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Application of Intelligence Indicators on Secondary School Safety and Security as a Measure of Learning Enhancement

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Abstract

There have recently been a number of violent public attacks in Nigeria and school children have not been spared. This study examines the perception of relationships between staff and students in the application of security measures in secondary schools and the setbacks between teachers and students in the enforcement of educational policy in schools. This study looks at the situation in two Local Government Areas in the Riverine area of Rivers State, Nigeria where the story is the same in terms of the safety and security of school children. This study found fear among students and staff, anxiety, uncertainty, low morale, and absenteeism as a result of bullying and violence. This study identified a number of challenges, which include the absence of electricity, the uncooperative attitude of some Nigerians towards innovation, and lack of funds. This paper echoes the voices of concerned Nigerians and notes that if stringent measures are not put in place to ensure safety in schools, Nigeria risks not producing the men and women it needs (with adequate skills and education) to guide the country in the coming years. This study recommends that federal, state and local governments have emergency notification systems mounted in strategic locations in schools. Governments should provide the infrastructures and control needed to make these systems work.

Keywords: School safety; school security; intelligence indicators; learning environment

Reference to this paper should be made as follows:

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INTRODUCTION

Safety in Nigerian schools is the concern of teachers, parents, and school administrators alike, all of whom see school systems as the incubators of great Nigerians who will soon pilot the affairs of the nation. Unfortunately, the violent reality of schools today makes one wonder how and if students are actually able to learn in such volatile environments. In addition, children and students are often very much in danger of being harmed, it is often simply the perception or fear of violence that influences how people act and behave. These perceptions can affect learners' school attendance, cause poor school performance, and affect the general wellbeing of learners. This situation must be remedied immediately if Nigeria is to produce the type of future citizen who will be able to hold their own as an equal among the community of nations.

This study was necessitated because of insecurity and violence in schools, resulting in the poor performance of candidates on the West African Senior Secondary School Certificate Examination (WASSCE) and National Examination Council (NECO). This study focuses on schools in the Riverine area of the Rivers State: Ogba/Egbema/Ndoni Local Government Area (ONELGA) and Okirika Local Government Area (WALGA). For the most part these are geographies that are quite far from most law enforcement officials. Amanchukwu (2010) reports that 29.93% of the May/June 2009 WASSCE candidates obtained a minimum of grade six in at least five subjects, including English Language and General Mathematics. School insecurity, including fear of being attacked by senior students, may have affected student performances on these examinations.

The VISION 20: 2020 redefines the scope of Nigeria's National Policy on Education and makes it more relevant to the needs of the present, stressing the development of skills and the need to unlock the ability and potential of every Nigerian child. One may wonder how such a feat is to be achieved in a context of intense physical insecurity. The results of this study can undoubtedly assist education managers, stakeholders, policymakers, teachers, and researchers as they work towards VISION 20: 2020 given that students must first be and feel safe before their potential can be unlocked (Briggs et al., 2012).

Research Questions

The following constitute the research questions for this study:

1. Is there a strained relationship between staff and students in the application of security measures in schools?
2. Are there any setbacks between teachers and students in the enforcement of educational policy schools?

LITERATURE REVIEW

School safety could be defined as a situation in which the learner feels at home, develops confidence, maintains a positive state of mind, and does not show any signs of withdrawal. The opposite, a sense of insecurity at school, can have considerable ramifications including anxiety, fear, uncertainty, and confusion. When insecurities in the physical environment (perhaps brought about by bullying) are internalized, they can lead a child to develop a poor "self-concept," low self-esteem and a lack of belief in his or her own goodness, skills or abilities. Nigeria can be seen as "a nation at risk" given its widespread physical and consequently emotional/intellectual insecurity. Insecurity can be distressful and threatening to the psyche and is often accompanied by some degree of withdrawal and isolation.

Studies conducted in various contexts have shown that if violence is left unchecked over time in school settings, it can have a detrimental impact on both teaching and learning. Even those who are not directly affected come to feel a heightened sense of school insecurity as a result of the media panic that tends to magnify isolated incidences of school violence (Thompkins, 2000). Research has also shown that in most sub-Saharan African countries, violence is often perpetuated in schools by the state, where the latter uses its repressive mechanisms to quell student rioters and imprison and torture student leaders (O'Malley, 2007). Other studies have emphasized the risk and consequences of sexual abuse in schools (Leach & Humphrey, 2007; Mirembe & Davies, 2001). O'Malley (2007, p. 7), who has studied and written about violence and its effects in Middle Eastern schools (Iran, Palestine and Afghanistan) notes that "schools and places that should be safe for children have increasingly become the prime target of attacks by armed parties".

Apart from sexual abuse suffered by students at school, the majority of the world's poor living in inner-city neighbourhoods and slums endure various degrees of violence that can have a negative influence on educational attainment and schooling outcomes. Mugisha (2006) and Magadi, Zulu and Brockerhoff (2003), found that a large proportion of the urban poor in third world countries live in "life and health threatening neighbourhoods". Consequently, this paper is designed to show how physical security threats can hinder educational attainment and to examine a number of intelligent safety indicators that might be applied to reduce this violence.

High levels of crime, victimization and violence in any community are strong indicators of insecurity. Feelings of insecurity may also emanate from the fact that those entrusted with student security in schools are not able to ensure it or are, in some cases, the source of the insecurity. Hudson (1999:26) emphasized that the head teacher, senior teachers and caretaker of any school are seen as responsible for school safety and security. He further notes that this responsibility should be extended to the individual teachers who are to some extent responsible for the safety and security of those they teach.

Feelings of insecurity can increase student drop-out rates. Sterns and Glennie (2006), for instance, found that boys (as compared to girls) are more likely to drop out of school because of harsh disciplinary measures meted

out on them by teachers. At the same time, twelve percent of girls and eleven percent of boys in slum schools worried about being harassed by teachers at their schools. Unfortunately, this study did not ask students to specify the type of harassment experienced or feared and so it is not possible to determine whether girls and boys endured different types of harassment.

Given the gendered and patriarchal nature of society, it seems likely that the school environment today is more insecure for female students. According to Leistikow (2003), Kenya’s Ministry of Education identified teachers’ negative attitudes towards female students as a factor in this insecurity noting that teachers often and openly allowed boys to bully girls in class. While in Nigeria, parents shy away from reporting sexual harassment meted out on their daughters at school, as shown in Table 1 below Kenya parents seem to be much more aware of sexual advances by teachers.

Table 1: Teachers try to have sex with pupils and sometimes do have sex with them

Response	Non- slum	Non-slum (%)	Slum	Slum (%)	Total	Total (%)
Strongly agree	14	2.06	280	12.52	294	10.09
Somewhat agree	26	3.83	184	8.23	210	7.2
Neutral	28	4.13	95	4.25	123	4.22
Somewhat disagree	68	10.03	84	3.76	152	5.21
Strongly disagree	528	77.88	1,554	69.47	2,082	71.42
Don’t know	2	0.29	39	1.74	41	1.41
Not applicable	12	1.77	1	0.04	13	0.45
Total	678	100	2,237	100	2,915	100

Source of data: ERP

As Table 1 highlights, children and students who live and attend schools in slums are more likely to experience sexual harassment (heightened insecurity) by teachers when compared with non-slum students. In this instance, if security detectors were mounted and monitored throughout the school, these types of behaviours would fade over time.

Apart from sexual harassment, Amanchukwu (2005) has noted that a series of killings in both secondary and tertiary institutions have likewise invaded these once sacred learning spaces. Schools have long been seen as the safest place for children while their parents are engaged in other activities. Unfortunately, the crime rate in today’s schools renders this shared cultural belief suspect. Recognizing this contradiction, the National Crime Prevention Council (2002) in collaboration with the national parents teachers association (PTA), and its national crime prevention partners (the All State Foundation, the ASSA ABLOY Group, Nextel Communications and the Security Industry Association) initiated the “Be Safe and Sound” campaign to mobilize parents, policy makers, school officials and students to take action to prevent violence in schools.

The story of violence is the same in developed countries, even among secondary school and middle school students. A study performed by Caty (1998) found that more than 6000 American students were expelled during the 1996-97 year for bringing guns to public schools. Dwyer (1999, p. 3) likewise stated that “250,000 or more weapons were brought to school each year by students”. Amanchukwu (2005, p. 157) concluded that “no school can honestly claim to be violent-proof” as everything depends on how the school manages its affairs on a day-to-day basis.

In the United States, most school crime is theft. In 2001 there were 42 thefts for every 1,000 students ages 12 to 18 and thefts accounted for about 62 percent of all crime against students at school that year (<http://nces.ed.gov/pubs2004/2004/2004.pdf>). In 2001, 36 percent of students also saw hate-related graffiti at school and 12 percent reported that someone had used hate-related words against them (De Voe et al., 2003:40). Students are not the only ones affected by school crimes. Teachers, at times, can also be the victims of these crimes, especially in rural schools where law enforcement is not as readily available or visible. Studies in Washington, DC from 1997 to 2001 found that teachers were the victims of some 1.29 million non-fatal crimes in schools, including more than a million thefts and 473, 000 violent crimes such as rape, robbery and assault.

It is important to note that the perception of crime can be as debilitating as crime itself. In 2001, 6 percent of students reported fears that they were going to be attacked or harmed at school and almost 5 percent said that they avoided one or more specific areas at school for their own safety (De Voe et al., 2003). A 1996-97 study carried out by the United States Department of Education revealed that 84 percent of public schools were considered to have a low degree of security. According to the report, however, the situation is changing. Educators have come to realize that the foundation of all learning is safety and security and that attendance and academic performance are closely linked to how safe students perceive the school environment to be. It is hard for young

people to concentrate on learning or have a desire to learn when they feel vulnerable, and a climate of fear forces teachers to shift their focus from teaching to policing (United States Department of Education, 1998).

A survey on youth bullying conducted by Wirthlin Worldwide for National Crime Prevention Council (NCPC) in 2002 revealed that six out of ten students witnessed 'bullying or taunting' on a daily basis. Although further studies showed that as many as 75% of children had been victims of bullying, only 20% of parents surveyed in 2000 saw bullying as a serious problem for their children (National Crime Prevention Council, 2001, p. 32). Bullying has long been an issue in Nigerian secondary schools and requires the attention of law enforcement before the situation gets out of hand.

Creating a Safe Learning Environment

The concept 'learning environment' refers to the classroom and all other places in the school that offer an opportunity for or affect learning. The school is set up by the society to inculcate knowledge and skills in individuals with the aim of personal and societal improvement. Along these lines, Nwagwu in Okonkwo and Ozurumba (1989) sees education as the formation of character, the development of intellectual capabilities of the individual, the improvement and transmission of cultural heritage, and the equipping of individuals with the knowledge and skills, values and attitudes that will enable them to earn a living in a rapidly changing world, and in turn contribute to the improvement and welfare of society.

These goals can only be achieved in the classroom if the classroom environment is conducive to learning. One of the preconditions for effective learning is a cordial relationship between teachers and learners. According to Tibilisi-Batumi (2011), teacher/student relations can develop in the following ways: authoritarian, authoritative, permissive, and uninvolved. He noted that authoritative teachers tend to support students in their endeavors and in their risk-taking, even when it produces mistakes. Thinking and seeking out new strategies are important skills for these teachers and so their students tend to persist until they find the right solution.

Atkinson and Feather (1966), in their Expectancy X Value theory, suggested that people are motivated to engage in an activity to the extent that they expect to succeed times the value they place on the success (that is they expect to succeed and value the success and so are motivated to engage in activity). Apart from relation style, Atkinson and Feather stated that the care shown by authoritative teachers and which tends to be lacking in uninvolved teachers, is key to student success. This care is generally expressed by giving time and attention to students and by showing respect to individual students. Uncaring attitudes can create insecurity in the student and consequently affect learning.

According to Ezeocha, Nosiri and Eferakeya (1990, p. 32), teachers should strive to maintain a satisfactory level of humanness by creating a conducive setting where lessons can take place. This is achieved by accommodating students' opinion, stimulating and reinforcing students, observing students so as to detect and support slow learners, and avoiding favouritism. Aggarwal (2007, p. 154) likewise states that in order to maintain the emotional climate of the class, students should be openly praised when they show good results. This encourages them to achieve more and develops their confidence, hope, self-reliance and self-respect.

Although teachers can face considerable disturbances and behavioural problems in the classroom, it is their responsibility to apply all of their own educational and classroom experiences to maintain respectful control of the classroom and to ensure that all students are able to come into an environment conducive to thinking and learning (Amanchukwu, 2005). It is important to note, however, that there are some instances in which teachers feel that they are or could be overpowered by violent students. An interview with teachers from the ONELGA and WALGA Local Government Areas in Rivers State in 2008 revealed that teachers are very often working in fear of students with the capacity to become extremely violent. The teachers themselves found it difficult to discipline these students for fear of retaliation. Meaningful learning cannot take place in such an environment.

Student-Student Relations

The classroom climate reflects the feelings that students generate and express in that environment. It is important that the classroom teacher initiate and encourage cooperative relationships among students. Fairness and equity must prevail in the school system as a whole and in the classroom in particular. Individual, collective and challenging tasks should be given to students to enable them develop attitudes that will help them excel in life. According to Amanchukwu (2007), students should be guided to practice civic skills such as problem solving, public speaking, consensus building, and discussion, writing, and reflection on controversial issues. These activities will help students to develop compassion and respect not only in their present relationships, but in their future relationships as well.

The “Be Safe and Sound” Campaign

The “Be Safe and Sound” campaign was a public education and awareness campaign launched in 2002 to involve parents in the issue of school safety and security. It encourages parents and school principals to actively evaluate the school’s social climate and its physical environment. The campaign is based on the premise that while security devices such as locks and alarms are important, tighter security alone will not make a school safer. Preventative safety measures that focus on behaviour and environmental design, such as conflict resolution programmes, zero tolerance policies, bullying prevention programmes, visitor policies and community service programmes, are critical.

The “Be Safe and Sound” campaign encourages parents to partner with school principals to organize school safety and security committees or action teams. These action teams, comprised parents, school principals, teachers, students, law enforcement and other key players, have been charged with the following tasks:

- To assess local school safety and security needs;
- To identify and engage community leaders and other concerned citizens who can help set safety and security priorities;
- To create action plans mapping out goals and objectives for addressing specific safety and security problems;
- To promote and advocate for school safety and security in the community;
- To enact positive change in and around the school compound; and
- To evaluate the effectiveness of school safety and security improvements.

This campaign seems to suggest that serious attention is increasingly being paid to safety and security in schools. The campaign has been a considerable success in the Edwin Stanton Elementary School in Philadelphia where a schools safety and security action team conducted several kinds of safety and security research in January and February 2003. This research included surveys of students, faculty and parents to find out how each group perceived the school’s current levels of safety and security. The school principal then worked with parents and other community leaders to evaluate the survey data and form a safety and security action plan. The action plan identified several major priorities including: to secure the building against potential intruders, to provide a safe corridor to and from school, and to launch a school wide anti-bullying campaign. This action plan also led to the adoption of a new school door bell, video camera surveillance equipment, a school safety and security resource center, and materials to help teachers detect signs of sexual abuse in students (www.safeschools.info/).

METHODOLOGY

Research Design

The study involved a descriptive survey designed to identify various security risks experienced in ONELGA and WALGA in the Rivers State. The study population included eleven secondary schools in the ONELGA and eight secondary schools in WALGA Local Government Areas. These schools are located in the riverine area of the Rivers state and have similar topography.

Instrument for Data collection

This study employed a Questionnaire called, “A questionnaire on the Application of Intelligence Indicators on Secondary School Safety and Security”. Questionnaires consisted of eighteen structured and open-ended questions written in simple English. Fifty-five questionnaires were administered to secondary schools in the ONELGA LGA and 40 were administered to secondary schools in the WALGA LGA. The breakdown is as follows:

Table 2: Surveys administered to secondary schools in the ONELGA

S/no	Names	Number of Questionnaires	
		Administered	Returned
1	Gov. Sec. Schl. Ngo	5	5
2	Gov. Sec. Schl. Asarama	5	5
3	Gov. Comp Sec. Schl. Ataba	5	4

4	Community High Schl. Egbormung	5	5
5	Community Sec. Schl. Iyonoroon (UBE)	5	5
6	Community Sec. Schl. Agwut obolo	5	5
7	Community Sec. Schl. Unyeada	5	5
8	Community Sec. Schl. Ebukuma	5	5
9	Community Sec. Schl. Ekede	5	5
10	Community Sec. Schl. Ibot-rren	5	5
11	Community Sec. Schl. Dema	5	5
Total		55	54

Field Survey, 2009

Table 3: Surveys Administered to Secondary Schools in the WALGA

S/no	Names	Number of Questionnaires	
		Administered	Returned
1	Okrika Grammar Schl. Okrika	5	5
2	Okrika National Sec. Schl Okrika	5	5
3	Community Sec. Schl. Kalio	5	5
4	Community Sec. Schl. Okujagu	5	5
5	Community Sec. Schl. Ogan	5	5
6	Sports Institute Isaka	5	3
7	Community Gov. Sec. Schl Okochiri	5	5
8	Gov. Girls Sec. Schl. Okumagba	5	5
Total		40	38

Field Survey, 2009

RESULTS

Research Question One

Is there a strained relationship between staff and students in the application of security measures in schools?

Table 4: Perception of Relationships between Staff and Students in the Application of Security Measures in Secondary Schools (ONELGA)

Question Number	Names of schools	Agree	Disagree	Undecided	Total
1	G.S.S. NGO	4	1	-	5
2	G.S.S. ASARAMA	4	1	-	5
3	COMP. S.S. ATABA	3	2	-	5
4	COMM.HIGH SCHL. EGBORMUNG	4	1	-	5
5	COMM. S.S. IYONOROON (UBE)	4	1	-	5
6	COMM.S.S. AGWUT OBOLO	4	1	-	5
7	COMM.S.S. UNYEADA	3	2	-	5
8	COMM.S.S. EBUKUMA	4	-	-	4
9	COMM. S. S. EKEDE	4	-	1	5
10	COMM.S.S. IBOT-RREN	5	-	-	5
11	COMM.S.S. DEMA	5	-	-	5
Total		44	9	1	54

In ONELGA, 81.48% of teachers felt that there was a strained relationship between teachers and students, while 16.67% did not feel this way. These results would seem to suggest that relationships between students and teachers are overwhelmingly strained in this LGA.

Table 5: Perception of Relationships between Staff and Students in the Application of Security Measures in Secondary Schools (WALGA)

Question Number	No.of schools	Agree	Disagree	Undecided	Total
1	OKRIKA G.S, OKRIKA	3	1	1	5
2	OKRIKA NATIONAL S.S.OKRIKA	2	2	1	5
3	COMM.S.S. KALIO	2	2	1	5
4	COMM.S.S. OKUJAGU	2	3	-	5
5	COMM. S.S. OGAN	2	1	2	5
6	SPORTS INSTITUTE ISAKA	3	2	-	5
7	COMM.S.S OKOCHIRI	3	2	-	5
8	G.S.S. OKUMAGBA	3	2	-	5
Total		20	15	5	40

In the WALGA, 50% agreed that relationships were strained while 35% felt that they were not strained. Although these results point to strained relationships again, the disparity in perceptions is not as great as it was in the ONELGA.

Research Question Two

Are there any setbacks between teachers and students in the enforcement of educational policy schools?

Table 6: Perceptions on setback between teachers and students in the enforcement of rules (ONELGA)

Question Number	Sec schools	Agree	Disagree	Undecided	Total
1	G.S.S. NGO	3	2	-	5
2	G.S.S ASARAMA	3	1	1	5
3	G. COMP. SCHOOL ATABA	4	1	-	5
4	COMM. HIGH SCH. EGBORMUNG	3	2	-	5
5	COMM.S.S YONOROON(UBE)	5	-	-	5
6	COMM.S.S. AGWUT OBOLO	2	2	1	5
7	UNYEADA	3	-	2	5
8	COMM.S.S.EBUKUMA	3	1	1	5
9	COMM.S.S. EKEDE	2	3	-	5
10	COMM.S.S. IBOT-RREN	5	-	-	5
11	COMM.S.S DEMA	5	-	-	5
TOTAL		38	12	5	55

With respect to this question, 69.09% agreed that there had been setbacks between teachers and students in the enforcement of school rules, while 21.81% felt that there had not been any setbacks.

Table 7: Perceptions on setback between teachers and students in the enforcement of rules (WALGA)

Question Number	School	Agree	Disagree	Undecided	Total
1	OKRIKA, G.SCH	4	1	-	5
2	OKRIKA, NATIONAL S.S.	3	2	-	5
3	COMM.S.S. KALIO	3	2	-	5
4	COMM.S.S. OKUJAGU	3	1	1	5
5	COMM. S.S. OGAN	5	-	-	5
6	SPORTS INSTITUTE ISAKA	4	1	-	5
7	COMM.S.S. OKOCHIRI	4	1	-	5
8	G. S. S. OKUMAGBA	5	-	-	5
TOTAL		31	8	1	40

In the WALGA LGA, 77.5% believed that there had been setbacks in enforcement while only 10% did not perceive any such setbacks. A subsequent interview with teachers during a Teaching Practice Exercise revealed that students are often unruly in terms of their classroom behaviour and that this affects teaching and learning.

Having analysed the situation in both LGAS, coupled with the fact that there are serious security problems in the country in general, the author recommends that emergency notification systems be employed to help better ensure the safety, security and hence learning and advancement of students in school.

Application of Intelligence Indicators in Secondary Schools

In order to save students, parents, teachers and other stakeholders from insecurity and all of its ramifications, it is crucial that all tiers of government find a lasting solution to the school safety problem. Technology has improved considerably in the last decade; so much so that schools in the developed world have begun to employ different technologies to keep their students safe. Some of these include automated emergency notification systems – one of the fastest growing safety and communications applications in schools today. These systems make it possible for school administrators to send out an emergency message to parents, students and other stakeholders simultaneously through multiple channels. Some of these technologies are discussed below:

Honeywell's Instant Alert for Schools

This is a web-based notification service allowing school officials to deliver messages, both emergency and routine to parents within minutes at the click of a button. Parents are notified immediately of safety/security issues through their communication method of choice, such as telephone, cell phone, personal digital assistant (PDA) and others. Parents can update their contact information online depending on how they would like to be reached. Teachers can also use this forum to discuss students' assignments, absences and academic performance with parents. Thus, the technology does not limit the system to emergency uses only. It can be used in day-to-day situations, including timely reminders of important events or deadlines. Schools pay varying subscription fees for the service based on their size.

For Broadview Middle school in Danbury, Connecticut, this application has allowed them to save up to \$5,000 annually. By using Instant Alert to communicate with parents, the principal of Broadview Middle school notes that they are sure to reach parents within minutes, rather than hours or days, and so are able to redirect their human and monetary resources back to addressing their primary concerns, the safety education of their students.

National Notification Network (3N)

The National Notification Network (3N) includes sophisticated geographic targeting features and a new universal messaging interface. The targeting features allow users to hone in on message recipients based on geographical categories such as zip codes, neighbourhoods or a radius surrounding a specific point. The system is easy to manipulate mainly because of its self-administrative qualities. With this technology there is no hardware or software; instead an application service provider handles all of the data similar to a cell-phone service provider. The database containing parent contact information is secure in case of computer failure or breach and is hosted on multiple duplicate platforms.

This system can be used to inform parents of both emergency and non-emergency situations. The 3N system can help schools to set up a contact database for their system or it can integrate a pre-existing database. Parents are able to use a password-protected web-site to update their contact information and can prioritize multiple contacts or email addresses. The system will continue sending messages automatically until the recipient confirm they have received the message. School officials can then go online and view an administrative log that records who has confirmed receipt of a message and to whom a message has been sent.

Saf-T-Net ALERTNOW

The ALERTNOW system enables authorized staff to contact every emergency number provided to the school simultaneously with a single phone call. ALERTNOW can make 6,000 calls at once and is activated by calling a toll-free telephone number instead of using the Internet or a personal computer. Saf-T-Net ALERTNOW was designed to be simple in terms of use. This system can be used for everything from gas leaks and fires in classrooms to more serious emergency situations.

