	-----	O_2

O_1-Pretest, O_2-Posttest, X-intervention

----- no pretest/no intervention

RESULTS AND DISCUSSION

The results are presented in order of the hypotheses that were raised in the study. The analyses were done in two-fold; reaction time and accuracy scores. A reduction in impulsivity is interpreted as increased reaction time and increased accuracy scores.

H_o1: *There is no significant effect of cognitive modelling on the problem-solving abilities of impulsive children.*

H_o1: *There is no significant sustainable effect of cognitive modelling on the problem-solving abilities of impulsive children.*

A two-way between groups MANOVA was used to test the effect of cognitive modelling training on the problem-solving abilities of the pupils. Problem-solving ability in this study was measured with the MFFT-20 (accuracy score and response time). Thus, there were two dependent variables. Four groups were involved in this strategy. Two of the groups were pre-tested, while two were not pre-tested. The two independent factors in this analysis were experimental treatment and whether pre-test was administered or not. **Table 2** illustrates the means and standard deviation for the treatment and pre-test factors.

Table 2 shows a higher MFFT accuracy mean score for the pretested experimental group compared with the non-pretested experimental group. It is possible that pre-testing influenced the results because, the pretested control group had a lower MFFT accuracy mean score than the no-pretested control group. However, pretesting did not gain an advantage for the control group. The results for response time indicates that for the experimental groups, the means for the pretest group (12.67) and the nonpre-test group (10.39) were significantly different (Mean diff = 2.28, p = .009), but the means for the control groups did not differ significantly between the pretest (11.08) and non-pretested (12.19) groups (Mean diff = 1.105, p = .145). Thus, the pretest effect was only evident in the experimental groups, with the pretest group having a higher response time than the non-pretest group. The Box's test of equality of covariance indicated that the covariances were equal across the groups in the test. The MANOVA multivariate results showed that there was no significant main effect for treatment [Wilk's λ = .999, F(2, 88) = .065, p = .937, η2p = .001] and pre-test [Wilk's λ = .967, F(2, 88) = .1.493, p = .230, η2p = .033]. There was however, a significant main interaction effect of treatment and pre-test [Wilk's λ = .843, F(2, 88) = .8.186, p = .001, η2p = .157]. The univariate between subjects' tests were examined to see which of the independent variables had the significant interaction effect. The results showed that there was significant interaction effects for both MFFT accuracy rate [F(1, 89) = 84.703, p < .001, η2p = .151] and response time [F(1, 89 = 64.906, p = .004, η2 p= .091]. This indicated that the pre-test had significant effect on the post-test scores. The simple effects test was therefore performed for the pre-tested groups and non-pretested groups to get the exact

Table 2. Descriptive statistics for MFFT 2 and RTIME 2 for experimental and pre-test factors

	Experimental or Control	Pre-test or no pre-test	Mean	Std. Deviation	N
MFFT 2 SCORE	Exp'al	Pretest	9.56	1.688	18
		No pretest	6.78	2.110	23
		Total	8.00	2.366	41
	Control	Pretest	7.80	2.872	25
		No pretest	8.89	2.242	27
		Total	8.37	2.597	52
	Total	Pretest	8.53	2.576	43
		No pretest	7.92	2.406	50
		Total	8.20	2.492	93
RTIME 2	Exp'al	Pretest	12.67	1.910	18
		No pretest	10.39	3.230	23
		Total	11.39	2.932	41
	Control	Pretest	11.08	2.499	25
		No pretest	12.19	2.842	27
		Total	11.65	2.714	52
	Total	Pretest	11.74	2.381	43
		No pretest	11.36	3.128	50
		Total	11.54	2.800	93

Table 3. Pairwise comparisons of treatment and pre-test/post-test MFFT 2 accuracy mean scores

Pretest or No Pretest	(I) Exp'tal or Control	(J) Exp'tal or Control	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
						Lower Bound	Upper Bound
Pretest	Exp'tal	Control	1.756*	.714	.016	.337	3.175
	Control	Exp'tal	-1.756*	.714	.016	-3.175	-.337
No Pretest	Exp'tal	Control	-2.106*	.656	.002	-3.409	-.804
	Control	Exp'tal	2.106*	.656	.002	.804	3.409

Dependent Variable: MFFT 2 SCORE:.*
The mean difference is significant at the .05 level. b. Adjustment for multiple comparisons: Sidak.

Table 4. Pairwise comparison for MFFT 2 accuracy

Exp'tal or Control	(I) Pretest or no pretest	(J) Pretest or no pretest	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
						Lower Bound	Upper Bound
Exp'tal	Pretest	No pretest	2.773*	.727	.000	1.328	4.218
	No pretest	Pretest	-2.773*	.727	.000	-4.218	-1.328
Control	Pretest	No pretest	-1.089	.641	.093	-2.363	.185
	No pretest	Pretest	1.089	.641	.093	-.185	2.363

Based on estimated marginal means
**. The mean difference is significant at the .05 level.*
b. Adjustment for multiple comparisons: Sidak.

nature of the interaction effects for the MFFT accuracy rate and response time in **Table 3**.

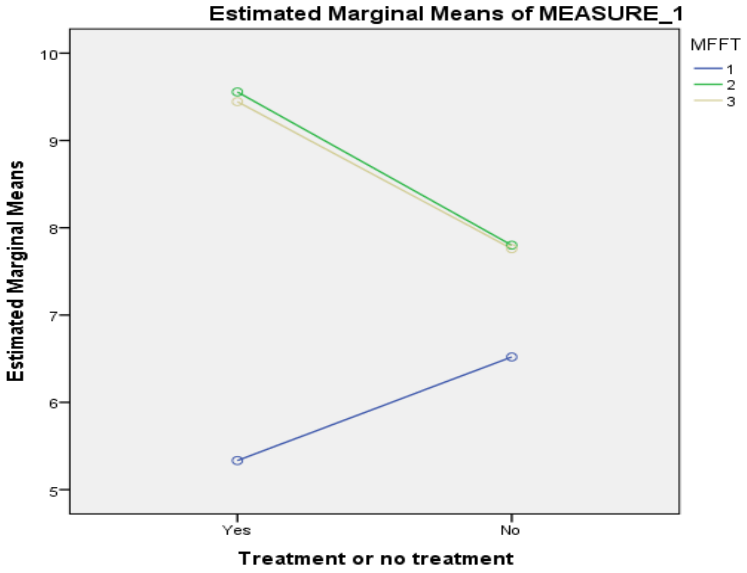
The simple effects analysis in **Table 3** indicates that there was a significant difference between the experimental and control group scores on accuracy rate for both pretest (Mean diff = 1.76, p = .016) and non-pretested (Mean diff = 2.11, p = .002) groups. For the pre-tested groups, the mean accuracy score for the experimental group was higher than the control group, while the reverse was the case for the non-pretest groups. Thus, MFFT accuracy scores for the pretested groups had improved, while scores for the non-pretested groups had significantly reduced. **Table 4** presents the comparison of mean differences between experimental and control groups with regard to pretest or non-pretest.

The results indicate a significant difference between the pretest group and the non-pretest group means on the MFFT accuracy for the experimental groups (Mean diff = 2.77, p < .001), but there was no significant difference for the control groups (Mean diff = 1.09, p = .093). The within group ANOVA test was conducted to test whether there were significant changes between the three measures (pretest, posttest and delayed posttest). The Mauchly's Test of Sphericity indicated that the variance of the difference between each pair of repeated measures of MFFT accuracy was approximately equal [W(2) = .928, p = .223]. The results of the within group ANOVA showed that both MFFT accuracy [F(2, 82) = 23.56, p < .001, η^2p = .365] and interaction effect [F (2, 82) = 6.759, p=.002, η^2p = .142] were significant. Pairwise comparison results (**Table 4**) showed that the pre-test accuracy score was significantly lower than both posttest (Mean diff = 2.75, p < .001) and delayed posttest (Mean diff = 2.68, p < .001). There was, however, no significant difference between the posttest and delayed post (Mean diff = .076, p = .998) as presented in **Table 5**.