Video Surveillance Systems

Today video surveillance systems are most often Internet Protocol (IP)-based surveillance systems coupled with the use of digital video cameras making video surveillance a much more compelling option for schools and

colleges. Using their existing network infrastructures, school administrators can monitor high-risk areas of their buildings from a desktop or laptop computer through a live Internet feed. Networked security cameras and digital video feeds also offer a cheap and easier way to store and search archived material. Schools can also take advantage of today's surveillance systems by providing local law enforcement officials with access to surveillance camera images through a secure network link. With the presence of network and streaming video applications, first responders and emergency personnel can link up with schools to monitor crisis situations from afar.

In schools where video systems have digital recorders, they often also include duress/panic switches in various locations. When these switches are activated, the video systems will automatically begin streaming live video from their cameras to the police dispatch center along with an audible alarm. The dispatcher can then dispatch the proper authorities and begin to assess the situation inside of the school while attempting to make contact with school personnel. Knowing the situation in school, the police can then determine the best tactical approach to resolve the situation.

Likewise, in case of fire outbreak, the fire department can assess whether there is smoke in the building or if students or faculty are trapped and the extent of the emergency. This allows the fire department to respond to the appropriate area of the school and quickly determine what they need to do to save those in the most danger.

Employee, Student and Visitor Tracking

In many schools today, visitors and employees are tracked to ensure constant student safety. Raptor Technology has recently developed web-based software called **V-soft** to help keep schools safe by tracking students, faculty, visitors, school contractors, volunteers and others who enter the school building. This software scans a driver's license or other form of identification and visitors then receive a badge with their picture on it. Visitors can have their pictures scanned when they visit a school for the first time and then have that picture kept in the database so they do not have to go through the whole process on subsequent visits. This system also allows for visitors identities to be checked against state sex offender databases.

V-soft system can also be used to keep track of tardy students by having students sign into the system when they arrive late. The system then prints out a tardy slip for the student, and administrators are able to set a tardy level at which to penalize students, for example, three instances of late arrival. The system then automatically alerts school officials when a student reaches the designated level.

Challenges

Given the population (150 million), diversity, and financial and political challenges Nigeria faces today, there are a number of obstacles to the implementation of the above technologies worth noting:

1. The technologies recommended require electricity to operate. A stable supply of power to schools has been a serious problem that the federal government has been trying to tackle for some time, but has not yet resolved.
2. The uncooperative attitude of some authorities may make it difficult to implement these technologies. If one feels that he or she may not benefit personally from a project, or perhaps may suffer through the project, he or she is likely to impede its progress.
3. Nepotism is another factor that often hinders progress and new programs in Nigeria. One can predict a power struggle among authorities over who will supervise such a project on a large, possibly national, scale.
4. Insufficient funds, in a country that must make few resources meet the needs of many, represents another significant challenge to advancements in school safety and security. Many recent projects have been abandoned due to inadequate funds or the discovery that designated funds were being misappropriated.
5. Lastly, staff students and school administrators will require considerable education to be able to use the aforementioned systems. Without this type of training for all involved, it is likely that new technology-based security systems will be left unused as was the case with the first set of computers delivered to secondary schools by the federal government a number of years ago. Without proper training, these tools are of no use to the people of Nigeria.

Educational Implications

In order for public secondary schools in the Rivers State, and especially in Riverine Areas, to make a mark on the academic world, there must be adequate security to protect the teacher and the taught, otherwise effective teaching and learning cannot take place. The emergency devices discussed in this paper should be mounted in schools to aid in detecting and preventing violence. These communication systems could be used to move the state and nation forward, particularly as such advancement relates to achieving Vision 20:2020.

Managers of education must take it upon themselves to recommend to the federal government the best paths forward for making our educational institutions safe and secure. Teachers likewise should feel empowered to identify safety and security risks and to make recommendations for the elimination of those risks. Parents and other stakeholders must also take greater interest in what is happening in our educational institutions so as to have a say in the safety and the behaviours of their children.

CONCLUSION

The safety and security of students is paramount to education in Nigeria. The success of students in many ways depends on the commitment of the government (federal, state and local) to mounting automated emergency notifications in schools in addition to setting up curriculum programmes that would explicitly address safety and security. Though there is general insecurity in the country, it is important that our leaders today bear in mind the vulnerability of children and students in schools. School children must have a safe and secure environment in which to learn if Nigeria is to achieve its national goal and objectives. Vision 20:2020 will not be met if there is no peace in the land and if priority for implementing peacefulness is not given to underfunded and increasingly insecure educational institutions.

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Senior High School Students' Understanding and Difficulties with Chemical Equations

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Abstract

Over the years, chemistry reports of the West African Examination Council Chief Examiners have consistently alluded to students' inability to write correct chemical equations in the Senior Secondary School Certificate Examinations. This study probes these difficulties. This study employs a cross-sectional survey using both quantitative and qualitative methods. The sample used for the study consisted of 334 SSS 3 elective science students in the 2008/2009 academic year drawn from all schools offering elective science in the New Juaben Municipality of the Eastern Region of Ghana. The instruments used for data collection were achievement tests and interviews. Some of the key findings of this study include: (a) students' inability to balance equations of combustion reactions involving hydrocarbons; (b) students' inability to predict correct products of reactions due to difficulty in writing the correct formulae of the products predicted; and (c) students' inability to translate reactions in statement form into symbol equations. This study recommends that secondary school teachers provide more exercises related to these difficulties to students and that they make time for students to explain or discuss their answers.

Keywords: Senior High School Students, Chemical Equation Understanding, Chemical Equation Difficulties

Reference to this paper should be made as follows:

Baah, R., & Ampiah, J. G. (2012). Senior High School Students' Understanding and Difficulties with Chemical Equations. *International Journal of Scientific Research in Education*, 5(3), 162-170. Retrieved [DATE] from <http://www.ijrsre.com>

INTRODUCTION

One of the most important ways in which chemists can communicate information about a reaction is through the writing of chemical equations. These equations enable chemists from different countries to simply and without error communicate with one another.

Chemical equations can be defined as symbolic and quantitative representations of the changes that occur in the process of chemical reactions, based on the principle that matter is neither created nor destroyed during chemical reactions. For example the chemical equation $x\text{A} + y\text{B} \rightarrow p\text{C} + q\text{D}$ shows that A and B are the reactants while C and D are the products. The subscripts x, y, p and q are the stoichiometric coefficients which represent the relative amount of substance of the reactants and products. The single-headed arrow indicates the direction of the reaction and shows that the reaction is an irreversible one. The arrow means “gives”, “yields” or “forms” and the plus (+) sign means “and”.

However, studies have shown that the ability to write chemical equations correctly is not a simple one (Gower, 1977; Suderji, 1983; Savoy, 1988). It is one that requires a functional understanding of the requisite subordinate concepts of atoms and atomicity, molecules and molecular formula, atomic structure and bonding, valency, use of brackets, radicals, subscripts and coefficient and molar ratio (Savoy, 1988).

Studies conducted by Savoy (1988) and Hines (1990) have reported that chemistry students often have great difficulties in both acquiring and using the skills required to balance chemical equations. A similar study conducted by Johnstone, Morrison and Sharp (1976) in Scotland revealed that students in senior high schools are rarely confident about writing chemical equations and then carrying out calculations based on them. A study by Anamuah-Mensah and Apafo (1986) likewise revealed that students in Ghanaian senior high schools have difficulties in learning certain chemical concepts, including chemical combination. Approximately two-thirds of the students who took part in the study indicated that the topic chemical combination was either difficult to grasp or never grasped. Findings from research conducted by Lazonby, Morris, and Waddington (1982), Schmidt (1984) and Bello, (1988) have shown that students' persistent difficulties in solving stoichiometric problems are partly associated with their inability to represent chemical equations correctly.

Chief Examiners' (CE) reports available through the West African Examinations Council (WAEC) confirm that senior high school students experience difficulty when writing chemical equations. The 1994 CE report showed that most candidates were unable to write balanced chemical equations for the Senior Secondary School Certificate Examination (SSSCE) chemistry paper. The 1995 CE report followed suit and reiterated that many candidates demonstrated problems when writing chemical equations. In 1999, the CE report indicated that students were unable to write equations for reactions between Bronsted Lowry bases and concentrated HCl. In 2001, the CE reported that the writing of ionic equations was poorly handled by candidates. The 2004 chemistry theory paper required candidates to write a balanced chemical equation for the production of oxygen when KClO_3 is heated and then calculate the volume of the dry oxygen gas evolved. The examiners' CE report for the above question noted that candidates had problems writing the equation correctly and hence could not get the correct mole ratio.

Based on the above, it is clear that over the years, students have experienced serious problems when writing chemical equations even though this is a basic requirement in chemistry. Without the proper writing of the chemical equation, students cannot subsequently solve or analyze equations. This study thus investigates how students write chemical equations given that this skill is central to the development of further chemistry knowledge and skills. This study was guided by the question: what difficulties do SSS 3 students have when writing chemical equations?

METHODOLOGY

This study investigates how students understand the writing of chemical equations and their difficulties encountered when writing such equations. A cross-sectional survey was used to accomplish this. The study involved two stages so as to incorporate mixed methods - quantitative and qualitative - to collect data. In the first stage, an achievement test focused on writing chemical equations was administered to SSS 3 elective science students drawn from seven senior high schools in the New Juaben Municipality of the Eastern Region of Ghana. The second stage involved group interviews with students who answered items on the test incorrectly. The interview was conducted to gain a better understanding of the reasons for their errors.

Population

The target population for this study was all SSS 3 elective science students in the 2008/2009 academic year in the New Juaben Municipality of the Eastern Region of Ghana. These students had studied chemistry for almost three years and thus were able to make a meaningful contribution to the study.

Sample

The sample consisted of 334 SSS 3 elective science students. The sample was drawn from all the schools in the population. The schools were labeled with letters and the breakdown of students who participated in the study by school are: A: 70 (58.3%), B: 30 (88.2%), C: 80 (58.9%), D: 55, (51.0%), E: 42 (97.7%), F: 35 (100.0%), G: 22 (56.4%) The mean age of the students was 17 years with a standard deviation of 1.8 years.

Instruments and Data Collection Procedure

The main instruments used in this study for data collection were an achievement test and an interview. The test was comprised of three parts. In Part I, students were given six complete but unbalanced equations of different reactions and were expected to balance each equation. Each equation that was balanced correctly carried 1 mark. The purpose of this section was to identify the difficulties students have when balancing chemical equations. In Part II, students were given five incomplete equations for different reactions and were asked to complete each equation by predicting the correct products and then balance the equations after making their predictions. The correct prediction of products and correct balancing of each equation carried 2 marks. The purpose of this section was to identify the difficulties students have predicting the products of reactions. Finally, in Part III, students were given four complete reactions in statement form and were expected to translate each reaction into an equation in symbols and then balance the equation. Each correct and balanced equation carried 2 marks. The purpose was to identify student difficulties translating reactions from statement form to equations in symbols.

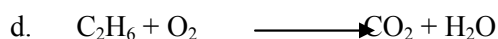
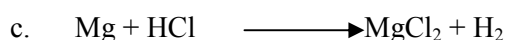
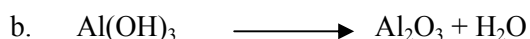
In order to test this instrument, the items were developed by the researcher and administered to SSS 3 elective science students at the University Practice Senior High School, Cape Coast, a school not included in the main study. Student responses gathered from this first test were used to guide the construction of the final achievement test. The achievement test was then shared with chemistry lecturers in the Department of Science and Mathematics Education and their suggestions and input on the validity of the instrument were collected. Finally, the instrument was pilot-tested with a sample of 54 elective science students from Ofori Panyin Senior High School in Tafo in the Eastern Region of Ghana. The Statistical Package for Social Sciences (SPSS) was used to determine the Cronbach alpha coefficient of reliability for the items in the pilot-test. An alpha value of 0.92 was obtained for the items in the chemical equations test. The difficulty and discrimination index for each item was determined and items found to be too difficult or too easy were deleted.

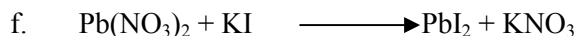
The test was administered to the students in their various schools and the answered scripts were collected immediately after the test. The test lasted for two hours and it took five days for all schools to take the test. After the scripts were marked, the names of students who encountered difficulty in the tests were recorded. The researcher then returned to the individual schools and used the group interview schedule to interview those students. The interview was unstructured and the purpose was to determine why students answered questions incorrectly.

Percentages were used to explain students' performance on the test. Qualitative data gathered during the interview was transcribed and used as an explanation of the answers provided by students on the test.

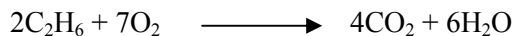
RESULTS AND DISCUSSION

In Part I of the test, students were given six complete but unbalanced equations of reactions and tasked with balancing each equation. The six equations given to the students were:





The correct balancing of an equation carried 1 mark and so the maximum mark for part 1 was 6 marks. The performance of the schools is shown in Table 1. Generally, students' ability to balance the given chemical equations was good. The performance of students on equation (d) was, however, quite poor – less than one quarter of the students balanced this equation correctly. Of the 334 students who participated in the study, only 21.3% were able to balance equation (d) correctly. The expected answer was



The reasons given by students for their wrong answers are presented in Table 2.

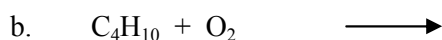
Table 1: Performance by school when balancing chemical equations in Part I

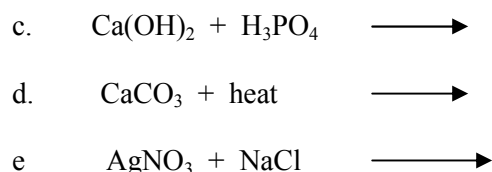
Schools	N	Qa	Qb	Qc	Qd	Qe	Qf
A	70	60 (18.0%)	40 (12.0%)	60 (18.0%)	14 (4.2%)	40 (12.0%)	53 (15.9%)
B	30	30 (9.0%)	29 (8.7%)	29 (8.7%)	10 (3.0%)	26 (7.8%)	29 (8.7%)
C	80	77 (23.1%)	69 (20.7%)	77 (23.1%)	29 (8.7%)	64 (19.2%)	73 (21.9%)
D	55	54 (16.2%)	46 (13.8%)	53 (15.9%)	8 (2.4%)	46 (13.8%)	52 (15.6%)
E	42	25 (7.5%)	14 (4.2%)	28 (8.4%)	2 (0.6%)	16 (4.8%)	18 (5.4%)
F	35	32 (9.6%)	25 (7.5%)	34 (10.2%)	5 (1.5%)	23 (6.9%)	29 (8.7%)
G	22	19 (5.7%)	14 (4.2%)	25 (7.5%)	3 (0.9%)	14 (4.2%)	18 (5.4%)
Overall	334	297 (88.9%)	237 (71.0%)	300 (89.8%)	71 (21.3%)	229 (68.6%)	272 (81.4%)

Table 2: Students' reasons for balancing equation (d) incorrectly (N = 264)

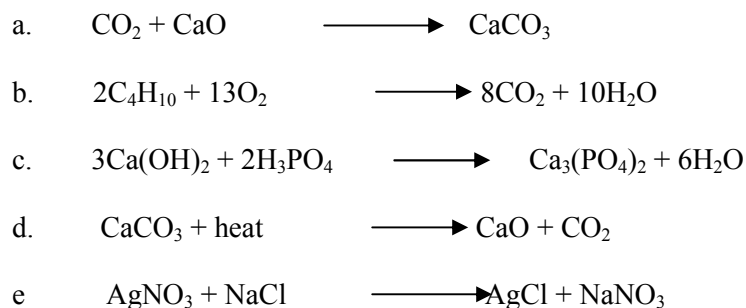
Number and Percentage of Students	Reasons for Inability
106 (40.2%)	They tried their best but still the equation was a difficult one to balance
120 (45.5%)	The appearance of odd and even numbers in the process of balancing the equation was confusing
38 (14.4%)	In balancing the equation, we did not know whether to write the numbers in front or behind the compounds

In Part II, students were given five incomplete equations of reactions and were expected to complete each equation by predicting the products in symbols. The incomplete equations were:





The expected balanced equations were:



The performance of the schools on this question is shown in Table 3. Of the five questions, performance on three questions (a, d, and e) was satisfactory, but performance on (b) and (c) was poor. Less than half of the students from any of the schools predicted the products of reactions (b) and (c) correctly. Students' responses and reasons for this poor performance are presented in Tables 4 and 5 respectively.

The main difficulty for students who could not predict the products of reaction (b) was their lack of knowledge of the fact that when a hydrocarbon is burnt in oxygen, it yields carbon (IV) oxide and water. For reaction (c), the main difficulty was the inability to write the correct formula for calcium tetraoxophosphate (V).

For Part III, students were given four complete reactions in statement form and were expected to translate each statement reaction into an equation in the form of symbols and then balance the entire equation. The statement reactions were:

- Barium chloride reacts with potassium tetraoxosulphate (VI) to form barium tetraoxosulphate (VI) and potassium chloride
- Potassium hydroxide reacts with tetraoxophosphate (V) acid to form potassium tetraoxophosphate (V) and water
- Decomposition of potassium trioxochlorate (V) on application of heat to form potassium chloride and oxygen
- Combustion of propane to form carbon (IV) oxide and water

Table 3: Performance by school when predicting products of reactions in Part II

Schools	N	Qa	Qb	Qc	Qd	Qe
A	70	43 (12.9%)	8 (2.4%)	5 (1.5%)	36 (10.8%)	34 (10.2%)
B	30	27 (8.1%)	2 (0.6%)	2 (0.6%)	19 (5.7%)	17 (5.1%)
C	80	63 (18.9%)	27 (8.1%)	30 (9.0%)	50 (15.0%)	60 (18.0%)
D	55	52 (15.6%)	3 (0.9%)	15 (4.5%)	45 (13.5%)	46 (13.8%)

E	42	15 (4.5%)	0 (0%)	1 (0.3%)	13 (3.9%)	9 (2.7%)
F	35	30 (9.0%)	1 (0.3%)	3 (0.9%)	21 (6.3%)	20 (6.0%)
G	22	17 (5.1%)	1 (0.3%)	1 (0.3%)	13 (3.9%)	13 (3.9%)
Overall	334	247 (74%)	42 (12.6%)	57 (17.1%)	197 (59.0%)	199 (59.6%)

Table 4: Students reasons for predicting the products of reaction (b) incorrectly (N = 292)

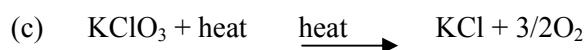
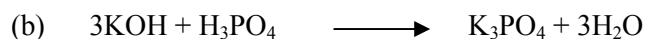
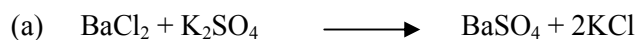
Products Provided by Students	Reasons for Providing Such Products	Number and Percentage of Students
$C_4H_{10}O_2$	Because C_4H_{10} reacted with O_2	72 (24.7%)
$2C_2H_5 + O_2$	Because C_4H_{10} on burning, will split into 2 moles of C_2H_5 with O_2 released	82 (28.1%)
$C_4 + H_2O$	Because carbon and water will be the products	48 (16.4%)
$CO_2 + H_2$	Because carbon (IV) oxide and hydrogen gas will be the products	56 (19.2%)
No response	Because of lack of knowledge about combustion reactions involving hydrocarbons	34 (11.6%)

Table 5: Students reasons for predicting the products of reaction (c) incorrectly (N = 277)

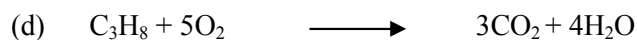
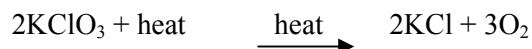
Products Provided by Students	Reasons for Providing Such Products	Number and Percentage of Students
$CaPO_4 + H_2O$	Because salt $CaPO_4$ and water H_2O will be the products	92 (33.2%)
$CaPO_4 + H_2O + H_2$	Because salt $CaPO_4$, water H_2O and hydrogen gas will be the products	73 (26.4%)
$(CaPO_4)_2 + H_2O$	Because salt $(CaPO_4)_2$ and water H_2O will be the products	70 (25.3%)
No response	Because writing the formula of the salt Calcium tetraoxophosphate (V) was a problem.	42(15.1%)

The general performance of the students when translating statement reactions into chemical equations in symbols was poor. For reaction (a) the main difficulties identified were: students' inability to write the correct symbol for Barium and their inability to write the correct chemical formulae for the compounds Barium chloride, Potassium tetraoxosulphate (VI) and Barium tetraoxosulphate (VI). The main difficulty identified in reaction (b) was students' lack of knowledge about the correct formula for tetraoxophosphate (V) acid, which made it difficult for them to write the correct chemical formula for Potassium tetraoxophosphate (V). The difficulties in reactions (c) and (d) included students' inability to write the correct formula for Potassium trioxochlorate (V) and their inability to write the correct formula for Propane.

The following were the expected answers



OR



The performance of the schools is shown in Table 6

Table 6: Performance by school when translating statement reactions into chemical equations in symbols in Part III

Schools	N	Qa	Qb	Qc	Qd
A	70	11 (3.3%)	8 (2.4%)	17 (5.1%)	19 (5.7%)
B	30	8 (2.4%)	2 (0.6%)	10 (3.0%)	12 (3.6%)
C	80	33 (9.9%)	24 (7.2%)	45 (13.5%)	48 (14.4%)
D	55	30 (9.0%)	20 (6.0%)	30 (9.0%)	40 (12.0%)
E	42	4 (1.2%)	0 (0%)	1 (0.3%)	0 (0%)
F	35	7 (2.1%)	3 (0.9%)	13 (3.9%)	17 (5.1%)
G	22	9 (2.7%)	4 (1.2%)	5 (1.5%)	5 (1.5%)
Overall	334	102 (30.5%)	61 (18.3%)	121 (36.2%)	141 (42.2%)

As displayed in Table 6, 232 (69.5%) students could not translate statement reaction (a) into an equation in symbols because writing the correct formulae for Barium chloride, Potassium tetraoxosulphate (VI) and Barium tetraoxosulphate (VI) presented a major problem. Again as shown in Table 6, 273 students could not translate statement reaction (b) into an equation in symbols because writing the correct formulae for tetraoxophosphate (V) acid and Potassium tetraoxophosphate (V) was too challenging. Translating statement reaction (c) into an equation in symbols was also a problem as 63.8% of students could not perform the task because they were unable to write the correct formula for Potassium trioxochlorate (V). Lastly, 57.8% of students could not translate the statement reaction (d) because they were unable to write the correct formula for Propane.

CONCLUSIONS

This study found that following problems among senior high school form 3 elective science students when writing chemical equations:

- Difficulty balancing equations of combustion reactions involving hydrocarbons. This was due to students' superficial knowledge of combustion especially with hydrocarbons.
- Difficulty predicting the correct products of reactions because of the difficulties writing the correct formulae for the products predicted.
- Translating whole reactions in statement form into equations in symbols. This posed the biggest challenge for students given their difficulty with writing the correct formulae of the compounds or species involved in a reaction. For instance students had problems writing the correct formula for compounds like Barium chloride, Potassium tetraoxosulphate (VI) and Barium tetraoxosulphate (VI). The correct formulae for species like Barium ion, tetraoxosulphate (VI) ion, trioxochlorate (V) ion and tetraoxosulphate (VI) ion were also problematic.

Implication for Teaching and Learning

Chemistry teachers should pay particular attention to helping students learn how to write equations for combustion reactions, especially those involving hydrocarbons (with $H > 5$). Chemistry teachers should give students more exercises focused on how to write chemical formulae. They should also make room for students to explain and discuss their answers so as to ascertain their understanding and any potential difficulties.

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Global Partnership/Co-operation and Pragmatic Community Development: An Assessment of an EU-Micro Projects Programme (EU-MPP) in Selected Communities in Akwa Ibom State, South-South Nigeria

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Abstract

This study carries out a post-evaluation (Social Impact Assessment) of European Union Micro-Projects Programmes (MPP) ₆ and ₉ in Akwa Ibom State so as to ascertain the impact of donor funded project(s) on the sustainable development of participating rural communities. The specific aim of the study is to objectively assess the effectiveness of the intervention strategies of EU-MPP ₆ and ₉ as leverage for sustainable development of the rural areas. The theoretical Index Pinning of the study is based on the premise that donor programmes and activities must be integrated in the framework of a locally owned strategy with strong local commitment, participation, capacity development and ownership. Data for this study were derived from 225 sampled respondents using interview and focused group discussion methods and analysed using descriptive statistics. The results reveal that the EU-MPP ₆ and ₉ have been very successful and have contributed to the infrastructure development of the affected communities. Having observed few militating factors, the study recommends broad-based strategies to enhance the expansion of EU MPP to most communities, especially those not yet able to access these programmes.

Keywords: EU; MPP; donor-funded programmes; Social Impact Assessment; Co-operation; Partnership; Infrastructural Development; Micro-Project.

Reference to this paper should be made as follows:

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INTRODUCTION

This exploratory paper is a Social Impact Assessment or post evaluation of the European Union Micro-Project Programme, aimed at assessing levels of development partnerships in Akwa Ibom State, Nigeria, and how this donor agency has sustainably heighten the tempo of community development in the study area (Akwa Ibom State). A Social Impact Assessment (SIA) is a pragmatic approach for assessing whether a certain development project has met its objectives and set in motion its desired consequences. Social impact analysis is a method for assessing the social implications of key structural reforms and development projects in a given country (Modo, 1995).

The concept of Development Co-operation and Partnership (DCP) generally involves a complex of bilateral and multilateral agreements between recipients, individual donor organizations, international donor organizations and governments. As noted by Boas (2004:547), multilateral and bilateral institutions occupy a dominant position in the developing world as they provide the loans and technical assistance required for sustainable development. The terms bilateral and/or multi-lateral institutions are used to describe the many different global institutions which, within the context of this paper, include the multi-lateral development banks (MDBs) – the World Bank and the three largest regional banks: the African Development Bank (AfDB), the Asian Development Bank (ADB), and the Inter-American Development Bank (IDB) – the International Monetary Fund (IMF), the European Union (EU) and related United Nations agencies. The relationships between these institutions, which in proper parlance, are called donor agencies, partnering organizations, or international interventionist organizations, are not only complex, but reflect the wide range of different tasks and programmes they offer to recipient societies or countries.

Since the emergence of modern development practice (Development Co-operation-Partnership) in the 1940s, the concept has undergone a number of reforms and readjustments to suit the peculiarities of both old and newly emerging societies. The notion of development co-operation, which until the 1950s and 1960s was perceived as merely a technical issue, has shifted to focus on a new range of cross-cutting themes such as governance, indigenous peoples, gender issues, community development, and so on.

One of the emerging issues in development co-operation today is the increasing importance attributed to community level involvement. Since the 1990s, promoting partnerships in sustainable community development has likewise been an important element in development co-operation. In Nigeria, donor or partner organizations have vigorously pursued policies and programmes of community-led assistance, particularly infrastructure development, in both rural and semi-urban Local Government Areas (LGAs) since the 1990s.

Beginning in the 1970s, the justification for development assistance or co-operation has increasingly become the need to build “human capital”, stressing the crucial importance of human capital to economic growth. One of the arguments advanced by development experts and policy makers has been that development aid or co-operation in the form of aided self-help community development will increase the capacities of poor nations to make the most productive use of international development investment resources (Eberstadt, 1985). This underscores the fact that nation states cannot achieve sustainable development, security and prosperity on their own. In the views of Messner (2004:11), in a globally networked world, constant policy and programme failure looms unless there is a cross border co-operation.

This paper is anchored in the changing pattern and nature of rural community development in Nigeria, specifically Akwa Ibom State. Most of the rural area under study has been the object of long-term neglect and desolation, resulting in a high prevalence of poverty, unemployment, poor living standards, poor infrastructural facilities and social disintegration (Olisa, 1992; Ijere, 1992; Mabogunje, 1985; Chambers, 1974; Obinozie, 1999; Idachaba, 1985; Dauda, 2002; Oshuntogun, 1986). Following the major food crisis of 2007/2008, and a realization that 925 million people are currently suffering from hunger and poverty and three quarters of these people live in rural areas and that by the year 2050, multilateral and bilateral institutions are again concentrating a major part of their development co-operation efforts on rural areas (Panel Discussion at GFFA Berlin, Germany on Rural Development Policies, January 21, 2011).

Rural community development which originated as a form of “communal self-help” and later became “government-sponsored community projects”, has today culminated in donor-aided or funded programmes with increased flow of aid or assistance from international donors and programs including UNDP country programmes; World Bank community-based projects; World Bank Health Systems Development Projects (HSDP); the Canadian International Development Agency (CIDA), the United States Department for International Development (USAID), the British Department for International Development (DFID), the European Union Micro Project Programme (EU-MPP), the International Fund for Agricultural Development (IFAD) and Rural Financial Institutions (RUFIN) Programme, and UNICEF/WHO health-related programmes. Akwa Ibom State is a state in which a number of these donor agencies operate.

A number of studies have attributed the failure of development projects to achieve their desired impact on the local people to the non-involvement of development partners and project beneficiaries in the assessment of the performance of the projects (Oladipo, 2000). There have been a number of dismal and persistent failures by many self-help and government-funded projects for rural development in the study area alone.

Putting the needs of the people at the centre of development and international cooperation has become the mandate of various donor organizations following a number of summits and conventions aimed at addressing the development challenges of less-developed societies. Donor organizations such as the EU and UNDP have slowly come to appreciate the ingredients needed for self-sustaining development in rural developing communities. These

organizations are thus today seen as catalysts that could usher in positive social change and the economic uplifting of rural people.

The validity of the above assertion constitutes the crux of this study, which involves an impact assessment of the European Union's Micro Projects Programme (MPP₆ and MPP₉). The EU today plays a very significant role in promoting development. It is the largest donor in the world, providing more than half of all international development funding. In 2006, it accounted for about EUR 25 billion, more than half of the world Official Development Assistance (ODA) (Gettu, 2006). It is a major source of financing for UN programmes, as well as for specialized agencies and specialized funds. Current EU development policy is predominantly focused on poverty reduction and supporting sustainable development (Gettu, 2006).

This study which differs from previous studies on donor-funded development projects both in methodology and problem content, is a coordinated attempt to fill burgeoning gaps in development literature on the effectiveness of EU-funded micro project programmes in Akwa Ibom State. This study covers easily identifiable EU-MPP₆ and EU-MPP₉ projects implemented in the state between 2003–2008 and 2009–2010 respectively.

Objectives

This study focuses on the following objectives in the aforementioned study area:

- i) identifying EU-funded projects;
- ii) examining issues of accessing the EU-develop funds and projects;
- iii) assessing the problems confronting the implementation of EU-funded projects;
- iv) empirically assessing the social and economic impact of the projects on participating communities; and
- v) recommending strategies for expanding the coverage of EU-funded projects across the state.

Research Questions

In view of the above, the research questions considered necessary for this study are:

- i) What are the impacts of EU-funded micro projects on the target groups or benefiting communities?
- ii) Are mechanisms required to sustain the benefits of EU-funded projects in place?
- iii) How can this interventionist programme be effectively used to leverage and enlarge the coverage of an efficient rural development policy in the state?

METHODOLOGY

Both primary and secondary data sources were used in this study. The primary data was derived from interviews and Focused Group Discussions (FGD) with the respondents in the selected project areas (communities). The services of six (6) field assistants were enlisted throughout the study. Secondary data sources included official documents and pamphlets published by the EU-programme, textbooks, journals and other text-based documents.

This study was conducted between November 2007 and December 2011 and covered the planning and implementation phases of the projects so that the researcher was able to ascertain the magnitude of the impact and sustainability of the programmes. The sample was comprised of male and female respondents aged twenty-five years and older. A greater percentage of the respondents were petty traders and farmers with only a First School Leaving Certificate, while a few had obtained some secondary education and above.

A purposive sampling technique was applied so as to select at least two (2) Local Government Areas (LGAs) from each of the three (3) senatorial districts where EU-Micro Project Programmes (EU-MPP₆ and ₉) were found. Communities with EU-MPPs were identified through official documents and personal visits/community tours. Two (2) communities were purposively selected from each of these Local Government Areas as it was not possible for all communities in the Local Government Areas to access and benefit from the programmes. With the help of six field assistants, interviews were conducted with the selected respondents in their own homes at agreed upon dates/times.

The focused group discussion was conducted differently among three sets of ten (10) respondents in three (3) separate communities in each of the senatorial districts in the study area. Questions centered on their visualization of the project in their area, their level of participation, their assessment of developmental impact and any envisaged problems. Six (6) Local Government Areas and twelve (12) communities were selected for participation in the study. The sample was comprised of two hundred and forty (240) respondents, with twenty (20) respondents selected from each community of which two hundred and twenty five (225) respondents were

contacted for interviews and focused group discussion. The data gathered were qualitatively and quantitatively analysed, using simple percentages.

BASIC CONCEPTUAL ISSUES

Development Cooperation/Partnership

The concept of development co-operation/partnership has been used to refer to development aid, development assistance, technical assistance, international aid, etc. According to Gettu (2006), the term international development co-operation is now used in place of the one-sided term “assistance”, and implies working closely with partner countries to strengthen capacities to formulate, implement and monitor development policies and programmes. Development cooperation expands our understanding again and takes into consideration how societies work and how international systems function. Development co-operation activities demand complex sets of interventions by multiple actors.

The idea of development cooperation is premised on the fact that the developmental challenges of developing countries, including poverty, environmental desertification, unemployment, civil strife/disobedience, political instability, poor standards of living, etc. can be solved using development aid from more advanced nations (core nations). UNDP commissioned research (1988, 1997) on the social policy factors and perceptions that encourage industrialized countries to support development cooperation, concluded that there was little or no correlation between the volume of external trade links and the scale of development co-operation. The two correlations the study did uncover involved the domestic rate of government expenditure, that is, the internal distribution of wealth and the image citizens in a particular country held of the effectiveness of the development cooperation undertaken. Based on this research, the under-listed are important in the context of development co-operation:

- A society where there is a high level internal redistribution of wealth is more open to development co-operation and supports a comparatively high level of spending relative to national income.
- Public support for devoting a substantial proportion of the annual budget to development co-operation depends on how the society in question views the work actually done in the field.

The partnership element of the concept ensures the availability of the financial resources needed to make real development happen. Partnerships also enable organizations to improve efficiency and increase competitiveness, particularly in service delivery (Gettu, 2006, p. 1). The concept of partnership, as a principle for development co-operation, describes a relationship based on horizontal cooperation rather than a vertical relationship between donors and recipients. This simple and unambiguous tool or distinction is often misconstrued in practice (Gettu 2006: 2-3) as partnership in development co-operation does still imply power disequilibrium between the supporting and the supported organizations.

Partnerships have been widely used where more than one organization or interest is involved in the formulation and implementation of a project or programme. Partnership allows co-operating stakeholders to capitalize on each partner’s intrinsic strengths, reflect shared goals and objectives and build on existing achievements (Gettu, 2006). While in practice, partnerships should go beyond mere signatures and embody participatory approaches to development management, this is not necessarily how they are currently being practiced in many countries around the world. At a fundamental level, development co-operation relies on building successful partnerships, which take time and in turn rely on a number of critical factors, some of which include:

- The establishment of an agreement that a partnership is needed;
- The development of a shared vision of what might be achieved and how it is to be achieved;
- Shared mandates and agenda granting respect and generating trust between different interests;
- Relationships based on respect, reciprocity and openness;
- Good communication and collaborative decision making with a commitment to achieving consensus; and
- Institutionalizing effective organizational management.

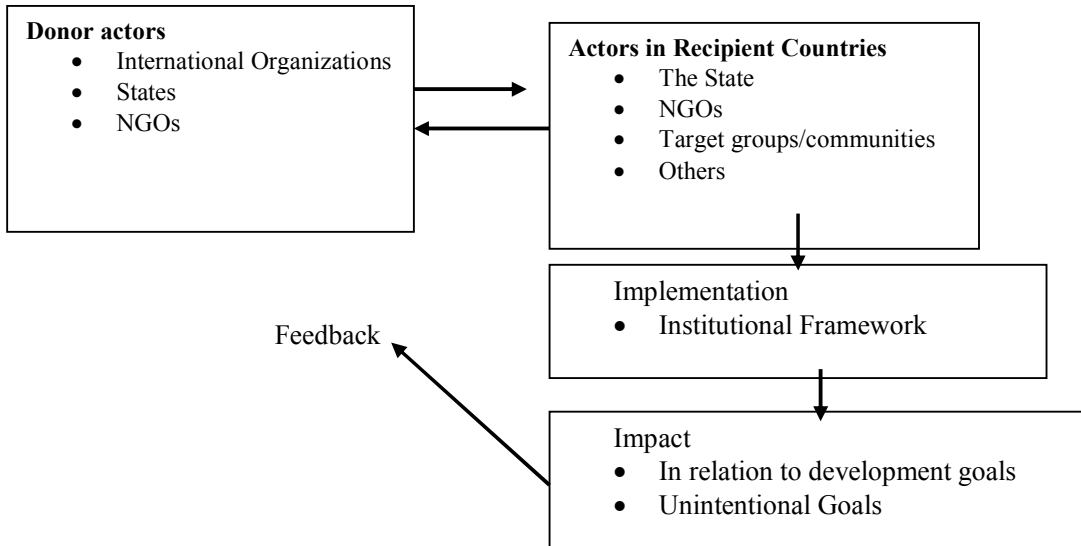
These factors hinge on the realization that partnership is not an end in itself, but a means to achieve a common objective and to promote better development outcomes (Gettu, 2006).

According to Messner (2004, p. 112), an agenda for strengthening multilateralism in development co-operation must go beyond piecemeal approaches, and include a coherent structure for global governance. The agenda should include the following conflict-prone questions:

- How can the effectiveness of development co-operation be strengthened?
- How can the co-operation of organizations be improved on the basis of their respective specialization advantages?
- How can civil society actors (and not just governments) from developing countries become responsible players in the international system in terms of voice, capacity-building and power sharing?

A dynamic model of development co-operation/partnership is shown below:

Figure 1: Model of International Development Co-operation (Foreign Aid as a Process)



Source: Adapted from John & Paul (2003).

An Overview of the EU-Micro Projects/Programme (EU-MPP₆ and EU-MPP₉)

The European Union Micro Project Programme (EU-MPP) is an interventionist development programme aimed at the economic and social development of rural communities, in this case, in response to the felt needs of those living in the Niger Delta. The Programme is the result of a co-operative instrument developed by the European Community between it and some of its member countries to finance local level micro-projects that have an economic and social impact on the lives of those in developing countries (EU-MPP₉ Fact Sheet). The Programme aspires to achieve, among other things, the provision of basic healthcare facilities, education, rural transportation, water supply and sanitation, access roads, and increased awareness around issues or gender, HIV/AIDS, the environment, conflict and human rights, transparency and accountability in local government administration, and income generating and other non-conventional projects as may be desired by the participating community.

The European Union through the European Development Fund (EDF) and Europe Aid has so far embarked on three (3) phases of its micro-project programmes in Nigeria. The MPP₃ was executed between November 2001 and 2006, covering three (3) states in the Niger Delta Region: Rivers, Bayelsa and Delta States. The programme funded 858 micro projects in those areas. The MPP₆ was executed between May 2003 and April 2008, in six states of the Niger Delta Region: Abia, Akwa Ibom, Cross River, Edo, Imo and Ondo States at a cost of 40.6 million Euros for 1,921 micro projects. The programme saw 1900 micro projects (EU-MPP₉ Fact Sheet) through to completion.

The MPP₉ was initiated in the nine Niger Delta States in April 2009, and will continue until the end of 2012, with a target of 1200 micro projects. The programme also includes an additional 125 pilot projects in the Etung Local Government Area of the Cross River State. The main purpose of the MPP₉ is to contribute to poverty reduction in rural and peri-urban communities in the nine (9) Niger Delta states through the promotion of participatory and gender equitable local development governance and improved socio-economic development. This

it is hoped will in turn contribute to strengthening peace and stability in the Niger Delta and achieving the Millennium Development Goals (MDGs). The MPP₉ programme is funded by a grant of 9.2 billion naira from the 9th European Development Fund and represents a continuation and expansion of earlier EU micro project interventions in the Niger Delta (MacRae, 2012).

The MPP is designed to be a bottom-up approach to development facilitated by Civil Society Organizations (CSO) selected through calls for proposals. Local communities are involved in the planning, supervision and implementation of the chosen project through the Project Management Committee (PMC), a democratic structure formed through a Community Mobilization Process. Interested communities must complete the participatory self-diagnosis form (IMPACT Form) obtainable through their Local Government Area. With the assistance of an assigned Civil Society Organization (CSO), the community then validates the Community Development Action Plan (CDAP). The CDAP consists of annual schedule of activities to be carried out to achieve the required 25% contribution. Communities contribute 25% of cost of the micro-projects in cash or in kind (10% for Etung Local Government Area), while Local Government Authorities contribute 25% (30% for Etung) of the cost of project, which has to be contracted using the contract procedure of government and must be contracted before EU funding (50% funds) can be released. The average cost of a micro project is 44,000 EUR. Once the CDAP and proposal are approved by the MPP, a memorandum of understanding is signed between the National Accounting Officer, the Local Government Area and the community, describing the proposed Micro Project (MP), the implementation modalities and the contributions from all parties.

ANALYSIS OF FINDINGS/RESULTS

In this section of the study, the data elicited from respondents is analyzed and presented. This section also shows EU-MPP₉ identified/completed projects as well as projects that are earmarked and on-going. The respondents views are classified as “Yes”, “No” and “Do Not Know”. Only the 225 successfully completed interviews have been included in this analysis. In the first question, respondents were asked: “Are you aware of any EU-MPPs in your community? Their responses are as presented in the table below:

Table 1: Respondents’ Awareness of and Participation in MPPs

Responses	Aware of EU- Project in their area	Participated in the Project
Yes	156 (69.33%)	134 (59.56%)
No	64 (28.44%)	86 (38.22%)
Don’t know	5 (2.23%)	5 (2.22%)

Source: Field Survey (2007 – 2011)

The above table shows that a larger proportion of the respondents 156 (69.33%) were able to identify some of the micro projects realized in their communities through EU-funded programmes. This is confirmed in the almost as larger share of respondents (59.56%) who further noted that they took part in the project. Field observations revealed the presence of EU-funded projects in most identifiable communities.

As a follow-up question, respondents’ opinions were sought on the various forms of involvement/participation they had in the project(s). Their responses are as presented below:

Table 2: Respondents’ Involvement/Participation in the MPPs

Responses	Financial Contributions	Labour	Material Donations	All of these Forms	None
Yes	84 (37.33%)	23 (10.22%)	18 (8%)	9 (4%)	No
No	---	---	---	---	86 (38.22%)
Don’t Know	---	---	---	---	5 (2.22%)

Source: Field Survey (2007 – 2011)

As shown in Table 2, among the 134 (59.56%) respondents who played an active role in the programme, a greater proportion (37.33%) did so through financial contributions/community levies. Other forms of involvement varied depending on capabilities. Focused group discussion and field observations in some areas helped to further reveal the degree of some respondents’ involvement.

Another follow-up question sought to determine the nature of some of the identified EU-funded projects in the study areas and responses are captured below:

Table 3: Respondents' Identification of Actual EU-MPP Projects in their Areas

Responses	Health Centre	Mini Borehole	School Project	Mini Market	Micro Processing Project	Others	Cannot Identify Any
Yes	33	35	28	23	18	19	
No							64
Don't know							5

Source: Field Survey (2007-2011)

The responses in Table 3 concur with those in Tables 1 and 2 and highlight several identifiable EU-funded projects in the respective study communities.

Another follow-up question sought to assess respondents' notion of the EU-funded programme vis-à-vis their impact on community socio-economic development. The responses are presented below:

Table 4: Respondents' Assessment of EU-Funded MPPs in their Communities

Variables	Yes	No	Don't Know
Programme has met community's pressing basic needs	128	92	5
Community leadership organization is involved	133	87	5
Projects are executed by competent hands	149	71	5
Project implementation cycle is usually short	156	66	3
There is effective supervision by donor agency	173	50	2
Community projects are usually executed according to specification	179	43	3
Community funds are released on time	127	83	15
Projects have physical sustainability	126	81	18
Projects are accessibly located	118	78	29
Community takes over after implementation	155	58	12

Source: Field Survey (2007-2011).

The overriding sentiment of all of the assessments/evaluations of the EU-MPPs from the various community respondents (as presented in Table 4) suggests that the project(s) is/are very significant to community development. This is mostly expressed in terms of their fulfilling pressing community needs, involving community leadership, demonstrating competent project execution, and the accessibility and physical sustainability of projects. The responses further imply that the programme has been successful in most of the study areas.

A programme of this nature and magnitude is, of course, not without some besetting factors as can be seen in Table 5.

Table 5: Factors Besetting EU-Funded MPPs in the Study Area

Responses	Poor Counter-part Funding	Lack of Interest from Communities	Poor Post-Project Management	Poor Enlightenment or Awareness	Lack of Local Gov't Interest	Corruption	others
Yes	196	119	165	194	189	177	125
No	12	22	14	34	38	41	43
Don't Know	4	3	2	2	1	3	1

Source: Field Survey (2007-2011)

The data in Table 5 suggest that the expected deliverables, in terms of impact on the communities surveyed, are sometimes hampered by challenges which include poor funding and a lack of community interest in accessing projects due to the lack of articulated civil society organizations (CBOs, VSOs, self-help bodies, etc), incompetence in managing the deliverables, corruption (which has characterized the nation's psyche), poor enlightenment or awareness by the donor body in calling for proposals from communities thus pushing a number of

poor communities out of the programme via poor local government leadership who, out of ignorance, have refused to make their various communities aware of the programme. Other challenges include a limited number of projects embarked upon in a particular state may prevent all communities from being able to benefit from the programme.

Table 6: Identified and Completed EU-Funded Projects in Selected Communities in Akwa Ibom State

S/N	PROJECT TYPE	LOCATION
1	Renovated Four (4) Educational Blocks	Ediene Abak, Abak L.G.A
2.	Constructed Market Stall (income generating project)	Ikot Ewe, Essien Udim L.G.A
3.	Mini-Water Project	Ikot Obong Edong, Ikot Ekpene
4.	Constructed Four (4) Classroom Blocks	Obot Mme, Ini L.G.A
5.	Constructed Four (4) Classroom Blocks	Ndot Ikpe, Ini L.G.A
6.	Furnishing and Provision of Desks and Tables	Ukpom Anwana, Ini L.G.A
7.	Road Construction	Ikot Ukpong, Etinan L.G.A
8.	Road Construction	Mbiotto II, Etinan L.G.A
9.	Constructed Four (4) Classroom Block	Ikot Umiang Ide, Etinan L.G.A
10.	Renovated Primary Health Centre	Ikot Mfon, Etinan L.G.A
11.	Constructed Market Stalls	Nkana, Etinan L.G.A
12.	Renovated Primary Health Centre	Obotim, Nsit Ibom L.G.A
13.	Constructed Primary Centre	Oku Uyo, Uyo L.G.A
14.	Constructed Primary School Block	Ikot Ekot, Etinan L.G.A
15.	Provision of Computer Sets with Solar Energy	Ikot Ebak, Etinan L.G.A
16.	Constructed Market Stalls	Mbiabong Etoi, Uyo L.G.A
17.	Constructed Market Stalls (income generating project)	Nkari, Ini L.G.A
18.	Mini Water Project	Ofi, Oron L.G.A
19.	Market Stall	Mkpanak, Ibeno L.G.A

Source: Field Survey, Observational Visits to selected benefiting communities (2007- 2011)

Table 6 above provides information on the selected communities benefitting from EU-funded projects. Some projects cut across communities in the three (3) senatorial districts of the study area. More importantly, the project type and location help to show the rural nature of the EU-funded projects strategy.