Further, within-group ANOVA analysis results showed MFFT accuracy differences between the pretest and the posttest (Mean diff = 4.22, p < .001), and delayed post (Mean diff = 4.11, p < .001), but no difference between the posttest and the delayed posttest response times, indicating that for the experimental group that received pretest, there was priming for the posttest. There was however no significant difference between any of the pairs of means in the control group. This implies that the cognitive modelling strategy has been effective in

Table 5. Pairwise comparison of pre, post and delayed post MFFT

(I) MFFT	(J) MFFT	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
					Lower Bound	Upper Bound
Pretest	Post test	-2.751*	.403	.000	-3.753	-1.749
	Delayed	-2.676*	.509	.000	-3.942	-1.409
Post test	Pretest	2.751*	.403	.000	1.749	3.753
	Delayed	.076	.452	.998	-1.050	1.201
Delayed	Pretest	2.676*	.509	.000	1.409	3.942
	Post test	-.076	.452	.998	-1.201	1.050



MFFT 1= Pretest, MFFT = Post test, MFFT 3 = Delayed Post test

Figure 2. Means plot for MFFT accuracy

Table 6. Within-subjects' effects-pre, post, delayed post for RTime

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	$\eta 2$ p
RTIME	Sphericity Assumed	922.139	2	461.070	74.056	.000	.644
	Greenhouse-Geisser	922.139	1.930	477.836	74.056	.000	.644
	Huynh-Feldt	922.139	2.000	461.070	74.056	.000	.644
	Lower-bound	922.139	1.000	922.139	74.056	.000	.644
RTIME * Treatment	Sphericity Assumed	37.488	2	18.744	3.011	.055	.068
	Greenhouse-Geisser	37.488	1.930	19.426	3.011	.057	.068
	Huynh-Feldt	37.488	2.000	18.744	3.011	.055	.068
	Lower-bound	37.488	1.000	37.488	3.011	.090	.068
Error (RTIME)	Sphericity Assumed	510.527	82	6.226			
	Greenhouse-Geisser	510.527	79.123	6.452			
	Huynh-Feldt	510.527	82.000	6.226			
	Lower-bound	510.527	41.000	12.452			

improving problem solving strategy of the subjects. **Figure 2** presents a pictorial view of mean scores of pre, post and delayed post MFFT accuracy scores for the experimental and control groups.

Figure 2 suggests that the difference between the pretest and the posttest accuracy score was sustained to the delayed posttest. Though the between-subject effects showed no significant overall treatment effect, the significant interaction effect suggests that the within-group effect differs between the experimental and control groups. The pairwise comparisons also show that there was no significant difference in the pretest scores between the experimental and control groups (Mean diff = 1.19, p = .145). This suggests that the two experimental conditions had equivalent baseline. For the posttest, however, there was a significant difference between the experimental and control groups (Mean diff = 1.76, p = .026), with the mean accuracy rate for the experimental group being higher than that of the control. This effect was sustained to the delayed post. The within-group ANOVA analysis was again used to test whether the mean scores of the response time for pretest, posttest and delayed posttest were significantly different. The Mauchly's Test of Sphericity was first measured for response time. And it showed there was equality of variance within the three measures [W = .964, p = .477]. The statistics for the sphericity assumed was therefore reported for the between subjects' effects. The within-subjects effect for response time is presented in **Table 6**.

Table 7. Pairwise Comparison of 3 of Rtime

(I) RTIME	(J) RTIME	(I-J) Mean Diff	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
					Lower Bound	Upper Bound
Pretest	Posttest	-3.609*	.491	.000	-4.830	-2.387
	Delayed Posttest	-6.629*	.569	.000	-8.045	-5.213
Posttest	Pretest	3.609*	.491	.000	2.387	4.830
	Delayed Posttest	-3.020*	.573	.000	-4.446	-1.594
Delayed Posttest	Pretest	6.629*	.569	.000	5.213	8.045
	Posttes	3.020*	.573	.000	1.594	4.446