Table 7: Proposed/Ongoing (2012) EU-MPP, Community-Based Projects in Akwa Ibom State, Senatorial District by Senatorial District

S/N	PROJECT TYPE	BENEFITING COMMUNITIES AND LGAs
Uyo Senatorial District		
1	Oil Processing Mill	Ikot Nkang Asuna, Etinan LGA
2.	Cassava Mill	East itam 3, Itu L.G.A
3.	Educational Block	Eman Uruan, Uruan L.G.A
4.	Water Project	Ikot Ada Idem, Ibiono Ibom L.G.A
5.	Health Post	Ikot Obio Nko, Ibesikpo Asutan L.G.A
6.	Oil Processing Mill	Ikot Ebre, Mbiaso, Nsit Ibom L.G.A
Ikot Ekpene Senatorial District		
7.	Market	Ebebit Afaha Obong, Abak L.G.A
8.	Health Post	Omum Unyam, Etim Ekpo L.G.A
9.	Water	Ikot Enea, Ikono L.G.A
10.	Educational Block	Ibiakpan Akanawan, Ikot Ekpene L.G.A
11	Water	Atan Ukwok, Ini L.G.A
12.	Market	Ikot Ekpat, Ukanafun L.G.A
Eket Senatorial District		
13.	Educational Block	Idung Offiong, Eket L.G.A
14.	Educational Block	Idung Assang, Esit Eket L.G.A
15.	Health Post	Ikot Okwo, Ikot Abasi L.G.A
16.	Educational Block	Ikot Etefia, Ukam, Mkpat Enin L.G.A
17.	Educational Block	Idung Ukpong, Okobo L. G. A
18	Water	Ukuko, urue Offiong/Oruko L.G.A

Source: EU-MPP, Programme launched in Akwa Ibom State, June 2012.

Data in Table 7 clearly show the various categories of projects currently earmarked and underway in the EU-MPP, in six (6) selected communities in each of the three (3) senatorial districts. The above projects are just a selection of the sixty (60) projects in the participating Local Government Areas and the benefiting communities of the State.

CONCLUSION

This paper has offered an appraisal of the European Union Funded MPP in Akwa Ibom State, which for the most part has spanned four years. The approach of this programme is premised to be bottom-up through the call for micro-project initiatives from active communities – an inclusive and participatory approach to sustainable development.

The conclusion of this Social Impact Assessment of an interventionist programme is that despite its limited coverage, it has significantly touched lives in the rural communities under study which is a core element in sustainable development. This is evidenced in the high level of satisfaction expressed by most of the benefiting communities towards their EU-funded projects. Many of these communities which thus far have not been able to benefit from government funded projects, can today boast of a donor-funded project, whose quality and impact in many cases surpasses government-run development projects. In many other ways, the EU-MPP has complemented the state government's aggressive drive towards sustainable rural development as it has liberated a number of communities and their people from the dearth, somnabulence and frustrations of their basic infrastructure.

The synergetical approach of the EU-MPP is also important to the achievement of the Millennium Development Goals. Based on this knowledge and the findings of this study, it is imperative that within the spirit of co-operation, collaboration and partnership exhibited by this donor body (EU-MPP), local actors proactively take the lead while external partners assume greater responsibility for their own possible contributions and role in development by forging new relationships and identifying new development mechanisms that reflect the particular local circumstances.

Recommendations

This study has shown that the EU-MPP Programme has the capacity to advance sustainable development in developing societies if the quality of development assistance is increased so as to absorb larger quantities of assistance and co-operation in the future. This study has offered a number of useful strategies, which if taken into consideration, stand to improve the quality of development outputs by European Union and other donor organizations in Akwa Ibom State.

- The EU-MPP Programme should be re-adjusted to meet the peculiarities of the local communities by relaxing the conditionalities for accessing micro projects. This requires reducing the present 25% fund commitment by communities to 10% to enable more rural communities access this form of donor assistance.
- The call for proposals procedure for micro projects from various communities in the state should be re-invigorated by means of increased awareness or sensitization to enlist broader support and participation of would-be benefiting communities.
- EU-Micro projects must be tailored to the specific needs of the local people if they are to improve the living conditions of the poorest and most vulnerable recipients in the rural communities.
- State and local Governments should intensify efforts to generate interest in EU-funded projects by making it mandatory for local communities to send proposals for EU-community-funded programmes.
- Civil society organizations should be chosen for participation on the basis of eligibility, proficiency and effectiveness without which the validation of community proposals may be faulty and biased.
- It is critical that local mechanisms for the ongoing management of handed-over projects be established if projects are to be maintained and sustained and communities are to truly benefit from their EU-funded micro-projects.

- There must be transparency and equity in the choice of project and project site to suit the needs of people in the various communities.
- Benefiting communities must meet their commitments to their projects by remitting their proportion of counterpart funding on time for prompt the commencement and implementation of projects.

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Cultural Inhibitions and the Rising Rate of Prostitution in Niger Delta

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Abstract

In recent years, the Niger Delta has been experiencing a number of social, political and economic challenges, ranging from extreme militancy to prostitution. Among other factors, the right to own property and a lack of employment opportunities remain major contributing factors to rising rates of prostitution, especially with respect to cultural inhibitions. It is against this backdrop that this paper examines the cultural practices in this region, with the broad aim of understanding the impact of culture on people. A likert-type scale was used in this research and was applied among a population of 300 respondents. Based on the findings of this study, we recommend income redistribution, the provision of employment opportunities, and a comprehensive land reform system as possible paths to the reduction of prostitution.

Keywords: Cultural Inhibitions, Prostitution, Niger-Delta

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INTRODUCTION

All people, irrespective of race, have beliefs and practices that they use to structure their lives and create social and personal meaning. These practices and beliefs in turn influence people's perceptions, attitudes and the management of their lives. Culture, in other words, is the foundation of individual and collective experiences.

Despite the pervasiveness of such beliefs and practices, it is often still considered inappropriate to discuss cultural issues. It is however, unfortunate that at this age and time, people still frown when cultural issues are being discussed.

According to Sanderson (1988), culture is the total life way of people and for the social scientist, culture means much more than just some aspects of human social existence. Culture includes all the conditions in which men and women are born, brought up, live, work, procreate and perish.

The ability of people to leave behind or adopt certain cultural practices is often constrained by poverty and fear of social exclusion. Those in such a situation in many ways have relatively less power to socially or economically reject the culture they know. Some of these more controversial practices in the Niger Delta include widowhood inheritances and the land-tenure system both of which deprive women of the right to property ownership.

With respect to prostitution, our argument here can be captured by the notion that cultural practices predispose inhabitants to various kinds of behaviours. This is then compounded by the fact that that under certain economic conditions, individuals may be rendered vulnerable and compelled to do things they would ordinarily stand against. According to Karl Marx (in Ekpenjong, 2003), man's pre-occupations in life, first and foremost are "food, clothing and shelter". People are thus quite strongly compelled to achieve these objectives and it is only after these have been achieved that is possible to consider other more abstract goals and values. In this context, prostitution is very much a means to a survival-based end. The word "prostitution" in fact is derived from the Latin word "prostituere" which means to "set up for sale". And while it may be argued that the world is experiencing an ongoing sexual revolution, this notion sheds little light on the world of prostitution as most people are engage in paid sex to achieve goals unrelated to procreation and/or pleasure (Igbaniibo & Odiike, 2008).

The general purpose of this study points at finding an understanding for the rising rate of prostitution in the Niger Delta area of Nigerian where oil exploration and exploitation is largely the business of the day. Based on the above, it is possible to hypothesize an inverse relationship between the cultural practices of a people and their economic conditions. It is thus also possible to hypothesize a relationship between the profitability of prostitution and the number of persons involved.

CONCEPTUALIZATION

The Niger Delta People: An Overview

The Niger Delta is one of a few contemporary environments today that still sustains oil production. It is in the words of Ogon (2003), the most endowed wetlands in the world stretching across approximately 70,000 square kilometers and is largely made up of mangroves, swamps and wetlands. It is one of five major Deltas in the world, making it not just a national, but an international asset.

Today there are more than 3000 human settlements across the Niger Delta (Isoun, 2001). A number of cultural bonds, as manifested in music, dance, theatre and masquerades, help to maintain strong connections within and across these settlements. Trade also continues to play a key role in fostering amicable cross-settlement relationships. Likewise, the environment of the Niger Delta has always been very hospitable and contributed to positive and cooperative relations. It has generally been marked by an ample supply of valuable plants, animals and mineral resources (Alaoga and Tekena, 1989) and by an absence of natural hazards such as deserts, ice, floods, typhoons, mountains, volcanoes and earthquakes.

During the pre-colonial period, the products and by products of the area's natural resources led to a great deal of self-sufficiency, and to inter-community trade along both river and land routes. The people inhabiting the area have traditionally been very hard working and their extended family structure offered an added source of revenue or income security. Generally, most needs were met through some combination of fishing, farming, trading, hunting, weaving carving, and other occupations and the people cannot therefore be described as poor.

As the colonial era settled on the region, fishing, farming and trading occupations were slowly eroded by the growth and development of small-scale city states. Despite the area's wealth of natural resources, including petroleum – the mainstay of the country's economy today, the region has remained largely underdeveloped. High levels of hunger and poverty characterize the region today.

Culture: An Overview

The concept of culture is generally applied to the total ways of life of a society. Some societies, however, are of great complexity. For this reason, Anikpo and Atemie (1999), opine that it is important to take into consideration the nature of various cultural patterns that exist in complex societies such as the Niger Delta. The present analytical problem is thus determining how to establish the influence of these diverse cultural practices on the current level of prostitution.

Every culture has at its basis, a set of interacting systems that perpetuate cultural practices over time (Ritzer, 2000). These include cultural taboos and sanctions that are established to control undesirable social behaviours. As Chukwunye (2008) observes, however, the cultural practices that often result, including the land tenure system, the culture of silence, and widowhood inheritances, prostitution is on the rise.

Most modern urban industrial societies tend to have a high degree of social differentiation and extremely complex occupational structures. Their populations often include people from diverse racial, religious and ethnic backgrounds. These and other kinds of social differentiations in turn serve as the bases for the development of subcultures. The concept of subculture has become increasingly important in modern sociological enterprises as researchers have sought to understand how people in various positions in the complex social structure have discovered ways of dealing with the often unique problems that confront them. It is from this perspective that we argue that many of those struggling to survive economically found new possibilities in prostitution as solution to their problems. In other words, their unique life situation pushed them to develop a subculture that then allowed them to fend for themselves as human beings preoccupied with food, clothing and shelter.

The Land Tenure System

From the beginning of human history, individuals and societies everywhere had to survive by meeting a number of fundamental material needs, the most important of which was food. According to Anikpo and Atemie (1999), humans are thus, above everything else, workers or producers. It is through productive activity that men and women are able to obtain the means needed to sustain life from nature. Humans must eat to live, therefore must work to eat. A number of problems on this path have and continue to be confronted.

In the Niger Delta, the land tenure system remains among the most constraining of these problems. Land by its nature is the economic and subsistence base of a people (Obioha, 2004). The importance of land accounts for its use as the base for agricultural activities across the African continent. Not surprisingly, land now constitutes the ecological background against which the social, political and economic activities of a people are determined (Uzorka, Okemini and Odoemelan, nd). Most of the settlement configurations we know today are related in one way or another with the land. The land and its influence on early human organization have in turn informed the basis for institutionalizing how land is to be exploited.

The rules and regulations governing the acquisition and ownership of land in the Niger Delta today stem from the land laws and customs of traditional African societies (Obioha, 2004). These laws derive their authority from their basis in antiquity. Anikpo (2004) argues that these laws define the framework for tenurial procedures today including inheritance rule, land pledging, gift land, and kola tenancy. Despite these general systems that have survived generations, there is no single land ownership pattern common to all African societies.

The system of land holding recognized by most African customary laws is neither absolutely communal nor individual in nature (Elias, 1951). In all patterns of ownership, however, women are at a serious disadvantage. They are restricted from fully partaking in the sharing, no matter their age or social status. This system of tenurial practice thus, apart from affecting the development of agriculture, plays a significant role in the level of prostitution in most societies today.

Land tenure as described by Olajuwon, Olabisi & Essang (1981), is the “body of rights and relationships between men that have been developed to govern their behaviour in the use and control of land and its resources”. According to Cole in Bale & Smith (1990) traditional inheritance practices preclude subdivision of land holdings, passing intact to son-in-laws through daughters. This thus suggests that women are not in any way supposed to own land or be allotted land, hence the automatic transfer of the right to the land to the husband after marriage.

The argument of this paper is such that, because they are often forced to fend for themselves in a society that systematically prevents their accumulation of wealth, many women have resorted to using what they have to get what

they need to survive. This notion is supported by the fact that women are unable to obtain simple bank loans in such societies because they do not have landed properties with which to back their loan applications.

The Extended Family System

Marriage of one man to many women (polygamous marriage) is a common phenomenon in Africa. Polygamous marriages do not exclude the merging of extended families, thus making the burden of the family life particularly taxing. It is within the context of these often quite large family groupings that many households in Africa often face ignorance of the misconducts of their female children.

Traditionally, the extended family formed the basis of recruitment into the social system (Ekpenyoung, 2003) and played very an important economic role given its necessity for large scale agricultural cultivation. Most modern societies don't have enough land for such cultivation, given social tenurial patterns, and the extended family has thus come to constitute itself a burden that often requires prostitution for its sustenance.

Widowhood Inheritance

According to Anikpo and Atemie (2006), widowhood inheritance is a variant of the levirate system. The defining feature of the widowhood inheritance is such that the new husband makes little payment to the wife's kin to inherit his deceased kinsman's wife. Children of this new wedlock belong to the living husband and bear his name. Under this system, the widow does not have a say as her rejection of the new husband will earn her a severe punishment. In some instances she may be asked to leave her home, while in other cases her children may be taken away from her. Against this background, most women are likely to remain and marry the new husband. For those who do resist, few options are available to them upon which to build new lives. The majority end up in prostitution because of their need to take care of themselves and their children.

Prostitution

Prostitution is a practice that exists in every society. It is believed that an estimated 1 million people across the globe enter into the illegal sex trade every year (Jackson, Children's Rights World Congress, 2005). A prostitute is a person who accepts money in return for sexual intercourse or other sexual acts. According to Obi (1987), prostitution is an indiscriminate exchange of sexual favours for Naira and Kobo. Most prostitutes accept a number of customers, feel no emotional tie to any, and use the trade as a major or sole source of income.

The act of prostitution by definition joins together two forms of social power, sex and money, in one interaction. In both realms men hold substantial and systematic power over women. In prostitution, these power disparities merge in an act which both assigns and reaffirms the dominant social status of men over the subordinated social status of women (O'Naill, 2001).

An important contention advanced by pro-sex work feminists such as Carol Queen notes that all too often feminists who are critical of prostitution have failed to adequately consider the view points of women who are themselves engaged in sex work, choosing instead to base their arguments in theory or outdated experiences. The argument here is that there is serious problem with the anti-prostitution position (Sullwan 2010) and, according to Sarah Bromberg, "it evolves from a political theory that is over-verbalized, generalized, and too often uses stereotypical notions of what a prostitute is". In many ways, the anti-prostitution position can therefore be seen as part of a binary construction of women's identity as either "good girl" or "bad girl" (Farley, 2000).

The position of this paper is that those involved in sex work are not there because they have been forced in by men, but because it represents a means to an end. It is for this reason that pro-sex worker theorists say that it is unproductive to conceive of prostitution as an industry (Julie, 2006). Rather than focusing on getting rid of this "industry" efforts would be better directed towards changes that would improve the lives of sex workers as sex workers.

Reasons for Prostitution

There are a number of social and economic reasons that women many become interested in prostitution. These include:

Economic reasons

Ostentatious lifestyles, as noted by Igbanbo and Odike in their article on prostitution, cannot be blamed for an interest in prostitution. The economic problems that people encounter generally stem from the cultural conditions that people find themselves in and have little control over. While it is possible for some cultures to provide means and opportunities for all to live comfortably, most cultures are characterized by difficulties that impoverish at least some of their subjects. As noted above, for example, polygamous marriage, an institution strongly tied to culture and cultural beliefs often contributes to the prevalence of prostitution (Igbanbo & Odike, 2008).

Social reasons

The social causes of prostitution may include the influence of friends or peers who are already involved in sex work. Living in an environment of affluence may also prove to be a “pull factor” as some may not have the capacity to resist the influence of money and what money can buy. The Niger Delta is a region that can be described as flowing with milk and honey. At the same time, it is characterized by high levels of poverty. This combination of wealth and poverty is dangerous, like fuel and fire, and may explode at any moment.

METHODOLOGY

The research population for this study was drawn from the nine states that constitute the Niger Delta. The population was comprised of 10 (3.3%) traditional rulers, 270 (90%) randomly selected prostitutes and 20 heads of families (6.7%) who have children that are in one way or another involved in sex work. Of the total respondents (300), 270 were, as noted above, sex workers whereas 30 (10%) were deemed to be custodians of traditional cultural values and may understand the impact of culture on the life of the people within the geo-political area.

A likert-type scale was used in this research because it bests helps respondents to succinctly evaluate the possible cause(s) of prostitution and the impact of culture on prostitution. According to Kerlinger (1973), likert-type scales are ratings scale of approximately equal “attitude value” that enable respondents to indicate some degree of either agreement or disagreement.

On the whole the research questionnaire for this study was tailored to suit the demographic information of respondents including their age, gender, social status, educational qualifications, and where applicable, the duration of their employment as a sex worker. Given the often low educational attainment of many respondents it was necessary to design and use a very simple questionnaire (Ololube, 2009).

DATA ANALYSIS AND RESULTS

This study examines the impact of cultural inhibitions on prostitution in the Niger Delta region of Nigeria. To arrive at the study’s results, the spearman rank correlation order was used as an analytical tool. Based on this statistical tool we determined that cultural inhibitions are, to a large extent, a contributing factor to rising rates of prostitution in the area. This was confirmed in answers to questions about the impact of the income on living standards. Approximately 70% of the sex workers polled indicated that they were ready to leave the industry should another attractive and well-paying occupation present itself. The cost of living in the Niger Delta is presently very high. The hardship this can cause, especially when among young women to whom little policy attention is paid, is significant. In this context, it thus becomes easy to see how women will use what they have to get what they need. From the perspective of sex workers and potential sex workers, the foreign money that has come to the oil rich region has made the practice even more attractive. Although the number of sex workers is growing by the day, they are still few relative to the size of the population and the demand for paid sex services, making the industry even more lucrative and thus attractive.

Table 1: Computation of Spearman Rank Correlation Coefficient

S/n	X	Y	RX	RY	RX-RY	(RX-RY) ²
1	5	5	2	2.5	-0.5	0.25
2	5	4	2	9	-7	49
3	4	4	7.5	9	-1.5	2.25
4	4	5	7.5	2.5	5	25
5	4	4	7.5	9	-1.5	2.25
6	4	4	7.5	2.5	5	2.25
7	5	4	7.5	2.5	5	49
8	4	5	7.5	2.5	5	25
9	3	4	12.5	9	3.5	12.25
10	4	4	7.5	9	-1.5	2.25
11	4	5	7.5	2.5	5	25
12	3	4	12.5	9	3.5	12.25
13	2	3	14	14	0	0
14	4	1	7.5	15	-7.5	56.25
15	1	4	15	9	6	36
						$\Sigma 229$

Rho = 4.31

DISCUSSION

In the course of testing the hypotheses of this study, the findings suggested that there is indeed a relationship between cultural inhibitions and prostitution. At the same time, the Niger Delta is a region of great wealth and abject poverty. Here, wealth circulates in the hands of the few lucky enough to be gainfully employed in the oil industry or as politicians. There have thus emerged two classes of individuals: those who have no money (or opportunity or means of livelihood) and those who have all of the above with some to spare.

The results also show that many prostitutes would have left sex work had it not been for family problems. Most of the sex worker interviewed noted that they were merely using what they had to get what they needed given their family's financial situation.

It was also found in this study that women with the lowest levels of education and women from the most disadvantaged racial and ethnic minorities are overrepresented in prostitution. This would seem to suggest that prostitution for many is less of a free choice than it is often conveyed as in popular or conservative culture. If prostitution is a free choice, why are the women with the fewest choices the ones most often doing it?

CONCLUSION

As with many issues in the field of development, there is a diversity of opinions on prostitution. While many see prostitution as a free choice, this paper contends otherwise. Very often those engaged in prostitution have been compelled to become so because of the conditions they found themselves in. This study has explored the various cultural practices perceived to be inhibiting the woman from living a life comparable to that of their male counterparts. This paper has argued that there is a relationship between cultural inhibitions and prostitution in the Niger Delta.

In the light of the above argument, an examination of the culture and the socio-economic life of the Niger Delta people was offered. Until oil was discovered and exploited in the region, very little prostitution existed. This however, gave much credence to the Marxian dictum that changes in the economic base of a society produce corresponding changes in the entire system. The social challenges in the Niger Delta today thus reflect the conditions the people found themselves in as a result of an oil induced consciousness. This situation is amplified by the inability of the peripheral capitalist state of Nigeria to put in place policies to meet the development needs of the oil bearing communities. Coupled with the cultural inhibitions discussed, women began to enter prostitution at an increasing pace.

Recommendations

This article may be unbalanced towards certain viewpoints, but it does aim as its sole objective to understand why prostitution is on the rise in the Niger Delta, despite the affluence of politicians and oil workers in the area. It is in recognition of this fact that we make the following recommendations to help lessen the need of women to turn to this occupation:

Employment for all: one of the greatest challenges of the current situation in the region is unemployment. Thousands of people roam the streets every day without jobs, and more importantly, without food. Under such conditions, very few are likely to resist the lucrative temptation of prostitution.

Income redistribution: income redistribution is necessary especially at this time to further bridge the gap between the very rich and the very poor.

Cultural flexibility: culture is dynamic. This means that many detrimental cultural inhibitions may be relaxed to make life reasonably easier and more meaningful for people. Presently, the concept of extended family is on the verge of collapsing and it should be allowed to do so. Believe it or not the organic nature of the modern society does not make for wasteful expenditures. Such disintegration cannot be controlled and will in fact lessen the stress of everyday living.

Welfare system: oil production has been intrinsically hostile to the environment and the people of the Niger Delta region. The people are impoverished and are increasingly pushed into new depths of poverty. Those who are chronically jobless should receive a sum each month to cushion the effect of oil exploration in the region and reduce the rising rate of prostitution.

Tenurial system: the most constraining problem confronting women today is that of the land tenure system. The economic importance of land accounts for its use as the base for agricultural activities all across the African continent. Land thus constitutes the ecological background against which the social, political and economic activities of a people are determined. The system of land holdings recognized by most African customary laws is neither absolutely communal nor individual in nature. The important point here is that in whatever pattern of ownership adopted, women are restricted and disadvantaged. Reforms are needed to allow women to own land and to, if necessary, sell that land to pursue other economic endeavours and thus avoid having to sell her body for income.

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Cost-effective Employee Appreciation Strategies in Schools: A Review of Literature

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Abstract

In every organization, be it profit or service oriented, administrators seek out the most direct avenues to success. The school as a service provider is no exception. This paper thus aims to identify cost-effective strategies used by administrators to demonstrate employee appreciation in schools. As such, this paper discusses the definition of cost in an educational context, indices of cost in schools, the concept of cost-effectiveness, cost-effective strategies in schools, and the advantages of such strategies. This paper concludes that school administrators looking to improve employee performance must identify low-cost strategies for appreciating and consequently motivating their employees. In addition to being low cost, the various strategies adopted should be assessed based on their ability to cultivate loyalty, commitment and hard work among employees.

Keywords: school administration, cost-effective education strategies, employee appreciation, Nigeria.

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INTRODUCTION

Analyses of cost-effectiveness, especially in education, are relatively rare and yet they offer powerful and valuable insights for school administrators, evaluators and policy makers. Such analyses can provide information that is counter to common sense, popular appeal, and traditional ideas (Levin, 2001) in an atmosphere often characterized by unrelenting worries about the efficiency of educational effectiveness (Ololube, 2011a, b).