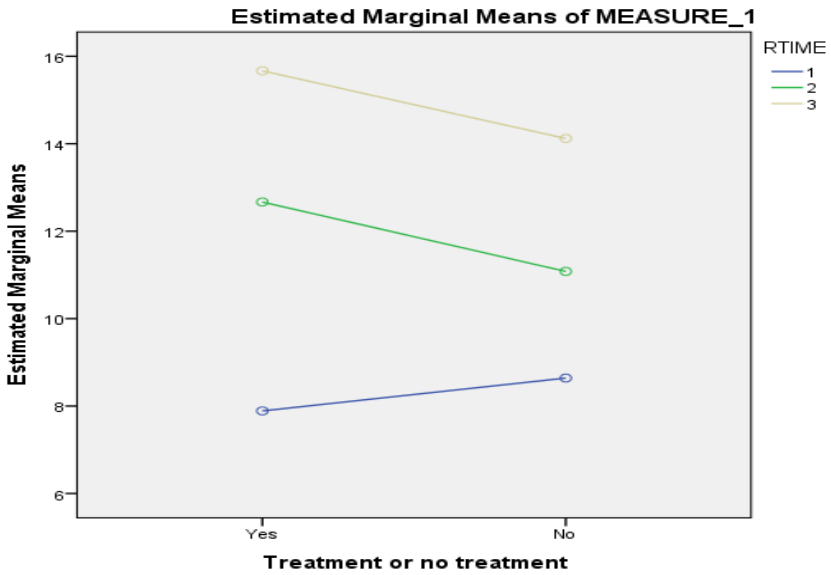


Figure 3. Means plot on RTimes for experimental and control groups

The results from **Table 6** show significant differences exist in response time within the experimental and control groups [F(2, 82) = 74.06, p < .001, η^2p=.644]. There was however, no interaction effect of treatment and response time measures [F(2, 82) = 3.01, p = .056, η2 p= .068].

The post hoc analysis then was done, following significant within subject effect to find out which of the measures significantly differ. Comparison between the three measures of Response Time is presented in **Table 7**.

The results show that the posttest response time was significantly lower than that of the pretest (mean diff = 3.61, p < .001), and the delayed posttest response time was further lower than the pretest (mean diff = 6.63, p < .001)). Again, the response time for the delayed post was significantly lower than that of the posttest (mean diff = 3.02, p < .001). Given that there was no significant interaction effect of treatment and time measures, this means the results indicated here were similar for both experimental and control groups. All the three measures of pretest, posttest and delayed posttest for response time were significant. The results further indicated that the baseline measure (pretest) response time for the experimental and control groups were not significantly different (Mean diff = .751, p = .323). There was, however, a significant difference between the experimental and control groups at the posttest (Mean diff = 1.59, p = .029), but no significant difference was observed with regard to the delayed posttest (Mean diff = 1.54, p = .100). The means plot of RTime for experimental and control groups is presented in **Figure 3**.

The experimental treatment was effective in increasing the response time of the pupils in the study at post-test measures. There was also an increase in the difference between the post-test and the delayed post-test. The implication here is that the cognitive modelling strategy has been effective in improving problem solving ability of the pupils. The null hypothesis is therefore rejected. The results obtained here are consistent with some other studies that used modelling in modifying the impulsive characteristics of their research subjects (eg., Herman, 1982; Nkrumah, 2013; Nwamuo, 2010; Olasehinde, 1992). For example, Schunk (1981) provided children deficient in division skills with either cognitive modelling of division operations or didactic instruction, along with practice opportunities, over a number of sessions. During cognitive modelling, the children observed an adult model verbalize operations while solving problems. Children who received training in cognitive modelling solved more division problems correctly on post-test, although both treatments enhanced self-efficacy on division operations equally. Nwamuo (2010) also modified the disruptive behaviours of some primary school children using cognitive modelling. Results of her study showed that modelling was effective in reducing impulsive behaviour characteristics of her subjects after intervention. Further, Nkrumah (2013) employed modelling to train impulsive children to delay responses and increase their accuracy scores on the MFFT-20. Results showed improved accuracy scores and delayed response in the experimental group relative to the control group. In the original modelling experiment conducted by Bandura (1981), the research subjects were children. It therefore seems to suggest that the technique is more effective when employed with children, as wildly reiterated by Odoemelam (1994). However, some other studies have modified young adults (and teenagers) disruptive behaviours using modelling. Olasehinde (1992) for example, trained some impulsive senior secondary school students on how to approach

Table 8. Multivariate tests effect of cognitive modelling on performance

Effect		Value	F	Hypothesis df	Error df	Sig.	$\eta 2$ p
Exp'tal	Pillai's Trace	.250	14.633[b]	2.000	88.000	.000	.250
	Wilks' Lambda	.750	14.633[b]	2.000	88.000	.000	.250
	Hotelling's Trace	.333	14.633[b]	2.000	88.000	.000	.250
	Roy's Largest Root	.333	14.633[b]	2.000	88.000	.000	.250
Pre-test	Pillai's Trace	.297	18.627[b]	2.000	88.000	.000	.297
	Wilks' Lambda	.703	18.627[b]	2.000	88.000	.000	.297
	Hotelling's Trace	.423	18.627[b]	2.000	88.000	.000	.297
	Roy's Largest Root	.423	18.627[b]	2.000	88.000	.000	.297
Exp'tal * Pretest	Pillai's Trace	.113	5.616[b]	2.000	88.000	.005	.113
	Wilks' Lambda	.887	5.616[b]	2.000	88.000	.005	.113
	Hotelling's Trace	.128	5.616[b]	2.000	88.000	.005	.113
	Roy's Largest Root	.128	5.616[b]	2.000	88.000	.005	.113

Table 9. Test of between-subjects' effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	$\eta 2$ p
Treatment	ENG 2 SCORE	548.011	1	548.011	1.865	.176	.021
	MATH 2 SCORE	5792.334	1	5792.334	26.291	.000	.228
Pre-test	ENG 2 SCORE	928.475	1	928.475	3.159	.079	.034
	MATH 2 SCORE	7153.929	1	7153.929	32.471	.000	.267
Experiment * Pre-test	ENG 2 SCORE	186.651	1	186.651	.635	.428	.007
	MATH 2 SCORE	2246.204	1	2246.204	10.195	.002	.103
Error	ENG 2 SCORE	26157.166	89	293.901			
	MATH 2 SCORE	19608.271	89	220.318			
Total	ENG 2 SCORE	385325.000	93				
	MATH2 SCORE	333819.000	93				

cognitive task reflectively. The results of her studies showed that there was an increased performance of the experimental group as against the control group at post-test measures. Gorrell (1993) also improved the classroom management skills of some undergraduate students using cognitive modelling. Such studies add to the literature to suggest that the modelling technique is effective for both adult and children populations, and also for assisting in resolving varied behavioural problems. In the present study and some others (Nkrumah, 2013; Nwamuo, 2010; Olasehinde, 1992; Schunck, 1981) the technique was used to assist impulsive subjects to approach cognitive problem-solving task reflectively and they reported positive results. Some other researchers employed modelling to increase the self-efficacy (Odoelemam, 1994) and the self-concept (Gorrell, 1993) of their research subjects and they also reported that the technique was effective. In effect, the modelling technique seems to be efficient not only with cognitive problem-solving abilities, but also other areas of psychological traits as indicated above. In addition, the technique appears effective irrespective of ecology. For example, it has been shown to achieve positive results in studies conducted in the Western countries (Schunk & Hanson, 1985), Oceania (Herman, 1982) and currently in Africa (Nkrumah, 2013; Nwamuo, 2010; Odoelemam, 1994).

Hypothesis 3

There is no significant effect of cognitive modelling on impulsive pupils' performance in Mathematics and English.

From descriptive statistics on English and Mathematics tests, the results for the English test showed that the pre-test scores for both experimental and control groups were lower than the non-pretested groups. In terms of performance the groups that were not pretested scored better than those who were. The same trend was observed in the Mathematics scores. The two-way MANOVA test was conducted to find out whether the observed differences were significant. The Box's test of equality of covariance indicated that the covariances were not equal across groups. The Pillai's Trace statistics were therefore reported in **Table 8**.