As highlighted by Owen (2004, p. 406), “we will not have better schools without better teachers, but we will not have better teachers without better schools in which teachers can learn, practice, and develop”. Moreover, “we will not have better schools without the effective administrative machinery needed to run the school system properly and achieve positive results” (Ololube et al., 2012). These quotes bring to mind many questions about the structure and success of modern schooling and highlight the complexity and importance of effectiveness as an educational value. Such questions include, how do students learn? What should we be teaching students? How can teachers help students to learn more with greater ease, depth, or speed? How should a curriculum be structured to maximize student learning? How should teachers deliver the curriculum (Stringfield, 1994)? How can a school be run cost-effectively so as to maximize the benefits of education (Ololube et al., 2012). In other words, how can schools be organized and operated to make the most of the curricula and instruction offered to students?

When attempting to answer these questions, it becomes apparent that school administrators are closest to the centre of the educational process and to the personnel problems that arise from this process. Administrators are the executive or the heads of schools. They develop and implement programmes that guide the actual education of the school as well as staff attraction, placement, retention and performance. In addition, they maintain school facilities, keep school records and ultimately create an atmosphere that should enable both teaching and learning (Mgbodile in Ocho, Okeke & Ndu, 1997, p. 52). The professional role of educational administrators can be thus grouped into five operational zones:

- (A) Management of instructional programmes
- (B) Staff personnel administration
- (C) Student personnel administration
- (D) Financial and physical resource management
- (E) School community relationship management.

Given the very broad scope of this work, it is clear that administrators cannot successfully achieve school goals specifically and education goals more broadly without the help of their staff. Stressing the importance of school staff, Castetter (1981, p. 4) notes that the extent to which public education succeeds in delivering services with efficient use of scarce inputs depends largely upon the quality of the personnel engaged in the educational process and the effectiveness with which they discharge individual and group responsibilities. While Castetter acknowledges that there are other important factors in school success, facilities, funding, well-designed programs and school leadership, the single most important element in the educative process is the staff charged with effecting desirable changes in children and youth (p. 4).

Nigeria’s Committee on Human Resource Development and Utilization (1967) described capital and natural resources as passive agents of development. Only human beings, the committee emphasized, are capable of accumulating capital, exploiting natural resources and building political and social organizations (Ojo, 1997). Earlier, the Ashby Commission (1960) as cited in Ojo (1997) noted in its report on investment in education, that the most critical (and complimentary) factors in Nigeria’s development were capital and high level labour (employees or staff). The committee concluded that of all the resources require for economic development, high level labour requires the longest lead time for its creation.

Similarly, in the first work force report of the United States Government in 1963, the late President John F. Kennedy observed that “employees are the basic of all resources and the indispensable means of converting other resources to mankind’s use and benefit. How well we develop and employ human skills is fundamental in deciding how much we will accomplish as a nation. The manner in which we do so will, moreover, profoundly determine the kind of nation we become” (Ojo, 1997, p. 13). The above clearly highlights that employees are the heart of any organization. They are the most potent resources and weapons in the hands of school administrators when it comes to achieving educational goals.

Not surprisingly, cost-effectiveness studies in education are both much in demand and much in supply. On closer inspection, however, there is less than meets the eye in terms of quality and usefulness. In particular, there seems to be neither an abundant database of literature on cost-effectiveness in education nor much of a demand for such studies in Nigeria. This paper focuses on the famine of cost-effectiveness studies in education in Nigeria. Despite the large numbers of studies that use a cost-effectiveness lens globally, cost-effectiveness has not been widely promoted or used in education as it has been used in other sectors of the economy. Regardless, the concept of cost-effectiveness remains a central tool in the evaluation of overall school effectiveness. Given this, the present paper is anchored in an exploration of cost effective strategies used by administrators to motivate employees in schools. This

paper thus examines the meaning of cost in schools, indices of cost in schools, concepts of cost effective, cost effective strategies, and the problems and advantages of cost-effectiveness. The question around which this study has been based is: what strategies with minimal or no cost can be used by administrators to motivate their staff?

CONCEPTUALIZATION/LITERATURE REVIEW

Meaning of Cost in Schools

Costs estimates pertain to the total cost of each of a number of alternatives being considered. In education, these are normally viewed on a per-student or per-participant basis (average cost) to compare the effectiveness per unit of cost among alternatives. Simultaneously it is important to analyze the distribution of the burden of costs among different sponsoring entities and/or clients so as to determine who pays the costs for each. Cost information is then combined with measurements of effectiveness to make cost-effectiveness comparisons. The same type of cost analysis can be used to compare alternatives on a cost-benefit or cost-utility basis (see Belfield, 2006) if appropriate data on benefits or utilities are available. The main point here is that cost analysis must be treated methodically just as effectiveness analysis is. It is not a casual activity or a rhetorical one (Levin, 2001). Glautier and Underwood (1996) cited in Besson, (2005) define cost as the monetary measurement of the sacrifices an organization has to make in order to achieve its objectives. Igwe (1990), on the other hand, explained cost as the alternative possibilities that are given up when any expenditure or course of action is decided upon.

In this context, cost is the amount of expenditure (actual or nominal) incurred on, or attributable to a specific thing or activity. Cost in schools is often used to mean the investment made in the education system to generate an educated human being (Belfield, 2003; Belfield & Levin, 2007). Nwadiani (2002) likewise defines cost in schools as the real resources (material, human and time) used up in the production of an educated individual. Ogbonnaya (2005) conceptualized cost in schools from two perspectives—direct and indirect. Direct cost includes the cost of all items purchased for or used in the school system while indirect cost in schools is expressed in terms of alternative opportunities in the use of resources. Conversely, Nakpodia and Okiemute (2011) combined cost-benefit, efficiency and effectiveness analysis into mean terms, which is measured in the utilization of resources (Nakpodia & Okiemute, 2011).

Cost-effectiveness analysis refers to a method for combining appropriate measures of outcomes with costs so that program and policy alternatives can be ranked according to their effectiveness relative to resource use. Presumably, the alternatives with the least cost relative to their results (or best results relative to costs) are the ones that are most attractive for adoption. This information should be viewed as helpful in guiding, but not determining, decisions. Other issues such as implementation feasibility need to be considered in the decision process as well (Levin and McEwan, 2000; 2001).

Indices of Cost in schools

Indices of cost in schools can be expressed as capital cost and recurrent cost. Capital costs are those durable school inputs which are finite in the expenses they require. Such capital costs include land, utilities, buildings, and furniture or equipment. On the other hand, recurrent costs incorporate expenses on such nondurable items as salaries and allowances, stationeries, consumables, repairs and maintenance, water and electricity bills (Ogbonnaya, 2005).

The Concept of Cost–Effectiveness

Cost-effectiveness analysis provides a method of comparing alternatives for their relative costs and results and in this way provides guidelines on which of the alternatives provides the most impact relative to cost. It differs from its close relation, cost-benefit analysis, which requires monetary measures of impact relative to costs. Most endeavours to improve education are unable to use cost-benefit analysis because it is difficult to measure the value of the improvements in market terms. It is however, possible to measure academic achievement and other indicators of school quality and effectiveness. Accordingly, cost-effectiveness enables measures of learning and other contextually-appropriate indicators to assess educational outcomes relative to costs (Levin, 2011). The comparative performance of alternate strategies is described using the incremental cost-effectiveness ratio, defined as the additional cost of a specific strategy divided by its additional clinical benefit, compared with the next least expensive strategy (Hu et al., 2007).

Cost-effectiveness is thus the least costly way of reaching an objective or getting the greatest value for a given expenditures. In line with the above, Ogbonnaya (2003) sees cost effectiveness in schools as a technique of educational policy analysis concerned with the determination of the least costly alternative to achieve policy objectives. To attain cost-effectiveness, Okeke (2001, pp. 112-113) proposes that the following steps be followed:

- (a) Operational statement of objectives;
- (b) Enumeration of alternatives for achieving operational objectives;
- (c) Determination of costs, benefits, and impacts of each alternative and the quantification of costs in achieving the stated objectives;
- (d) Comparison of alternatives in relation to the objectives – the alternative that is most effective is preferred.

The above suggests that cost effectiveness focuses on the results of a programme, helps weigh the potential benefits of each alternative against its potentials cost, and involves a comparison of the alternatives in terms of their overall advantages.

Cost-Effective Strategies

There is no general agreement on the most cost-effective strategies school administrators should use to demonstrate appreciation of school employees. However, the following have been cited as possible methods or alternatives:

- (1) Staff awards: staff will appreciate that their activities or actions are noticed and appreciated by their supervisor. For the administrator to achieve this, one option is offering a “behind the scene” award at the end of the year for humble employees who perform well. A teacher whose students excel in his or her subject in public examinations could, for example, be rewarded with such a prize. Similarly a teacher who makes a successful outing with students on an inter-school competition may deserve an award.
- (2) A surprise achievement celebration: quite simply, this can be achieved by providing a special lunchtime treat to an employee or team of employees whose actions deserve recognition. Alonge in Wali (2002) is of the opinion that administrators who give small gifts for special occasions (birthdays, weddings, etc.) or give free tea, coffee and snacks to their employees also makes them feel appreciated and motivated. In all of these cases it is the act of acknowledging the contributions and value of the employees.
- (3) Pass on praise: if a school administrator hears or is made aware of a positive remark about a staff person, he/she should repeat it to that employee as soon as possible, perhaps via email or send a thank you note to the employee’s home address, copying the Dean and Head of Department. This will show that the administrator understands how much the employee may have sacrificed or given to complete their assignment with excellence.
- (4) Publish a *Kudos Column* in the school newsletter and ask employees to submit kudos for their peers. Similarly set up a suggestion programme by either establishing a suggestion box or completing school-wide questionnaires so that employees feel that their opinions and ideas are taken seriously.
- (5) Express interest in your employee’s professional development. Ornstein and Levine (2006) observed that teachers’ training does not end when they begin teaching, but that teaching demands rigorous and continuous training. Employee professional development and training should be seen as a continuum. School administrators should ensure that their employees attend programmes that will increase their professional growth and capacity. Even if a school cannot fund professional development opportunities, employees will still appreciate an administrator’s interest and guidance in this regard.
- (6) Recognize employee value by delegating functions according to levels of competence: Wali (2010) observed that delegation is necessary for an organization like a school to exist and grow. Employees who are neglected in the distribution of functions often become apathetic to the achievement of school goals.
- (7) Make teaching jobs challenging: Nwankwo (1982) has suggested that in order to make teaching jobs challenging and less boring, school administrators should not allow teachers to stay too long in one assignment. In other words, classes and responsibilities should be rotated. A form master could, for example, rotate with house master and vice versa. School administrators should avoid saddling a willing staff with too many responsibilities, since a heavy work load has been identified as a major source of stress (Ngoka, 2002).
- (8) Ensure that existing school policies are not frustrating: obnoxious school policies can be an obstacle to an employee’s competence at work. There are, for example, schools where employees must fill out forms or wait

for “visiting hours” before seeing their principal. Enyi (2004) notes that unless such rigid bureaucratic arrangements are dismantled and more open systems of administration are adopted, employees will continue to face unnecessary frustration at work.

Problems Associated with Cost-Effectiveness Analyses

Levin (2001) has identified a number of factors that may impede the use of cost-effectiveness analysis in decision making. These include:

Lack of Training: cost effectiveness evaluations in education are often done by persons considered to be evaluation specialists. Evidence suggests however that training programs in educational evaluation do not require preparation in cost-effectiveness analysis and that the tool is probably not familiar to those teaching or working in the field of educational evaluation. This conclusion is confirmed by the cursory treatment or complete absence of cost effectiveness analysis in evaluation textbooks used for courses in educational evaluation.

Lack of Effects: A second plausible reason for the absence of cost-effectiveness analysis in educational evaluation is that most educational research does not provide an unambiguous estimate of effects. Many, if not most, rigorous studies seem to find statistically insignificant results or differences in effect sizes that are so small they lack practical significance. That is, there is a huge stock of educational research, but much of it is of poor quality or idiosyncratic and so cannot be generalized. Nevertheless, there are still a substantial number of good studies that show at least some potential for replication.

Lack of Demand by Policymakers: interestingly, few inquiries or policy decisions in education use information on cost-effectiveness analysis as a criterion. Even government units with responsibilities for budgetary analysis rarely use this as a tool. It is possible that not only do decision makers ignore cost-effectiveness analysis in their resource allocation decisions, but perceive it as a distraction they wish to avoid.

Advantages of Cost-Effective Strategies in Schools

The first advantage of cost effective strategies is that they are useful to school administrators and other proprietors of schools given the limited and often inadequate resources at their disposal. Cost effectiveness strategies can help to make the best use of the resources that are available. Secondly, cost effective strategies are useful where budget allocation or funds to perform certain activities are fixed and administrators are considering alternatives that may use the given level of funds in a new way so to achieve greater benefits or greater effectiveness. Finally, cost effective strategies are useful to school administrators, policy makers and planners in situations where the objectives and benefits of a programme and accomplishment are fixed. Cost-effectiveness analyses can enhance and complement national strategies to garner new political commitments and evidence-based action (Hu et al., 2007).

CONCLUSION

This paper has drawn on the wealth of literature in the economics of education to consider the role that administrators can play when it comes to cost-effective strategies to appreciate employees in schools. Given the literature that was reviewed, it is possible to conclude that one of the major concerns of any school organization, whether public or private, is controlling cost. Employees are production costs that have to be monitored regularly. School administrators looking to improve employee performance will thus often look for strategies to appreciate and motivate staff at minimal cost. This reflects the fact that employees who feel they have a positive personal relationship with their superiors are more likely to be engaged, while disgruntled or apathetic employees can drain the energy from the teaching functions they perform. Engaged teachers on the other hand pass their enthusiasm for the subject matter and for learning onto the students. In fact, students are more likely to become and remain engaged if they are served and taught by passionate teachers.

This paper recommends that teachers be appreciated and motivated so as to enhance their commitment to teaching and the school system. As Obi (1997) has noted, any organization that has a programme for helping workers to meet their needs is more likely to enjoy their loyalty, commitment and hardwork. The management of human resources is an inevitable and crucial task of administrators in Nigeria’s education system (Ololube, 2007). Adequate

and proper human resources cost-effectiveness analysis will go a long way to reducing and correcting all form of maladministration in the system (Nakpodia & Okiemute, 2011).

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The Effectiveness of Information and Communication Technology Curriculum: A Case of Private Senior Secondary Schools in Botswana

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Abstract

This formative evaluation seeks to measure the effectiveness of Botswana ICT curriculum (Code 0417) by evaluating the content taught and the instructional strategies used to deliver the course contents. It also seeks to assess whether both academics and students felt that the course content and instructional strategies were important. This study employed both quantitative and qualitative research designs as surveys, focus groups, one-on-one interviews, classroom observations and student test annual examination grades were used to collect data. Sixty students enrolled in the course and twelve course instructors were selected randomly from a sample of three private senior secondary schools in Botswana. Descriptive statistical analyses were used to analyse the data collected. Students rated all ICT course topics, except computer networks, as less useful than did their instructors. Both students and teachers offered a number of suggestions on how this course might be improved.

Keywords: Computer Literacy, Formative Evaluation, Effectiveness of ICT Curriculum, Teaching Strategies, Botswana.

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INTRODUCTION

Educational evaluation as defined by Brown (1995) is the systematic collection and analysis of all relevant information necessary to promote the improvement of a curriculum and assess the effectiveness and efficiency, as well as participants' attitudes within the context of the particular institutions involved (p. 227). Similarly, Finch and Crunkilton (1999) see educational evaluation as determining the value of curriculum, predicated on collecting data to be analyzed in a systematic manner. The two purposes of evaluation that it is thus possible to identify are the assessment of effectiveness and the promotion of improvement. Evaluation is therefore the process of gathering information that facilitates improving a program (formative) or that helps in determining its value (summative). Many experts have analyzed the difference between formative and summative evaluation. For Markle (1989),

summative evaluation is an evaluation to prove while formative evaluation is an evaluation to improve. According to Baker and Alkin (1973), summative evaluation is evaluation for validation, while formative evaluation is evaluation for revision and improvement.

Curriculum evaluation as defined by Finch and Crunkilton (1999) involves deciding on the value of a curriculum or part of a curriculum based on data that was collected with the intent of improving the curriculum, program or curriculum materials. According to McNeil (1996), curriculum evaluation is more general in that involves ethically and empirically responding to the questions: "what should we do?" and "what can we do?" For McNeil, evaluation is a "collection of guidelines to make essential decisions" about what to teach and how to teach, which will benefit all involved in the particular curriculum. White (1988) adds that evaluation of this type is not concerned with assessing an individual's achievement, but with making broader judgments about the value of the curriculum. In education, a high quality curriculum is vital as the outcome of an excellent curriculum is excellent students. Thus as McNeil (1999) emphasizes evaluation should be done so as to develop a curriculum without deficiencies or, in other words, to identify its weaknesses and proactively avoid any major problems it may cause.

There are many different types of curriculum evaluation, depending on the objects being evaluated and the purpose of the evaluation, and they are generally distinguished based on method (for example, questionnaire method or interview method). For Brown (1995), evaluation can be formative or summative, process or product-oriented, and quantitative or qualitative. Stake (1986) offers an interesting description of the first two. For him, "when the cook tastes the soup, that's formative; when the guest tastes the soup, that's summative". Formative evaluation is based on information gathered during the learning process. Summative evaluation, on the other hand, is based on information gathered at the end of the learning process.

The term "formative evaluation" was coined by Scriven (1967) and is the process of collecting qualitative or quantitative data during the developmental stage of the instructional design process (Seels & Glasgow, 1990). The data collected is used to provide immediate feedback and helps to make revisions or modifications to the program before the final product is developed. In the process of instructional development, the instructional designer evaluates the instructional materials to determine weaknesses so that the material can be modified (Smith & Ragan, 1999). Formative evaluation can be done by an internal or external evaluator or, preferably, a combination of the two.

As acknowledged by Bachman (1991), there are four important considerations when planning a formative evaluation. The first is whether the program is suited to such evaluation. The second is ensuring that the design of the evaluation is effective. Thirdly, the data gathered must be relevant to the research question being studied. Finally, this type of evaluation is generally not suited to large samples as these samples in this type of evaluation consume considerable time and effort.

In this study, a formative evaluation approach is used to improve the curriculum design of a computer literacy program, rather than a summative approach that might have demonstrated the overall effectiveness of the curriculum. This formative evaluation was aimed at helping instructors to identify whether or not students achieved sufficient mastery of the skills in the curriculum or if further instruction was needed in specific areas. It was also aimed at determining if instructors and students agreed on the importance of course content and instructional strategies.

Formative Evaluation in Information and Communication Technology

Computer literacy encompasses "an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skilful, productive use of computer applications suitable to individual roles in society" (Simonson, Mauere, Montag-Toradi, & Whitaker, 1987, p. 233). Gupta (2006) defines it quite simply as the individual's ability to operate a computer system. This includes having a basic understanding of file management processes as well as how to open, save, copy, delete and print documents. It also involves using computer applications or software to perform personal or job-related tasks, using web browsers and search engines online, and being able to email.

Information and Communication Technology (ICT) is a fundamental part of contemporary secondary school curriculum. Computer literacy is not only required in ICT courses, but in most other courses and disciplines students will pursue. Previous studies have confirmed that computer competency is essential to both academic and career achievement (Davis, 1999). Consequently, several studies have focused on the contents of ICT courses and their instructional strategies in terms of learning effectiveness. Gupta (2006) found that basic parts and functions of information systems, system software, security and privacy issues, the use of application software (word processor, spread sheets, presentation), and accessing remote computers should be among the course objectives of a basic

computer literacy course. While the above may appear to be broad-reaching, it does not encompass all basic-level skills as an "all-purpose Information and Communication Technology" class that expects everything to be taught in one semester is considered unrealistic (Beard, 1993).

According to Lankshear and Knobel (2003), new computer literacy skills often pertain to electronic gaming, synchronous and asynchronous communication, weblogs, webpages, and multimedia text productions. In Andrews (2004) new computer technologies literacy research, the focus is on the environment in which students learn how to read and write which now includes multiple modalities: graphics, animations, video, audio, hyperlinks, and print. Wambach (2006) observes that computer proficiency now means that students are able to collaborate on classroom projects and work on annual inquiry projects with and through the Internet. Wambach concluded that whatever type of computer system is used (desktops, laptops, or tablets) and wherever the computer is used (in a lab, on a wireless cart, or on a bedroom desk) students desire one-to-one access (rather than a shared computer) and consider computers as learning tools, as essential as pencils or calculators.

With the changes in technology, the elements of computer literacy are likewise bound to change constantly, making it important for educators to regularly revise course contents to include the latest advancements. Currently, computer and web-based instruction with interactive practice activities have been found to be effective methods for teaching computer literacy (Martin, Klein & Sullivan, 2004, 2006). At the same time, the rapid pace of technological change has led businesses to reorganize and to demand a highly computer-literate workforce (Porter & Miller, 1985). They thus seek computer skills in almost everyone they hire (Ndahi & Gupta, 2000; Hedberg, J. (2002). So as to meet these demands and needs it is important to determine what constitutes the desired computer competency skills and how they should be taught. Formative evaluations such as this are thus important in primary, secondary and post-secondary schools so that course goals align with student needs, technological advancements, and employer requirements.

The Information and Communication Technology Curriculum

The course at the centre of this formative evaluation is a computer literacy course called Information and Communication Technology (Syllabus Code 0417) as administered by the International General Certificate of Secondary Education (IGCSE) Technology program worldwide. In Botswana this curriculum is only offered in private senior secondary schools, not in government schools. This curriculum provides students with a solid introduction to computers and the software applications they will use in both their personal and professional lives. The course is conducted in a learner-centred classroom and requires active student participation. Instruction features illustrated lectures, in-class group work, on-line research and discussion, student-generated information and demonstrations, and hands-on lab activities. The course has two areas of concentration: theoretical knowledge about computers and practical knowledge on how to use computers for productivity, problem solving, and data analysis.

Information and Communication Technology (ICT) falls into Group V (Creative, Technical and Vocational) of the International Certificate of Education (ICE) subjects. Information and Communication Technology is an applied subject and all candidates require frequent access to computer and Internet facilities to develop and demonstrate their skills. The syllabus is structured around the flexibility needed to cope with a wide variety of resources and ever-changing technologies. Curriculum content is divided into eight interrelated sections which should be read as an integrated whole and not as a progression. These are:

1. Types and Components of Computer Systems
2. Input and Output Devices
3. Storage Devices and Media
4. Computer Networks
5. Data Types
6. The Effects of Using ICT
7. The Ways in Which ICT is Used
8. Systems Analysis and Design

Purpose of the Evaluation

Evaluation is conducted to improve a curriculum by identifying its strengths and weaknesses (White, 1988). The purpose of this evaluation was to measure the effectiveness of the course by evaluating the content taught and the instructional strategies used to deliver course content. This evaluation also sought to identify if academics and the

students agreed on the importance of the course content and instructional strategies. The effectiveness of the course was arrived at by measuring student and instructor perception of usefulness of different topics and the helpfulness of teaching strategies used. A summative assessment of student performance data (monthly tests and annual exams) was also conducted to enhance information gained about student learning in the formative evaluation.

Research Questions

This student and academic portions of this study were structured around the following questions:

- Do academics and students agree on the optimal content of the computer literacy course?
- Do academics and students agree on the optimal instructional strategies used to teach the content of the computer literacy course?

The beneficiaries of this evaluation include learners, teachers, college administrators, and education policymakers. In its National Development Plan, the Government of Botswana outlines the strategies that it hopes will produce the knowledgeable, skilled, enterprising and independent individuals demanded by today's technologically advanced environment (Republic of Botswana, 2003). In its Revised National Policy on Education, it acknowledges that society must be computer literate and that the workforce has to be prepared to make the best use of ICT (Republic of Botswana, 1994). The Government of Botswana has indicated its intention to provide resources for the expansion of educational facilities, including the provision of computer and Internet access in all schools by 2016 (Republic of Botswana, 1997). This study aims to make available, to the Government of Botswana, an ICT curriculum evaluation that could help to shape and perhaps expedite its intention to provide these resources.

Limitations

This study recognizes that locally dependent factors related to culture, history, norms and values constitute a background which may influence the results of the study. Empirical study results can thus only be generalised to other populations with similar cultural and societal conditions. The curriculum under evaluation is only offered by private senior secondary schools in Botswana and the study was therefore limited to these schools.

METHODOLOGY

Participants

Participants in this study included students and course instructors in the Information and Communication Technology course offered at private senior secondary schools in Botswana. Sixty students enrolled in the course and twelve course instructors were randomly selected from a sample of three private senior secondary schools. Twenty students and four instructors were selected from each of the sampled schools. The coordinator of the course was also interviewed so as to obtain additional relevant information. Based on the different data sources, different evaluation procedures were used, as explained in the next section.

Data Sources

A variety of quantitative and qualitative data sources were investigated and recommendations were made based on the results of the data analyzed. The primary data sources included surveys and interviews with students and instructors as well as classroom observations. The secondary data accessed included grades on student tests and annual examinations. Student and instructor opinions on course content as well as instructional strategies were noted. A descriptive statistical analysis was adopted and percentages and means were calculated.

Survey

Sixty students and twelve instructors were surveyed. The survey questionnaire was administered by the researcher with the help of course instructors. The survey consisted of two categories of questions, feelings toward topics covered (usefulness of content) and feelings toward teaching strategies used (helpful strategies). The same survey questions were asked of both students and instructors. Respondents were asked to rate the questions on a four-point

Likert-type scale adjusted to reflect the two categories of questions. For the usefulness of content category, the Likert scale was Very Useful = 3, Useful = 2, Less Useful = 1 and Not Useful = 0. For the helpful strategies category, the Likert scale was Very Helpful = 3, Helpful = 2, Less Helpful = 1 and Not Helpful = 0. The validity of the instrument was verified by asking two ICT instructors to review and consider the instrument and then incorporating their suggestions and alterations into the final survey.

To comply with ethical requirements, a letter from the University of Botswana was obtained. The letter was given to the principal of the school being studied and after his or her permission had been obtained, the study commenced.

Test and Examination Scores

Student performance on tests and annual examinations was analysed. Four tests were administered to all students. These four tests covered the major topics of the course. The content covered during the study year (three terms) was tested by an annual exam.

Classroom Observations

Observations were made in the class so as to collect data on instructional strategies and the content taught in the class. Most classes involved lectures and in-class activities. In-class activities and hands-on projects helped instructors to evaluate the skills learned by the students. Observations were made by the researcher and three lessons were randomly selected for observation.

RESULTS

The results of the study are presented based round the study’s research questions: A. What to teach? and B. How to teach?

A. What to teach: do academics and students agree on the optimal content of the ICT course?

Survey results

Both student and instructor opinions of the content taught in this Information and Communication Technology course were collected through the survey. The weighted mean of the responses obtained were tabulated and are depicted in the graphs below. The eight main topics taught in the course (type and components of computer systems, input and output devices, storage devices and media, computer networks, data types, the effects of using ICT , the ways in which ICT is used, and systems analysis and design) were listed on the survey. Students and instructors rated these topics on a four point Likert-Type scale on the basis of their usefulness (Very Useful=3, Useful=2, Less Useful=1 and Not Useful=0). The results of student and instructor survey mean scores on the usefulness of course content are shown in Table 1.

Table 1: Student and Instructor Survey Mean Scores on the Usefulness of Content

Contents taught	Students	Instructors	Total
A1. Types and Components of Computer Systems	1.88	2.11	2.00
A2. Input and Output Devices	1.56	2.36	1.96
A3. Storage Devices and Media	2.56	2.88	2.72
A4. Computer Networks	2.60	2.90	2.75
A5. Data Types	1.72	2.49	2.11
A6. The Effects of Using ICT	1.08	2.04	1.56
A7. The ways in which ICT is used	2.20	2.79	2.50
A8. Systems Analysis and Design	2.06	2.50	2.28
Mean Total	2.00	2.51	2.25

The mean score of student ratings was 2.00 as compared with 2.51 for instructors suggesting that instructors deemed the content to be slightly more useful than students. Computer networks was rated as the most useful by students (M = 2.60) followed by storage devices and media (M = 2.56). Computer network was also rated as the most useful by instructors (M = 2.90) followed by storage devices and media (M = 2.88). According to the students, the least useful content was the effects of using ICT (M = 1.08) while the instructors rated type and components of computer systems (M = 2.11) to be the least useful. Students rated all topics less useful than the instructors, except computer networks. The top two topics rated both by the students and instructors were computer networks, storage devices and media and the way in which ICT is used. The analysis of ratings can be seen in the graph in Figure 1.

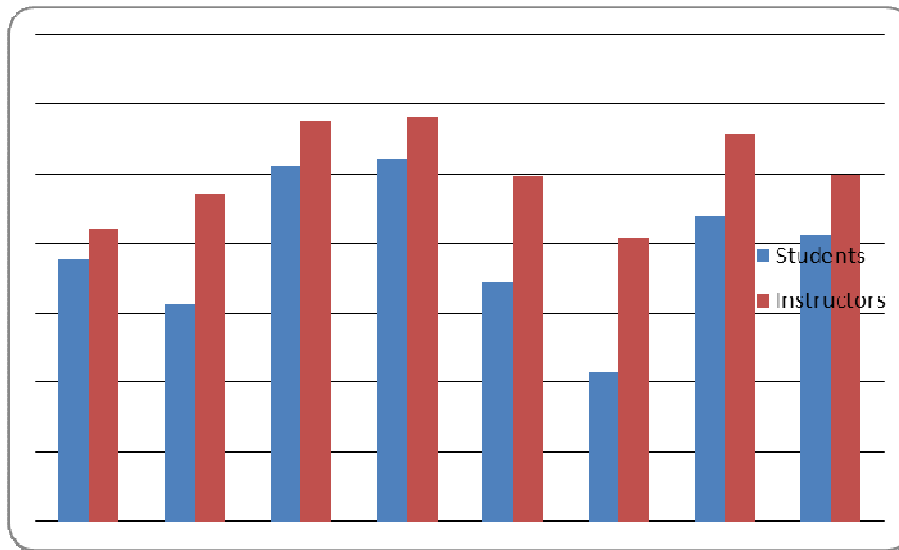


Figure 1: Analysis of students' and instructors' perception toward contents covered

Student Performance on Tests and Annual Examinations

Student performance on the different tests offered an assessment of student understanding of the different contents taught. These four tests covered the major topics of the course. A maximum of 100 points could be scored on each test and on the annual exam. The content covered during the study year was tested in the annual exam.

Student test and exam marks are presented in Table 2. Students seem have learnt the contents quite well as they scored more than 70% on all four tests and the exam. However, the performance of students from all sections was comparatively better (81.4%) on test four (ways in which ICT is used, and systems analysis and design) and test two (storage devices and media and computer networks. Test one (types and components of computer systems and input and output devices) and test three (data types and the effects of using ICT) had relatively lower results. Test one had a mean of 72.08%, test two had a mean of 76.64%, test three had a mean of 72.80%, and test four had a mean of 81.40%. On the annual exam, the mean score was 70.56%.

Table 2: Mean Analysis of the Tests and Annual Scores

Tests	Test 1	Test 2	Test 3	Test 4	Annual
Mean%	72.08	76.64	72.80	81.40	70.56

Student performance on test one was the lowest (72.08%). The poor performance on this test can be explained, in part, by the fact that students rated the topics covered in this test (types and components of computer systems and input and output devices) as not very useful and therefore may not have been interested in these topics. They scored highest marks (81.40%) on test four, which included the ways in which ICT is used and systems analysis and design. Interestingly, students rated this content as the third most useful for them. The lowest scores were

given on the annual exam, likely because the exam covered all the content in the course and required much greater preparation and knowledge.

B. How to teach: do academics and students agree on the optimal instructional strategies for teaching the content?

Survey Results

Eight instructional strategies that were used in the course: PowerPoint presentation for teaching, reading from textbooks, hands-on practicals, in-class activities to develop practical skills, group work, printed hand outs, Internet-based research, and monthly tests and exams. All were listed on the survey questionnaire. Students and instructors rated these strategies on a four-point Likert scale based on their level of helpfulness (Very Helpful=3, Helpful=2, Less Helpful=1 and Not Helpful=0) (see Table 3). Students (M = 2.60) and instructors (M = 2.84) agreed that in-class activities to develop practical skills were the most helpful for learning course content. Students and instructors also agreed that the least helpful teaching strategies were tests and exams (students = 0.56, instructors = 1.30) followed by readings from textbooks (students = 1.12, instructors = 1.52). PowerPoint presentations were rated the second most useful instructional strategy by instructors (M = 2.78) but students rated this as one of the least useful instructional strategy (M = 1.92). Given the literature review and general usefulness of PowerPoint as a teaching tool, it is worth further investigation to determine why students didn't find this to be a helpful strategy. Perhaps, in the way they are used in this setting, students find them to be too teacher-centred and do not allow students to be part of the learning process. On an average, instructors rated all the instructional strategies higher (M = 2.08) than did students (M = 1.84). Graphical representation of the responses of students and instructors on the helpfulness of the teaching strategies is shown in Figure 2.

Table 3: Analysis of Student and Instructor Perception towards Teaching Strategies

Strategies Used	Students	Instructors	Total
B1. PowerPoint presentation for teaching	1.92	2.78	2.35
B2. Reading from textbooks	1.12	1.52	1.32
B3. Hands- on practicals	2.24	2.56	2.40
B4. In class activities to develop practical skill	2.60	2.84	2.72
B5. Group work	2.36	1.90	2.13
B6. Printed handouts on different activities	2.00	1.70	1.85
B7. Internet excess based research	1.88	2.25	2.09
B8. Monthly tests and annual exams	0.56	1.30	0.93
Mean Total	1.84	2.08	1.96

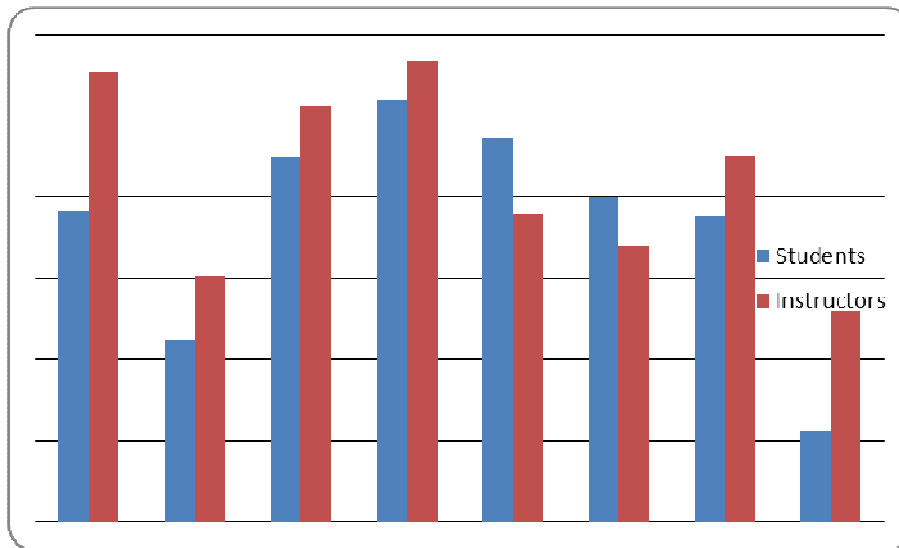


Figure 2: Analysis of students' and instructors' perception of helpfulness of teaching strategies used

Classroom Observations

Classroom observations revealed that students seemed to dislike the long PowerPoint presentations that instructors tended to use to deliver lectures. Here again, students seemed to prefer in-class activities and hands-on projects. While students did not like the written tests and exams, instructors felt that this was an important strategy for measuring student learning. Students seemed inclined towards the hands-on finals that tested their skills. Overall, there was much interaction between the instructor and the students, and students were helped individually when they encountered difficulties. It was, however, difficult for one instructor to pay individual attention to all students because of the large number of students in the class.

Open-ended Question Analysis

The survey contained an open-ended question that focused on areas of potential improvement in the course (Part C). The most common suggestions offered by students were: (1) No changes required; satisfied with the content taught; (2) More than one instructor needed for a class size of 15-20 students as it is difficult to get individual assistance when working on projects; (3) The text book assigned was not helpful and activities were preferred in place of readings; (4) Pace of class needs to be slower, especially when working on difficult topics; (5) Lessons should be paired (two lessons at a time) so as to finish all intended content; (6) The frequency of tests should be reduced; and (7) Involvement of students while using PowerPoint should be increased.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Formative evaluation was used in this study to evaluate the content and teaching strategies of an ICT course taught in Botswana private schools. Data from different sources was collected and analysed. The data collected from student and instructor surveys provided their assessment of the usefulness of topics and skills taught, and the helpfulness of the teaching strategies used.

The student and instructor surveys both indicated that the content of the course was useful as the mean score was 2.25. Computer networks, storage devices and media and the ways in which ICT is used were the top scoring topics for both students and teachers. For students, the least useful topic was the effects of using ICT, while the instructors rated type and components of computer systems as the least useful. With the exception of computer networks, students rated all the topics to be less useful than did instructors. Microsoft skills are required for many jobs today and have become a part of everyday life. These skills thus assist students in their other classes and so were rated as quite useful. Likewise, while students and faculty realized the importance of learning concepts related to the Internet and the World Wide Web, they did not find it as important to know what was inside a computer. Data types and input and output devices received a low rating by students, but a high rating by

instructors. More practical activities designed to teach the importance of these devices and skills were recommended by the instructors.

Students and instructors indicated that in-class activities designed to develop practical skills were the most helpful instructional strategy. According to students and instructors, the least helpful teaching strategies were monthly tests and exams followed by readings from textbooks. PowerPoint presentations were rated the second most useful instructional strategy by the instructors but were rated as one of the least useful instructional strategies by students. This paper recommends that instructors seek new ways to make PowerPoint lectures more interactive as student dislike of this otherwise useful tool may be related to their feeling that this tool is instructor-centred and fails to provide students with meaningful involvement.

Overall the following conclusions can be drawn from this study:

- Group work, hands-on projects and in-class activities were the most helpful strategies according to both instructors and students.
- Long lectures and monthly tests and exams were disliked by both students and instructors.
- The teaching of Excel and web design could be enhanced with more demonstrations and directions.
- It was difficult for instructors, based on the classroom observations, to help each of the thirty students in the class when they encountered difficulties. Having an assistant to the instructor in larger classes is advisable.
- Clear directions and handouts are needed for projects and in-class activities.
- A greater number of collaborative activities would allow students to learn from each other.
- Analysis of the course materials showed that the text book was inappropriate for the class.
- The discussion forum must be redesigned with clearer directions and more time assigned in class to work on it.

The findings of this evaluation have implications for the Information and Communication Technology curriculum for all schools in which this computer literacy course is offered. Some of these implications are not surprising. For examples, hands-on projects are more effective than lectures and textbooks when teaching practical skills. One unexpected implication is such that instructors need to more find creative methods to impress upon students the importance of file management systems.

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Teacher Efficacy: Is Student Engagement Essential in Botswana Junior Secondary Schools?

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Abstract

This paper discusses student engagement in learning in junior secondary school classes. Concern has been raised on the declining performance of students in junior secondary schools. The 2009 junior certificate results are a testimony to this concern. This paper investigates the response of Botswana junior secondary school teachers on three subscales: the Teacher Sense of Self Efficacy scale (TSES), efficacy in student engagement, instructional strategies and classroom management. The findings of this study suggest that teachers do not fully engage students in learning activities. Data was collected using a survey instrument administered to 1006 participants. Based on this study, decline in student performance can be linked to teachers failing to fully engage students in learning. Recommendations on how to engage students in learning are offered.

Keywords: Student Engagement, Classroom Management, Instructional Strategies, Teachers' Sense of Efficacy, Teacher Efficacy, Instructional Self-Efficacy.

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INTRODUCTION

In the context of the classroom, student engagement is defined as the ability to encourage students to learn (Harlin, Roberts, Briers, Mowen, and Edgar 2007). Students who are supported in their learning will be motivated to learn and accomplish more at school and their performance will improve. Teachers who encourage students to learn are perceived as having strong teaching efficacy beliefs – they believe in their abilities to produce desired student learning (Tschannen-Moran, Hoy & Woolfolk, 2001).

Wolters and Daugherty (2007) report that teachers' sense of efficacy "was best conceptualized as three related dimensions reflecting teachers' sense of efficacy for instruction, management and engagement" (p. 190). A teacher's sense of efficacy around student engagement is also related to an individual's conviction that he/she assists students to "become and remain involved, invested or motivated for learning" (Wolters and Daugherty p.182). They found that teachers with efficacious beliefs are those that tend to be interested in facilitating learning and believe that the students ought to be involved and motivated in the learning environments. Interestingly, a more recent study by Dibapile (2011) found that efficacy in student engagement was related to teachers holding Post Graduate Diplomas in Education. These teachers rated themselves higher in terms of student engagement than did their colleagues with other qualifications.

Students who are not engaged and not interested in learning are easily discouraged and may decide to abandon their studies, jeopardizing their own future and that of their community and nation. Research emphasizes the importance of motivation when engaging students in learning tasks. For teachers, the ability to motivate students involves “knowing what kinds of tasks support and feedback encourage students to put forth effort and strive to improve” (Darling-Hammond & Baratz-Snowden, 2006, p.8).

Given our general knowledge of the role of teachers and teaching in encouraging and sustaining student engagement, one may be left to wonder why are junior and senior secondary school students still struggling with this dimension of learning? Likewise, how has concern about this issue spread so fast as to be echoed by both Botswana’s President and the community at large? This paper will explore a number of the classroom issues affecting student engagement and teacher efficacy in fostering student engagement and hence, successful learning.

Categories of Student Engagement

Fredericks, Blumenfeld, and Paris, (2004) classified forty-four studies of engagement into three categories: behavioral, emotional and cognitive. For them, “behavioral engagement encompasses doing work, and following the rules; emotional engagement includes interest, values, and emotions; and cognitive engagement incorporates motivation, effort and strategy use” (p. 65). These categories are helpful in understanding student engagement.

Learning requires students to take responsibility for their work (a student-centered approach) rather than looking to teachers to drive the learning process. We still do not know in Botswana if students are self-engaged in learning or if it is the teachers who are controlling in the learning settings. Addressing teachers at a 2012 workshop in Maun, the North West District of Botswana, Chief Officer Mr. Maseko advocated for approaches like Pupil Academic Empowerment Strategies (PAES) that motivate learners and diminish the teacher’s role as the director in learning. Such teaching strategies are useful as they encourage students to take responsibility for their learning rather than relying on the teacher to lead the learning process.

Student Engagement and Teacher Efficacy

Student engagement is associated with teacher efficacy, and research has clearly found that teacher efficacy has an impact on teacher “performance, commitment, and professional retention” (Ware & Kitsantas, p. 303). Self-efficacious teachers are viewed as having the ability to organize relevant activities and to show patience with students who are struggling. Thus these “teachers will exhibit good performance and probably remain committed to their work” (p. 303).

Cousins and Walker (as cited in Fives and Buehl, 2010) found that teachers with high self-efficacy are likely to perform better than those with low self-efficacy because they “implement didactic innovations in the classroom and use classroom management approaches and adequate teaching methods that encourage students’ autonomy and reduce custodial control” (p. 252). Likewise, according to Erawan (2010), teachers with high self-efficacy keep students on task

Schunk (2012) defines teacher self-efficacy as instructional self-efficacy, referring to personal beliefs about one’s capacity to help students learn (p.153). Accordingly, instructional self-efficacy influences a teacher’s activities, effort, and persistence with students (Ashton & Webb, 1986). This notion of self-efficacy implies that for students to learn effectively, teachers must believe in their own abilities to enhance learning. Teachers with low self-efficacy may not be motivated to plan or prepare their teaching materials effectively (Henson, 2001; Tschannen-Moran, & Woolfolk Hoy, 2001). Teacher efficacy is vital to what is described as intentional teaching (Slavin, 2006). A teacher who comes to the classroom and prepares lessons with intention is much more likely to positively impact student engagement and learning than one who sees his or her position as simply a job to be endured. Effective teachers thus teach not only to earn a salary, but to develop students’ learning. In the context of teacher efficacy research, teacher self-efficacy is thus perceived to be a “predictor of student achievement” (p.153).

Rizvi and Elliot (2005) in analyzing data from Karachi teachers in Pakistan public primary schools reported various “dimensions of teacher efficacy, teacher practice, teacher collaboration, and teacher leadership (p. 46). This and other research confirms that “when teachers are highly efficacious, their students are found to have a high level of academic achievement, autonomy and motivation, and a firm belief in their own efficacy” (Cheung, 2008, p. 104). Teachers with a high teacher efficacy are also ambitious in their work and comfortable with new ideas. They show

patience, when facing challenging situations because they are influenced by their desire to see students with all abilities succeed.

It remains the practice of some teachers punish students when they make errors, using corporal or other means of punishment. This type of student punishment contradicts the findings of most teacher efficacy research. Ashton and Webb (1986) have suggested that these teachers' beliefs were often linked to strict punishment procedures, such as abusing students physically and verbally, and sending students out of the classroom. Highly efficacious teachers criticize their students' errors less, devote extra time to assisting struggling students, and continue to show interest in all students' education (Ho & Hau, 2004; Tschannen-Moran & Woolfolk Hoy, 2001). Teachers with a high teacher efficacy are also proactively perceptive in terms of students' needs in the learning environment (Cheung, 2008). Highly efficacious teachers engage students in learning while using various instructional methods to control undesirable classroom behavior. Woolfolk Hoy, Rosoff, and Hoy (1990) added, "A sense of personal efficacy becomes related to beliefs about control only after some years of actual experience in classrooms" (p.146).

Kounin's Research

The research of Kounin (in Brophy, 2006) is discussed below as it relates to student engagement. This paper contends that if teachers in Botswana were to adopt the research findings of Kounin, students would become more engaged in learning and low academic performances would be reduced. Kounin identified a number of teacher efficacy variables by analyzing video tapes of classrooms:

- *Withitness*: "Remaining with it," teachers stayed on top of what was happening in the classroom and continued to assess the overall classroom environment while engaged with individual students or small groups.
- *Overlapping*: Teachers performed more than one task at a time. For example, they remained close to students or looked at them to capture their attention, which allowed them to conduct the lesson without disruption.
- *Signal continuity and momentum during the lesson*: The teacher teaches well-planned, efficient classes centered on capturing student attention. The teacher should also present content continually and that is more compelling than the noise of competing distractions (p. 760).
- *Group alertness and accountability during lessons*: Teachers used question strategies that maintained group attention and their sense of responsibility for learning. Such strategies included pausing before asking an individual to respond to a question, refraining from guessing when selecting participants, and "interspersing choral responses with individual responses" (Brophy, 2006, p. 760).
- *Challenge and variety in assignments*: Students can be encouraged by and engaged in "seatwork" by being offered a diversity of assignments to challenge their cognitive abilities (Brophy, 2006).
- *Conveying purposefulness*: Teachers who were efficient classroom managers took advantage of the time allotted for teaching and evaluated whether the students were participating and learning. They encouraged students to be responsible for finishing their work on time. Daily revision of work was arranged, and students were given effective evaluations (Brophy, 2006).
- *Teaching appropriate conduct*: Effective classroom managers were viewed as having and communicating an understanding of what they expected from students as well as what they would not accept. They concentrated on the work students should be doing, which was important, and on teaching them how to do their work (Brophy, 2006).
- *Maintaining attention*: Effective classroom managers quickly identified students who were confused or not paying attention in class. They also organized seating arrangements so that students faced the direction in which they could best concentrate. In addition, effective managers changed the tone of their voices

when they spoke with students and moved around the class or “pace[d] to sustain attention” (Brophy, 2006).