The multivariate test in **Table 8** showed significant effects for the experimental [F(2, 88) = 14.63, p < .001, η2p = .250], pretest condition [F(2, 88) = 18.63, p < .001, η2p = .297] as well as the interaction effect [F(2, 88) = 5.62, p = .005, η2p = .113]. The between subjects' effects for the dependent variables (English and Mathematics) were analysed. The Levene's test showed variance for the subjects was not equal. Tests for between-subjects' effects for English and Mathematics performance are displayed in **Table 9**.

The results of the between-subjects effects in **Table 10** showed significant effect for experimental condition [F(2, 88) = 14.63, p < .001, η2p = .250], pre-test condition [F(2, 88) = 18.63, p < .001, η2p = .297] and interaction on only Mathematics. There was no effect on English test score. The post hoc analysis was therefore done for Mathematics performance in **Table 10**.

The pairwise comparison for Mathematics in **Table 10** showed significant difference between the experimental group and control group (Mean diff = 15, p < .001).

Comparison between pretest and non-pretest groups also showed significant difference between the two groups (Mean diff = 17.75, p < .001). The results therefore demonstrated that the treatment had an effect on both pretest and non-pretest groups. However, the non-pretest group performed significantly higher than the pretest group. It is obvious in terms of problem-solving abilities that the groups were not equal, and the pre-test had no priming effect. The null hypothesis

Table 10. Pairwise comparisons between experimental and control groups

Dep Variable	(I) Exp'tal or Control	(J) Exp'tal or Control	Mean Diff (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Diff[b]	
						Lower Bound	Upper Bound
ENG 2 SCORE	Exp'tal	Control	4.911	3.597	.176	-2.235	12.058
	Control	Exp'tal	-4.911	3.597	.176	-12.058	2.235
MATH 2 SCORE	Exp'tal	Control	15.968*	3.114	.000	9.780	22.155
	Control	Exp'tal	-15.968*	3.114	.000	-22.155	-9.780

is therefore accepted. Studies on behaviour modification that tested the impact of the training strategies on students' performance have usually used English and Mathematics. In the present study, the researchers tested the efficacy of the modelling therapy on pupils' performance in Mathematics and English. The study found out that modelling had a positive impact on Mathematics but not in English. Schunk (1981) and Schunk and Hanson (1985) for example provided children deficient in division skills with either cognitive modelling of division operations (using adult models) and children deficient in subtraction skills with peer cognitive modelling. Children who received cognitive modelling both with adult and peer models, solved more division and subtraction problems correctly on the posttest, and also demonstrated enhanced self-efficacy in Mathematics problem solving. Herman (1982) also used cognitive modelling to improve Mathematics, reading and spelling performance of some impulsive subjects. None of the studies reviewed so far attempted to find out whether impulsive behaviour modification has impact on the problem-solving abilities of impulsive children in Mathematics better than in English or vice versa. Although there were no discrete hypotheses raised for the two subjects, the analyses show that there was improvement in subjects performance in Mathematics better than in English. Superficially, it is assumed that reflective processes are more engaging in Mathematics than in English. In Mathematics, for example, problems of addition that require carry overs demand grave impulse control (even when the child knows the correct approach) so that the child does not miss out on the "remainders". Also, in Mathematics, there are sometimes more than one way of approaching a problem, in such cases, the child has to think through the easiest approach. Some of these engagements make Mathematics seem more reflective oriented than English. At the level of the subjects employed here, English involves more of comprehension exercises and sentence construction. In this case, impulse control is important, but may not be critical especially in situations where the child knows the right approach. It will be prudent for further studies to compare the potency of cognitive modelling between Mathematics and English for clearer understanding of this issue.