Effective classroom managers also followed up on demanding tasks in the first weeks of class, encouraging and supporting students as needed. According to Emmer, Evertson, & Anderson (as cited in Brophy, 2006) effective managers “continued to give reminders and occasional remedial instruction, and they remained consistent in enforcing their rules” (p. 760). Effective managers instructed their students to abide by rules and procedures; talked about their expectations regarding student accountability, engagement, and quality of work; and clearly posted tasks and due dates.

This paper asserts that should the above research findings be applied in classrooms in Botswana and teachers can be motivated to teach in a more intentional way, students will begin to assume more responsibility for their own learning and learning environments, thereby improving their academic performances. For Daugherty, (2005) efficacy around student engagement was a significant predictor of a teacher adequately engaging the struggling learner, motivating students, and pursuing effective instruction and assessment. It is unclear if struggling students in Botswana are truly engaged in learning or if they are left to struggle further and thus grow increasingly isolated from the education system and its goals.

FACTORS AFFECTING STUDENT ENGAGEMENT

Teaching Salaries and Union-Government Disputes

This section discusses several factors that can influence Botswana teachers and hinder their efforts to engage students in learning. These factors were identified during the collection of data for this study. One of the most significant factors affecting teacher efficacy (and hence student engagement) was the chronically low salaries paid to teachers. Beginning in September 2010, education and public service unions had advised their members to reduce the workload in response to the government’s unwillingness to increase salaries. On this matter, the Secretary General of the Botswana Federation of Public Sector Unions (BOFEPUSO), to which teachers unions subscribe, wrote, “We strongly advise members only to work as per the normal hours of work for government employees, effective September, 2010, unless advised by the union leadership” (Gazette, 2010, p. 2).

At the time of data collection, disputes between teachers and the government regarding certain work-related duties were ongoing and teachers tended to comply with the advice of union leaders rather than the requirements of their employers. For many teachers this meant finishing work in the afternoon, at half past four, which is the end of the business day for government employees. Previously, teachers provided extracurricular activities to students, like sports and music, after class hours. Teachers also refused to invigilate the national examinations that junior secondary school students were required to write at the end of the year. As a result, principal educators and other professionals hired by the government invigilated the examinations.

One of the concerns in this regard is how long it will take teachers to regain their efficacy and whether the added stress of the dispute will prevent them from effectively engaging students in learning. Evans and Ingersoll (as cited in Klassen and Chiu, 2010) found that “teachers who are dissatisfied with their work display less commitment and are at greater risk for leaving the profession” (p. 742). If teachers in Botswana continue to carry with them a series of unresolved work-related issues, maintaining efficacy, engaging students, managing classes and using effective instructional strategies will not be easy.

Class Size

Class size is another factor that can affect student engagement and performance. Over-attended classes can hinder learning by interfering with curriculum goals and making it difficult for teachers to interact regularly students. Botswana junior secondary school classrooms are crowded. According to Botswana education statistics, at primary and secondary schools, the teacher-student ratio should be 1:28 and 1:40, respectively (Education Statistics, 2004). Most classrooms in Botswana were designed to accommodate 35 students, but class enrollment frequently exceeds that number. In such situations, even if teachers have a high efficacy and intend to employ various teaching methods to engage students in learning, they are bound to be less successful.

Overcrowded classrooms in Botswana are not a new problem. Reporting the benefits of a smaller class enrollment, the 1993 Report of the National Commission on Education noted that in smaller classes, “the teacher is

able to give individual attention to the child; to give more work and mark it; to get to know the strengths and weakness of children better and therefore devise appropriate remedial measures and more effectively monitor progress of children in class” (p. 122). Despite this early observation, classes today remain overcrowded. This overcrowding calls into question the ability of Botswana to achieve its Vision 2016 goal of being an educated and informed nation given the further caveat that “education must focus on the development of the individual’s potentialities to the fullest extent, across life-span” (p.37).

CONCLUSION

The premise of this paper is not to suggest that all teachers in primary, junior and secondary schools in Botswana fail to engage students in learning. There are teachers and schools that are performing well and have a good history of academic achievement. This paper does suggest, however, that the general decline in academic performance being observed across the nation is, in many ways, related to student engagement.

It is important to note as well, that this paper does not presume that learning begins and ends in the classroom. It is equally important that parents play an active role in engaging and encouraging their children to learn and achieve. In Botswana parents are increasingly criticized for not taking more ownership of the education and education outcomes of their children. As offered by the Minister of Education “parents should take responsibility for education of their children by monitoring and guiding them at home” (Bothoko, 2012). The Assistant Minister of Education has likewise expressed concern over this lack of interest. Parents “are not involved in their children’s learning and do not attend PTA meetings”. The Dean of the Faculty of Education at the University of Botswana has expressed similar views: “parents are equally to blame for poor results because they put very limited effort in ensuring that their children perform to the best of their abilities at school”. Research and reports evidence have found that parental or guardians’ involvement leads to the following:

- Enhanced academic performance
- Better to classroom behavior
- Decreased student drug and alcohol abuse
- Increased teacher moral
- Improved parent-child relationships (Columbus High School Parent/Guardian Involvement Plan, 2012).

The above findings on parental involvement are vital and undoubtedly have a role to play in student academic performance. The increased involvement of parents is also likely to lead to increased motivation among teachers as teachers will feel as though their classroom efforts are being acknowledged and reinforced by parents at home. Parents must begin to recognize themselves as a critical piece of the learning environment and to understand that teachers alone cannot accomplish the important job of engaging students. Learning is a collaborative activity whereby teachers and parents much work together to help the learner to succeed.

This paper has contended that students will be more successful in their educational pursuits if they are engaged in the learning process and take responsibility for some of their own learning. Teachers play an important role in making sure that students are focused in their learning activities. The research of Kounin has articulated the ways in which teachers can help students to become task-focused. The research of Daugherty (2005) has highlighted the importance of teachers providing extra guidance and supports to low performing students rather than neglecting their engagement altogether to continue to work with high performing students.

For both high and low performing students, motivating students can help them to persist during learning and when learning obstacles are encountered. The centrality of student assessment to engaged learning cannot be underemphasized as this is where student strengths and weaknesses are identified, thereafter allowing teachers to employ different/tailored strategies to help all students to succeed.

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An Investigation into Senior High School Students' Difficulties and Understanding in Naming Inorganic Compounds by IUPAC Nomenclature

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Abstract

This study assesses the difficulties that students have when naming inorganic compounds by IUPAC nomenclature. It uses a cross-sectional survey comprised of both quantitative and qualitative methods. The sample for the study consisted of 334 elective science Senior Secondary School (SSS 3) students in 2008/2009 academic year. Students were drawn from all schools offering elective science in the New Juaben Municipality of the Eastern Region of Ghana in that year. Of the sample population, 252 students were male and 82 were female with a mean age of 17 years and a standard deviation of 1.8 years. The instruments used for data collection were an achievement test and an interview. Some of the key findings include: students' inability to write the correct names of certain elements in compounds, students' inability to determine the central atom in compounds, students' inability to determine or calculate the oxidation numbers of central atoms in compounds, students' inability to write the correct names of radicals, and students' lack of knowledge about valency. This study recommends that teachers pay particular attention to assisting students in locating central atoms of compounds and hence calculating their oxidation numbers. This study also recommended that chemistry teachers focus more intently on helping students to name radicals correctly.

Keywords: Ghana Senior High School, Student Learning, Chemistry Students, Inorganic Compounds.

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INTRODUCTION

In the early practice of chemistry, the chemical name of a compound and its chemical formula had little or no relationship to one another. For example the compound Na_2CO_3 was called soda ash. The name “soda ash” contains no information about the type or number of elements in the compound. Modern naming methods have corrected this lack of connection. Today's rules for naming chemical compounds are set by the Nomenclature Committee of the International Union of Pure and Applied Chemistry (IUPAC). Older names, such as soda ash, are now generally referred to as common names. The correct IUPAC name for Na_2CO_3 or soda ash is sodium trioxocarbonate (IV).

Students' ability to write correct IUPAC names is central to learning and understanding chemistry. The West African Examination Council (WAEC), the body responsible for organizing examinations in West Africa, has for some time been concerned about students' inability to systematically name inorganic compounds correctly. The 1995 WAEC Chemistry Chief Examiner (CE) report stated that many candidates had problems with the systematic naming of inorganic compounds. The 1999 CE report also indicated that students were generally unable to provide the IUPAC names of some given inorganic compounds. Student difficulties with naming inorganic compounds have resulted in their inability to write correct chemical formulae (CE report for 1994, 2001, 2004 and 2005).

In a study conducted by Baah (2009), 334 senior high school students were asked to write the chemical formula for copper (I) oxide. Of those who participated in the study, 199 could not correctly write the formula. Of those who answered incorrectly, 120 wrote the formula as CuO and noted that this was because copper (I) is Cu and oxide is O. In the same study, the students were asked to write the formula for iron (II) sulphide. More than half (53.3%) could not write the formula for the compound. Of those who could not write, 107 students wrote the formula as Fe_2S , their reason being that iron (II) is Fe_2 and sulphide is S. It was clear from the study that students lacked the understanding of the meaning of the Roman Numeral in the bracket. They lacked knowledge of valency and the role valencies play in the writing of chemical formulae.

Hence the present study, which sets out to investigate the problems students have with understanding the systematic naming of inorganic compounds, is an important one. The fact that little academic research appears to have been done in this area, also makes this study a valuable one.

This study probed students' understanding of and difficulty with naming inorganic compounds using IUPAC nomenclature. The performances of students from both well-endowed and less-endowed schools were also compared so as to determine if the difficulties were more pronounced in a certain type of school. The following research question was used to structure the study:

1. What difficulties do SSS 3 students' have when naming inorganic compounds using IUPAC nomenclature?

The following null hypothesis was also used to guide the study:

2. There is no significant difference between the performance of students from well-endowed schools and those from less-endowed schools in the naming of inorganic compounds by IUPAC nomenclature.

METHODOLOGY

In this study, students' understanding of the systematic naming of inorganic compounds and the difficulties they have with such naming were investigated. A cross-sectional survey was used to accomplish this. This study was comprised of two stages in which a mixture of methods – quantitative and qualitative – was used to collect data.

In the first stage, an achievement test based on the systematic naming of inorganic compounds was administered to SSS 3 elective science students from all seven of the Senior Secondary Schools (SSS) offering science as elective in the New Juaben Municipality of the Eastern Region of Ghana. In the second stage, group interviews were administered to students who provided incorrect answers in the test. The interview was conducted to ascertain their reasons for getting the items wrong. The instruments were administered to the students in their various schools.

Population

The target population for this study was all SSS 3 students enrolled in elective science in the 2008/2009 academic year in the New Juaben Municipality of the Eastern Region of Ghana. These students had studied chemistry for almost three years and were therefore deemed able to make a meaningful contribution to the study. The seven schools were

classified as well-endowed and less-endowed based on their science facilities and the grade with which students were admitted to pursue the science programme.

Sample

The sample for this study consisted of 334 SSS 3 elective science students. The sample was drawn from all the schools in the population. Table 1 shows the number and gender of science students who were present in their respective schools at the time of the study and who participated in the study.

Table 1: Number and gender of students in the schools that participated in the study

Schools	Males	Females	Total
A	61 (87.1%)	9 (12.9%)	70
B	19 (63.3%)	11 (36.7%)	30
C	50 (62.5%)	30 (37.5%)	80
D	55 (100.0%)	0 (0.0%)	55
E	26 (61.9%)	16 (38.1%)	42
F	24 (68.6%)	11 (31.4%)	35
G	17 (77.3%)	5 (22.7%)	22
Total	252 (75.4%)	82 (24.6%)	334

Instruments and Data Collection Procedure

The main data collection instruments used in this study were an achievement test and an interview. In developing the test instrument, items were constructed by the researchers and administered to SSS 3 elective science students at the University Practice Senior Secondary School, Cape Coast (a school not used in the main study). The responses from these students then guided the construction of the achievement test. The achievement test was shown to chemistry lecturers in the Department of Science and Mathematics Education of the University of Cape Coast, Cape Coast, Ghana and their input on the validity of the instrument was sought. The instrument was then pilot-tested with a sample of 54 elective science students attending Ofori Panyin Senior Secondary School in Tafo in the Eastern Region of Ghana. Finally, the Statistical Package for the Social Sciences (SPSS) was used to determine the Cronbach alpha coefficient of reliability for the items in the test. An alpha value of 0.90 was obtained for the items. The difficulty and discrimination index for each item was determined and items found to be too difficult or too easy were deleted.

The test was administered to the sample students in their various schools and the answered scripts were collected immediately after the test. The test lasted for one and half hours and it took five days for all the schools to take the test.

After the scripts were marked, students who encountered difficulty with the test had their names recorded. Researchers then returned to the individual schools and used a group interview schedule to interview those students. The interview was unstructured and its purpose was to determine why students had provided incorrect answers in the test.

Percentages were used to standardize students' performance in the test. An independent samples t-test analysis was used to test for differences in performance of students from well-endowed and less-endowed schools. Qualitative data gathered during the interviews were transcribed and used to help explain students' test answers.

RESULTS AND DISCUSSION

In the achievement test, SSS 3 elective science students were given six inorganic compounds to name using IUPAC nomenclature. These compounds were:

- (a) H_2S
- (b) $\text{Cu}(\text{OH})_2$
- (c) $(\text{NH}_4)_2\text{SO}_4$
- (d) KMnO_4

- (e) NaCN
 (f) Na₂CO₃

The results of the performance of the students in the various schools are shown in Table 2.

The correct naming of each compound carried 1 mark making 6 the maximum mark for the question. On the first item, H₂S, in four (A, C, D and G) of the seven schools more than two-thirds of students scored this item correctly. In school F, more than half of the students named the compound correctly using IUPAC nomenclature. In school B less than half of the students could name the compound whereas in school E less than one-third of the students could name the compound using correct IUPAC nomenclature. In schools E, F and G less than half of the students named the compound Cu(OH)₂ correctly. For the compound (NH₄)₂SO₄, it was only in school C that more than two-thirds of the students named the compound correctly. In schools A, B and G, less than half of the students could name the compound. In schools E and F less than one-fourth and less than one-third respectively could name the compound (NH₄)₂SO₄ correctly. With respect to the compound KMnO₄ it was only in schools C and D that more than half of the students named the compound correctly. In schools A, B, E, F and G, less than half of the students could name the compound KMnO₄ using IUPAC nomenclature. Performance was even poorer with the compound NaCN than it was in KMnO₄. This was because performance deteriorated in schools A, E, F and G. Performance in school D on this question, however, was surprising as over 90% of the students named NaCN correctly. Finally, performance for the compound Na₂CO₃ was okay because four schools out of seven had more than half of their students name the compound correctly. Generally, most students found the naming of Na₂CO₃ easier than KMnO₄ even though both compounds involve the same number of steps in their naming. Hence it is possible that some students have committed the names of some compounds to memory. The performance of the schools is shown in Table 2.

The null hypothesis tested for any significant difference between the performance of students from well-endowed and less-endowed schools in naming inorganic compounds by IUPAC nomenclature. The independent samples t-test analysis was used and as shown in Table 3, there was significant difference between the performance of students from well-endowed and less-endowed schools. The mean score for well-endowed schools ($\bar{M} = 0.630$, $SD = 0.294$,) was significantly ($t(332) = 8.734$, $p = 0.001$) higher than the mean score for less-endowed schools ($\bar{M} = 0.350$, $SD = 0.285$) with an effect size = 1.0.

H₂S

Of the 334 students who participated in the study, 209 students (62.6%) gave the correct IUPAC name for H₂S as hydrogen sulphide. As shown in Table 2 below, the proportion of students who could write the IUPAC name of H₂S correctly was higher in well-endowed schools as 75.1% of students in these schools succeeded compared to 42.6% of students from less-endowed schools. In all of the well-endowed schools, more than two-thirds of their students correctly named the compound.

Table 2: Performance by school for correctly writing the names of IUPAC compounds

Schools	H ₂ S	Cu(OH) ₂	(NH ₄) ₂ SO ₄	KMnO ₄	NaCN	Na ₂ CO ₃
Well-endowed						
A	47	40	26	29	21	32
N = 70	(67.1%)	(57.1%)	(37.1%)	(41.4%)	(30.0%)	(45.7%)
C	61	59	63	52	50	49
N = 80	(76.2%)	(73.7%)	(78.7%)	(65.0%)	(62.5%)	(61.2%)
D	46	47	30	38	50	38
N = 55	(83.6%)	(85.5%)	(54.5%)	(69.1%)	(90.9%)	(69.1%)
Overall	154	146	119	119	121	119
N = 205	(75.1%)	(71.2%)	(58.0%)	(58.0%)	(59.0%)	(58.0%)
Less-endowed						
B	13	17	10	12	12	14
N = 30	(43.3%)	(56.7%)	(33.3%)	(40.0%)	(40.0%)	(46.7%)
E	9	9	7	9	5	7
N = 42	(21.4%)	(21.4%)	(16.7%)	(21.4%)	(11.9%)	(16.7%)

F	18	17	9	16	9	18
N = 35	(51.4%)	(48.6%)	(25.7%)	(45.7%)	(25.7%)	(51.4%)
G	15	10	7	8	6	15
N = 22	(68.2%)	(45.5%)	(31.8%)	(36.4%)	(27.3%)	(68.2%)
Overall	55	53	33	45	32	54
N = 129	(42.6%)	(41.1%)	(25.6%)	(34.9%)	(24.8%)	(41.9%)

Table 3: Independent samples t-test analysis of performance of well-endowed and less-endowed schools when naming compounds using IUPAC nomenclature

Schools	N	Mean	SD	t	df	p
Well-endowed	205	0.630	0.294	8.734	332	.001*
Less- endowed	129	0.350	0.285			

*Significant at $p < 0.05$

In schools B and E, both of which are less-endowed schools, less than 50% and 30% respectively had the naming of the above compound correct. Overall and as shown in Table 2, 37.4% out of 334 students who participated in the study could not give the correct IUPAC name for H_2S . Reasons given by students for their incorrect answers are presented in Table 4.

$Cu(OH)_2$

Of the 334 students who took part in the study, 199 students (59.6%) gave the correct IUPAC name of $Cu(OH)_2$ as copper (II) hydroxide. As shown in Table 2, two out of three well-endowed schools that participated in the study had more than two-thirds of their students give the correct IUPAC name. Of the four less-endowed schools, only one had more than half of its students score this item correct. More than two-thirds of the students from well-endowed schools therefore answered this item correctly compared to less than half of students from less-endowed schools. As shown in Table 2, 40.4% of students who took part in the test could not give the correct IUPAC name for $Cu(OH)_2$. Reasons given by these students for their incorrect responses are shown in Table 5.

Table 4: Students' responses and reasons for writing the IUPAC name of H_2S incorrectly (N = 125)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Hydrogen (II) sulphate	S is sulphate, H is hydrogen and H_2 is hydrogen (II)	50 (40.0%)
Sulphur (II) acid	S is sulphur and the presence of H makes it acidic therefore H_2 would make the name sulphur (II) acid	33 (26.7%)
Sulphuric acid	Because in the formula of sulphuric acid, there are H_2 and S	17 (13.4%)
Hydrogen sulphur	Because S is sulphur and H is hydrogen	17 (13.4%)
No response	Because we thought there was a mistake with the formula	8 (6.5%)

$(NH_4)_2SO_4$

Of the 334 students involved in the study, 152 students (45.5%) gave the correct IUPAC name for the compound $(NH_4)_2SO_4$ as ammonium tetraoxosulphate (VI). Only one of the three well-endowed schools had more than two-thirds of its students give the correct IUPAC name. In school A (well-endowed), less than half of the students answered this

item correctly. Less than half of the students from any of the less-endowed schools provided the IUPAC name of the compound. More than half, 54.5% of 334 students, could not give the correct IUPAC name of $(\text{NH}_4)_2\text{SO}_4$. Reasons for their incorrect responses are presented in Table 6.

Table 5: Students' responses and reasons for writing the IUPAC name of $\text{Cu}(\text{OH})_2$ incorrectly (N = 135)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Copper hydroxide	Because the subscript 2 in the formula does not take part in the naming of the compound.	50 (37.0%)
Copper dioxohydrogen	Because both the oxygen and the hydrogen are two	33 (24.4%)
Copper dihydroxide	Because the OH groups are two	50 (37.0%)
No formula	Because we did not know whether to calculate the oxidation number of Cu or H before naming the compound	2 (1.5%)

Table 6: Students' responses and reasons for writing the IUPAC name of $(\text{NH}_4)_2\text{SO}_4$ incorrectly (N = 182)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Ammonium sulphate	NH_4^+ is ammonium ion and SO_4^{2-} is sulphate ion so when they bond, that is the name we would have.	61 (33.5%)
Ammonium sulphuric	NH_4^+ is ammonium ion and SO_4^{2-} is derived from sulphuric acid (H_2SO_4) therefore when the two ions bond, such name would be the resultant name.	16 (8.9%)
Ammonium tetraoxosulphide	NH_4^+ is ammonium ion and SO_4^{2-} is tetraoxosulphide ion, therefore when they bond, such name would be the resultant name.	33 (18.1%)
Ammonium (II) tetraoxosulphate	NH_4^+ is ammonium ion and SO_4^{2-} is tetraoxosulphate ion so when two of NH_4^+ ions bond with one SO_4^{2-} ion such name would be the result	33 (18.1%)
Diamine tetraoxosulphate (VI)	NH_4^+ is amine and two of it is diamine and SO_4^{2-} is tetraoxosulphate (VI) ion	16 (8.9%)
Ammonium tetraoxosulphate (IV)	NH_4^+ is ammonium ion and SO_4^{2-} is tetraoxosulphate (IV) ion	12 (6.6%)
Ammonia tetraoxosulphate	NH_4 is ammonia and SO_4 is tetraoxosulphate	11 (6.0%)

KMnO₄

Of the 334 students who took the test on the IUPAC naming of KMnO_4 , 164 students (49.1%) gave the correct IUPAC name of the compound as potassium tetraoxomanganate (VII). More than half of the students from the well-endowed

schools gave the correct IUPAC name while less than half of the students from the less-endowed schools performed the same task correctly. Again, in none of the less-endowed schools did even half of the students score this item correctly. As shown in Table 2, 50.9% of 334 students could not give the IUPAC name of the compound. Reasons given by these students for their incorrect responses are presented in Table 7.

Table 7: Students' responses and reasons for writing the IUPAC name of KMnO_4 incorrectly (N = 170)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Potassium tetraoxomanganate	K is potassium and MnO_4 is tetraoxomanganate	(25.3%)
Potassium manganate (IV) oxide	K is potassium and MnO_4 is manganate (IV) oxide	33 (19.4%)
Potassium tetraoxomagesium (VII)	K is potassium and MnO_4 is tetraoxomagesium (VII)	33 (19.4%)
Potassium tetraoxomanganese (IV)	K is potassium and MnO_4 is tetraoxomanganese(IV)	34 (20.0%)
Potassium tetraoxomanganate (V)	K is potassium and MnO_4 is tetraoxomanganate (V)	13 (7.6%)
Potassium tetraoxomanganate (VI)	K is potassium and MnO_4 is tetraoxomanganate (VI)	10 (5.9%)
Potassium tetraoxomanganese	K is potassium and MnO_4 is Tetraoxomanganese	4 (2.4%)

NaCN

Of 334 students, only 153 students (45.8%) gave the correct IUPAC name of NaCN as sodium cyanide. As shown in Table 2, only school D (well-endowed) had more than two-thirds of its students answer this item correctly. In school B (less-endowed) less than half of the students answered this item correctly. In the remaining less-endowed schools fewer than one-third of the students could answer this item correctly. More than half of the students participating in the study (54.2%) could not give the correct IUPAC name for the compound NaCN. Reasons given by students for their incorrect answers are presented in Table 8.