DISCUSSION, CONCLUSION AND RECOMMENDATION

Cognitive thinking strategies normally develop before children enter adolescence, and childrens academic and social journey could be smooth if they adopt reflective thinking, not only for academic work but also for avoidance of risky decision-making. Pupils in the regular classrooms who are often set aside as underachievers and repeat classes, can function like their peers if they are given the needed assistance. This study suggests that a concerted formalised teaching and practice strategy is needed for children to get to the academic level expected by the general standard. For these children, mastery learning may be impossible unless they are formally trained how to learn. In recent educational reforms, the classroom is expected to practice inclusion of children with some level of special needs, including impulsivity. Teachers will need the help of proven alternative approaches to teaching and learning, such as the strategy used in this study. The cognitive behaviour modification strategies of cognitive modelling, used in this study has been effective for use in the Ghanaian classroom situation. The reflective characteristics acquired were sustained even to the delayed posttest. By itself, cognitive behaviour modification strategies for self-initiated appropriate attending to cognitive tasks will not eliminate a pupil's learning deficits. Neither will it guarantee that learners will fully make use of their cognitive skills. Educators still need to explore the world of children in search of answers to learning problems. This study investigated options for improving the academic performance of underachieving impulsive pupils. The results suggest the need for incorporating these strategies into the educational programs for all children. In our view, improvement in the children's problem solving ability may have been much higher and have lasted much longer if the intervention had been sustained for a longer period. It takes time and constant practice to learn strategies and develop automaticity in them.

Quite intriguing, previous assessments of impulsivity focussed on parents and teachers as key informants. The Vanderbilt Assessment Scale, which was adapted for this study assessed only those two groups as informants and employed the children themselves as informants, thus affirming the fact that they can recognize the negative behaviour of impulsivity within and assess themselves when given the opportunity. Another unique contribution of this study the use of a larger group to increase the power of the study and more importantly, Solomon four to test for testing pretest sensitisation effects. The reflective thinking strategies embedded in the intervention was seen in the increased scores after the behaviour modification training. It is important to note that the strategy delayed responding, even though merely delaying responses may not necessarily indicate reflectivity. This study proved that reflective thinking strategies are necessary for increasing problem solving and decision making. All children benefit from instruction, but some children need incredible amounts of careful, personal instruction, with clear and repeated demonstrations of how they should go about their learning and performance of cognitive tasks. Left without adequate demonstrations, struggling impulsive learners are likely to continue trying to make sense out of lessons, but rarely will they accomplish this feat. Besides giving impulsive children a new potential for performing, the strategy used in this study provides children with self-directed problem-solving techniques that increase the possibility for all children to maximise their learning potential for school success.

Recommendations

The problem of classroom impulsivity is too pronounced to be continually ignored in the Ghanaian primary schools. The condition yields undesirable consequences for children and cripple their academic achievement; the real essence of their being in school. It is therefore

recommended that schools in collaboration with educational psychologists should organize remedial programmes for children where reflective practices could be taught and its importance emphasized. Teachers need to have clear knowledge of impulsive characteristics that are displayed in the classroom setting so that they could help identify such children before they graduate into other unmanageable disorders. The questionnaires used in this study could be a source of information to stakeholders. Parents and teachers should praise other children who demonstrate desirable behaviours in order to signal or draw other pupils' attention to what is expected of them in the classroom. Positive self-talks help to achieve target behaviours, and teachers can make use of that in the classroom. More important, teachers could be given training to increase their awareness of reflective teaching, avoid the barriers by having a clear understanding of reflective teaching and its implementation and improve its practice.

Other recommendations that could be made due to observations noted in the course of the study are: The Ghana Education Service stipulated maximum class size of 35 must be strictly enforced in order to restrict the spread of impulsivity among children (where a few exist in the classroom). Teachers must also learn to ignore children who blurt out appropriately or seek attention in impulsive and disruptive ways. Instead, apply the consequences of the behaviour plan. Also, the classroom should not contain fixed or permanent sitting places for children. The place a pupil sits during lessons should be based on the behaviour at that time. Teachers are expected to provide feedback on both the content and process of the learners' own reflective practice and provide an environment that encourages reflective practice Schools should invite resource persons like educational or cognitive psychologists to train teachers in reflective practices. Finally, curriculum developers may have to integrate the pedagogy of reflective teaching in trainee-teachers curriculum so that they are equip with such skills before they are placed in the classrooms.

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