Table 8: Students' responses and reasons for writing the IUPAC name of NaCN incorrectly (N = 181)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Sodium cyanate	Na is sodium and CN is cyanate	33 (18.2%)
Sodium cynaide	Na is sodium and CN is cynaide	33 (18.2%)
Sodium cynide	Na is sodium and CN is cynide	34 (18.8%)
Sodium cylide	Na is sodium and CN is cylide	17 (9.4%)
Sodium cynite	Na is sodium and CN is cynite	17 (9.4%)
Sodium nitrogen Carbonate	Na is sodium and CN is nitrogen carbonate	14 (7.7%)
Sodium carbon Nitrogen	Na is sodium, C is carbon and N is nitrogen	16 (8.8%)
Sodium cynade	Na is sodium and CN is cynade.	17 (9.4%)

Na₂CO₃

Of 334 students, 170 students (50.9%) gave the correct IUPAC name of Na₂CO₃ as sodium trioxocarbonate (IV). In two of the three well-endowed schools, more than half of the students scored this item correctly. Likewise, two of four of the less-endowed schools also had more than half of their students score this item correctly. It was only in school E (less-endowed) that less than one-fifth gave the correct IUPAC name for Na₂CO₃. Students' reasons for giving the incorrect response are presented in Table 9.

Table 9: Students' responses and reasons for writing the IUPAC name of Na₂CO₃ incorrectly (N = 164)

IUPAC Name Given by Students	Students' Reasons for the Name Provided	Number and Percentage of Students
Sodium carbonate	"that is what we know"	164 (100%)

CONCLUSIONS

The difficulties found among SSS 3 students with the systematic or IUPAC naming of inorganic compounds were:

- Inability to write the correct names of some elements in compounds. With H₂S, for example, students thought that S was sulphur rather than sulphide and in KMnO₄ that Mn was manganese rather than magnate.
- Inability to determine the central atom in compounds.
- Inability to determine or calculate the oxidation numbers of central atoms in compounds.
- Inability to write the correct names of radicals. For example, some students recorded the OH in Cu(OH)₂ as dioxohydrogen, the NH₄ in (NH₄)₂SO₄ as ammonia or diamine and the SO₄ as sulphuric tetraoxosulphide, and the CN in NaCN as cyanate, cynide, cylide, cynite, cynade and/or carbon nitrogen.
- Lack of knowledge about valency.

Implication for Research and Practice

The results of the study show that students from less-endowed secondary schools have increased difficulty naming inorganic compounds using IUPAC nomenclature when compared with students from well-endowed schools. The results also suggest that students from both well-endowed and less-endowed secondary schools have difficulty naming some radicals correctly. Chemistry teachers should therefore pay attention to this area of IUPAC naming. The results of the study also show that students from both schools have very limited knowledge about valency. More research could be carried out to further examine the causes of this limited knowledge.

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The Comparative Efficacy of Cycloplegic Drugs–Tropicamide and Cyclopentolate on School Children

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Abstract

This study compared the cycloplegic action of equiconcentration of tropicamide and cyclopentolate, as well as effects on visual acuity at far and near, near and far phorias, and amplitude of accommodation. Twenty five ocular healthy persons of both gender between the ages of 17 and 29 were used for this study. The result from this study showed that 1 drop of 1% solution of tropicamide as it reduces the quantity and quality of the variables considered. In each case, exophoria tended toward esophoria or less exophoria while exophoria tended to increase. It is concluded that tropicamide though less effective, is a more useful cycloplegic than cyclopentolate because its use is not associated with such time and action inconveniences and complications as observed with cyclopentolate. Based on the above findings and observations, for optimal and complication free diagnostic and therapeutic procedures, the use of tropicamide in an appropriate concentration of 0.5 percent to 1 percent is recommended over the use of cyclopentolate.

Reference to this paper should be made as follows:

Ihekaire, D. E. (2012). The Comparative Efficacy of Cycloplegic Drugs–Tropicamide and Cyclopentolate. *International Journal of Scientific Research in Education*, 5(3), 223-246. Retrieved [DATE] from <http://www.ij sre.com>

INTRODUCTION

Through advancement in optometric practice, practitioners have been exposed to the use of therapeutic and diagnostic agents much to the advantage of patients (OPR, 2012). One such advancement is the application of cycloplegic agents to the eyes to either enhance or diminish the functions of the ocular system (Pavan-Langston, 2005). The most desired effect of these cycloplegic agents is their effect on the ciliary muscles of the eyes, which are paralyzed to bring about relaxation or a complete elimination of accommodation, that is, cycloplegia. Cycloplegia is the paralysis of the ciliary muscles achieved by blocking the muscarinic receptors normally stimulated by the release of acetylcholine from the nerve endings of the parasympathetic system. Since the parasympathetic nervous system also enervates the pupil sphincter pupillae muscle, cycloplegia is always accompanied by mydriasis (although mydriasis is not always accompanied by cycloplegia) (Aneja, 2007). Cycloplegic drugs are used to produce the above effects and can thus prevent or reduce accommodation during refraction, thus making latent refractive errors manifest.

A proper and adequate fundoscopic examination is central to accurate diagnosis and treatment in the practice of optometry. A satisfactory prescription for glasses may be given only after the examiner has accurately determined the refractive status of the eye and made allowances for the tonus of the ciliary body or the accommodative power (Beazley et al., 2012).

The punctum remotum, or the far point of the eye, is the conjugate focus of the retina when the eye is in a non-accommodative state. Since the first step with any refractive technique is to determine the far point of the eye, clinical methods to suspend accommodation during the examination are needed (Kaufman, [n.d]; Apt & Gaffney, [n.d]; Banks, 1980). This can be achieved in one of two ways:

1. by inserting stronger convex or plus lenses than necessary in front of the eye, known as the “fogging technique”; or
2. by paralyzing the accommodative power of the eye with drugs, the result of which is “cycloplegia.”

All topical drugs, when instilled into the conjunctival sac are rapidly absorbed through the cornea and become effective in the inner part of the eye (Uruti, 2006; Jankov et al., 2006). Constriction of the pupil by the third cranial (CNIII) is due to the liberation of acetylcholine, which when formed and accomplished, immediately begins to destroy the enzyme cholinesterase. One drug, of which tropicamide and cyclopentolate are prototypes, abolishes the action of acetylcholine and thus causes mydriasis by preventing the sphincter from contraction (parasympatholytic drugs).

The sphincter pupillae and ciliary muscles, which belong to the adrenergic system, are innervated by the postganglionic parasympathetic efferent fibres of the short ciliary nerve branches of the oculomotor nerve (CN III) that have synapsed in ciliary ganglion. The dilator pupillae muscle is innervated by long ciliary nerves carrying postganglionic fibres of the sympathetic nervous system that have synapsed in the superior cervical ganglion. Cholinergic stimulation of the sphincter pupillae muscle causes papillary constriction (miosis), and cholinergic stimulation of the ciliary muscle brings about increased accommodation. Blockade of the cholinergic system dilates the pupil (mydriasis) and relaxes the ciliary muscle, causing a decrease in accommodation (cycloplegia).

Adrenergic stimulation causes papillary dilation, while adrenergic blockade causes papillary constriction. This suggests that the ciliary muscle may have a minor adrenergic innervation, with stimulation decreasing accommodation. In other words, more pronounced cholinergic effects obscure adrenergic effects.

Cholinergic blocking drugs, mainly of the atropine group, interfere with the actions of acetylcholine in nerve transmission at the following sites:

- The motor endplate of post ganglionic parasympathetic nerve fibres in smooth and cardiac muscles – these structures are stimulated by muscarine and blocked by the atropine group of drugs;
- The autonomic ganglia of both parasympathetic and sympathetic nervous systems – nicotine in small doses stimulates ganglionic stimulation, with the action being opposed by ganglionic blocking agents; and
- Both the motor endplate of the skeletal muscle and the central nervous system.

Mydriatics are agents that bring about increase in pupil size and the accommodative convergence accommodation ratio, as well as a decrease in visual acuity and the amplitude of accommodation. A widely dilated pupil is often required in fundoscopic examinations where retinal or lenticular peripheries are to be visualized through microscopy, ophthalmoscopy or fundus photography. In this process, the smooth muscles of the iris are ultimately activated. Mydriasis is thus the result of an imbalance in favour of dilator action which can be caused by:

1. increased activity along the sympathetic pathway;
2. decreased activity along the parasympathetic pathway;
3. direct stimulation or inhibition of the effector smooth muscles
(Lowenstein & Loewenfeld, 1962).

Two classes of drugs produce a mydriatic effect when instilled into the eye:

1. Sympathomimetic agents, including phenylephrine, hydroxyamphetamine, cocaine, adrenaline, and ephedrine; and
2. Parasympatholytic agents, including atropine, tropicamide, (mydriacyl), and cyclopentolate (cyclogyl).

CYCLOPLEGIC REFRACTION

Historical Background

The history of cycloplegic refraction has been reviewed in detail by Bannon. He notes that Piny (23–79 AD) discussed various herbs used to dilate the pupil for the treatment of corneal ulcers, cataracts and other ocular conditions. Throughout the 16th century, atropine and other drugs were used to dilate the pupil for cosmetic purposes (as suggested by the name, belladonna). Atropine's cycloplegic effect however, was not known until 1811 when William Wells, a London oculist, discovered that a patient whose pupils were dilated and had partial ptosis also had a failure of accommodation. It occurred to Wells that this effect might be caused by belladonna, and he convinced a younger physician, Cutting, to allow him to instill belladonna in his left eye. Cutting's accommodation was reduced from about 7.000 to less than 1.000 in about 45 minutes, and his power of accommodation did not return for eight days. His refractive state also changed from slightly myopic to slightly hyperopic (Manny et al., 2001).

As Bannon reflects, it would still be another fifty years before Donders would popularize cycloplegic refraction on scientific grounds. With his 1864 publication of "On the Anomalies of Accommodation and Refraction of the Eye", the use of cycloplegics in refraction became a universally accepted method. Evidence from earlier workers indicated that the orthodox method of refraction in America ophthalmologists entailed the use of cycloplegics. Although, as early as the 1980, Howe in Grosvenor (1989) suggested that while refraction was possible without cycloplegics, ophthalmologic training was (and, to a great extent, still is) carried out in hospitals and clinics where patients were often children, illiterate adults or the elderly whose resistance made the use of cycloplegic refraction methods difficult.

Cycloplegic Agents

Cycloplegic agents are drugs that act by antagonizing the muscarinic action of acetylcholine. They do so by blocking its action at structures innervated by postganglionic parasympathetic nerve fibres. These agents paralyse the constrictor pupillae as well as the ciliary muscle, causing mydriasis as well as cycloplegia.

For many years, atropine was the only cycloplegic agent available. To bring about full cycloplegia in children, it had to be instilled two or three times daily for three days prior to cycloplegic refraction. The resulting cycloplegia persisted for seven to ten days and the accompanying mydriasis lasted as long as two weeks.

Homatropine is a semi-synthetic alkaloid. It is not, however, considered to produce sufficient cycloplegia in children under the age of 15. Although compared with atropine, only a few drops are required, and the cycloplegic effect begins in a matter of 45-60 minutes, due to the availability of newer preparations, homatropine is not frequently used today.

Cyclopentolate (cyclogyl) is a short acting cycloplegic agent available in 0.5 and 1.0 percent solutions. With this agent, cycloplegia occurs within 30-45 minutes and persists for up to 24 hours. Even though it does not yield as complete cycloplegia in children as atropine does, Davies (1989) considers it to be a suitable alternative to atropine for children, even under the age of six if one or two drops of one percent solution are administered. For adults, he recommends one drop of 0.5 percent solution.

Reports of central nervous system effects following the use of cyclopentolate include confusion, ataxia and personality changes. Lyle and Hopkins (1977) reported that in almost all of these cases, the effect accompanied higher than recommended dosage or the combination of cyclopentolate and other muscarinic agents.

Tropicamide (Mydriacy I) is also a short acting cycloplegia available in 0.5 and 1.0 percent solutions. For young adults, three or four drops of the 1.0 percent solution, separated by a few minutes, will bring about full cycloplegia, and recovery occurs in two to six hours. Davies (1989) considers tropicamide inadequate for producing cycloplegia in children. According to Lyle and Hopkins (1977), reports of adverse reactions to tropicamide are made conspicuous by their rarity. In addition to its use as a cycloplegic, tropicamide is widely used as a mydriatic agent.

Choice of a Cycloplegic Agent

There appears to be little doubt that in children below the age of six years, complete cycloplegia can be obtained only with the use of atropine. However, the use of atropine is attended by a number of complications and dangers:

1. Parents must co-operate by instilling the ointment in the child's eye twice per day for 3 days;

2. The resulting cycloplegia may last as long as two weeks;
3. The ointment is poisonous and can cause death if taken by mouth, and
4. For a child with intermittent convergence strabismus or high esophoria, there is a possibility that complete cycloplegia can cause a constant convergent strabismus (Davies, 1989).

Despite its effectiveness, because of these problems the optometrist should consider the use of a less potent cycloplegic agent, such as cyclopentolate or tropicamide. If the cycloplegic refraction is needed to uncover latent hyperopia that may be responsible for a child's convergent strabismus, the fact that a full cycloplegic effect will not occur is of no great consequence.

When an agent other than atropine is used for cycloplegic refraction, it is not considered necessary to subtract a "tonus allowance" as it is when atropine is used. However, in some cases, the prescription of the full plus found in cycloplegic refracting may result in complaints of blurred distance vision. On the basis of Davies (1989) report, that twenty patients between the ages of 10 and 14 who were refracted under tropicamide had an average amount of residual accommodation of 3.56D, it is recommended that cyclopentolate (1 percent) be used for children. Tropicamide, however, will induce an adequate cycloplegic effect in adults.

Indication for Cycloplegic Refraction

Of the three major classes of diagnostic pharmaceutical agents that optometrists use, cycloplegic agents are indicated in far fewer cases than either mydriatic agents or anesthetics. Mydriatics are used frequently by practitioners who use binocular indirect ophthalmoscopy and fundus photography, while topical anesthetics are used routinely by practitioners who perform applanation tonometry and gonioscopy. Cycloplegic refraction is in fact necessary for only a small percentage of patients.

Children

When a child (often a pre-scholar) is seen with a convergent strabismus, the practitioner must determine whether there is an accommodative element in the strabismus. The only way to do this is through cycloplegic refraction. If cycloplegic refraction yields little or no uncorrected hyperopia, the condition is not accommodative strabismus, and the prognosis for non-surgical cure may be unfavourable. However, if several diopters of uncorrected hyperopia are found, the strabismus is accommodative, and a full correction for the hyperopia (possibly with an addition for near work) will greatly reduce or completely eliminate the esotropia.

The use of cycloplegic refraction should also be considered for a child whose eyes are normally straight but who has significant amount of esophoria (a deviation occurring only when fusion has been interrupted), particularly if the esophoria is present at the 40cm distance. Because the combination of hyperopia and esophoria in near work is often responsible for asthenopic symptoms and a distaste for reading, any latent hyperopia found through cycloplegic refraction should be corrected. As noted earlier, tropicamide causes insufficient relaxation of accommodation in children, so cyclopentolate (1 per cent) should be used to make such determinations.

Young Adults

For young adults between the ages of 16 and 40, latent hyperopia is sometimes a problem. Its presence should be suspected whenever a patient complains of headaches or other symptoms associated with near work but has little or no uncorrected hyperopia and no other refractive or binocular vision anomaly. The use of overfogging procedures, such as Borish's delayed subjective can, in many cases, make procedures fail to uncover the expected latent hyperopia. Tropicamide (1 percent) is considered to be the best cycloplegic agent because it has virtually no side effects. However, it is necessary to use 3 to 4 drops of 1 percent tropicamide to produce a cycloplegic effect similar to that brought about by one drop of 1 percent cyclopentolate.

Older Adults

The need for cycloplegic refraction falls markedly with age. Beyond the age of 40, the amplitude of accommodation decreases rapidly and is essentially non-existent by the age of 55. Consequently, patients over the age of 40 would not be expected to have latent hyperopia that went undetected in routine fogging procedures.

Statement of the Problem

In the practice of optometry, there are cases where ophthalmoscopy and refraction can be difficult due to congenital myopic pupil, crystalline lens opacity. Refraction also proves difficult in children of preschool age, illiterates, the intellectually challenged, persons experiencing language barriers, and in those with ciliary spasms.

After the completion of refraction by some subjective technique, examination either discloses a receding near point accommodation or the punctum remotum is quite remote for the individual's age thus indicating a hypertonicity of ciliary muscles. In such cases, the optometrist immediately begins to think about relaxing or paralyzing accommodation and dilating the pupil with a cycloplegic agent. The choice of the cycloplegic agent is dictated by the onset of action and the desire for a quick recovery with minimal side effects in order not to inconvenience the patient.

Since both cyclopentolate and tropicamide are effective cycloplegic agents, the question becomes which of the two better meets the above requirements for an effective clinical procedure involved in the day-to-day practice of optometry. This question may be answered if the following sub-questions (research questions) can be addressed:

1. Does the onset of action of tropicamide differ from that of cyclopentolate?
2. Does the duration of action of tropicamide differ from that of cyclopentolate?
3. Does the rate of papillary dilatation with tropicamide differ from that of cyclopentolate?
4. Does the loss in amplitude of accommodation with tropicamide differ from that of cyclopentolate?
5. Is there any difference in the mean time needed to achieve peak mydriasis with tropicamide and cyclopentolate?
6. If there any difference between the onset of recovery of accommodation with tropicamide and cyclopentolate?
7. Is there any difference between the cycloplegic properties of tropicamide and those of cyclopentolate?

Objective of the Study

This study aims to complete the cycloplegic effect of tropicamide and that of cyclopentolate among young adults. This will be achieved by:

1. Comparing the onset of action of tropicamide and cyclopentolate;
2. Comparing the time of peak mydriasis of the two drugs;
3. Comparing their duration of action;
4. Comparing the recovery rate of accommodation with both tropicamide and cyclopentolate.

Previous research has confirmed that tropicamide and cyclopentolate are the most suitable alternatives to atropine as far as cycloplegia is concerned (although they do not achieve as complete cycloplegia as atropine does), especially in children between the ages of 6 and 16 years old. At the same time, some consideration has been given to clarifying what constitutes adequate and effective cycloplegia. Gettes (1961) asserts that there must be less than 2.50D residual accommodation at the time of retinoscopy and examination for a cycloplegic agent to be effective. This will be taken as a baseline for this study.

Significance of the Study

Health care practices, including optometry are continuously growing and expanding their understanding of human health and afflictions. The importance of research into the diagnostic and therapeutic aspects of optometry thus cannot be over emphasized with respect to the maintenance of effective and convenient optometry practices. Given that the eye is the most precious human sense organ, caution must be exercised in choosing drugs to be used in clinical diagnostic examinations. Generally optometry drugs are chosen for convenience of application, desired effect in the least possible time, quickest recovery rate and minimal adverse effects. In this study, the cycloplegic effect of tropicamide is compared with that of cyclopentolate in meeting these requirements. This study also looks at the lowest possible percentage concentrations needed for effective therapeutic diagnoses and treatment. This research will thus also help to determine the minimum number of drops required for effective cycloplegia, thereby reducing the risk of over dosage.

This study will undoubtedly compliment the scope and context of hitherto existing literature on cycloplegics, especially research on cyclopentolate and tropicamide. For those already in or just entering the eye care profession, this study may expose certain hidden properties of these drugs which will in turn precipitate further studies.

REVIEW OF RELATED LITERATURE

In order to ensure a proper understanding of cycloplegia, it is important to offer some knowledge of the anatomy of the sphincter pupillae and dilator pupillae muscles of the iris and ciliary body.

The automatic nervous system can be divided into parasympathetic (or cholinergic) and sympathetic (or adrenergic) systems. Drugs affecting these systems may in turn be divided into cholinergic stimulating (agonist) and cholinergic blocking (antagonist) agents. Acetylcholine is the cholinergic neurohumoral transmitter and norepinephrine (noradrenaline, levarterenol) is the main adrenergic neural transmitter. Acetylcholine is inactivated by the enzyme cholinesterase, whereas norepinephrine is largely inactivated (90 percent) through re-uptake by the axon that released it or by enzyme catechol-O-methyl transferase. The amount of norepinephrine stored in the axon of the synaptic junction is limited by the inactivation of norepinephrine by monoamine oxidase.

Cycloplegics

Cycloplegics are chemical agents (drugs) that paralyze the ciliary muscles by blocking the muscarinic receptors that are normally stimulated by the release of acetylcholine from the nerve endings of the parasympathetic system. Cycloplegia is always accompanied by mydriasis since the pupil sphincter pupillae muscle is innervated by the parasympathetic nervous system. However, mydriasis is not always accompanied by cycloplegia. Although there are a number of these cycloplegic agents, this literature review will focus on tropicamide and cyclopentolate.

Mydriatics and Mechanism of Action

Physiologically, the pupil size is about 3mm – 4mm, but this is not universal. Myopes, for instance, are credited with large pupils, and hyperopes, astigmats, and emmetropes are known to have smaller pupils (Borish, 1970). Mydriasis can be achieved by using one of three types of pharmacological agents:

- Sympathomimetic agents, including phenylephrine, adrenaline, and cocaine;
- Parasympatholytic agents, including tropicamide, cyclopentolate, and atropine; and
- Ganglionic blocking agents, including hexamethonium.

These agents produce mydriasis through the:

1. Blockade of normal sphincter tone by inhibiting the action of acetylcholine, as liberated by postganglionic parasympathetic nerves (the muscarine blocking drugs). The ciliary muscle is likewise affected by the same type of innervation. In order to obtain a selective mydriasis, therefore, it is pertinent to choose drugs with lower potency than atropine or to use lower concentrations of the cycloplegic agents.
2. Stimulation of the dilator pupillae muscle which will bring about a selective mydriasis. Drugs that act in this way mimic the action of nor-adrenaline liberated from the post-sympathetic nerve, and are, therefore, called sympathomimetic drugs.

Sympathomimetic drugs have little or no effect on the ciliary muscles and hence may be used without the accompanying complication of cycloplegia. In the eye, these drugs will act on receptors in the peripheral blood vessels and dilator pupillae (Vale & Cox, 1984). Sympathomimetic agents are those produced by the sympathetic adrenergic nerves (Dipalma, 1976). Catecholamines are the main substances responsible for the stimulation of the majority of the structures innervated by post-ganglionic sympathetic nerves.

Parasympatholytic agents can be divided into:

- Those that block the motor end-plate of post-ganglionic parasympathetic nerve fibres in smooth and cardiac muscles. These structures are stimulated by muscarine and blocked by the atropine group of drugs.
- Those that block the acetylcholine at the automatic ganglia of both the parasympathetic and sympathetic nervous system. Nicotine in small doses stimulates ganglionic transmission, with the action being opposed by ganglionic blocking agents.
- Those that block both the motor end-plate of skeletal muscles and the central nervous system (Newell & Ernest, 1974).

Parasympatholytics bring about mydriasis by competing for the same receptors as acetylcholine, occupying them, and thus rendering the acetylcholine ineffective, that is, it has the same affinity as acetylcholine for the receptors but different intrinsic activity (they are acetylcholine receptor blockers). They produce mydriasis by paralyzing the sphincter pupillae and decreasing accommodation through paralysis of the ciliary muscles.

Ganglionic blocking agents are agents that block the transmission of impulses across both sympathetic and parasympathetic automatic ganglia. They are used mainly in the treatment of hypertensive cardio-vascular disease to reduce peripheral resistance by decreasing sympathetic tone to vascular tone. The ganglionic blocking agents' ocular side effects constitute their main ophthalmic interest as the conjunctival blood vessels and pupils are dilated (Newell & Ernest, 1974).

Clinical Uses of Cycloplegics

A state of paralysis of the ciliary muscles is called cycloplegia. It may be produced by drugs instilled into the conjunctival sac, including atropine, homatropine, scopolamine, and tropicamide. These also paralyze the sphincter muscle of the iris causing a dilation of the pupil. For this reason, they are also called mydriatics. Most drugs which dilate the pupil also paralyze accommodation to some extent.

Both these properties – cycloplegia and mydriasis – are utilized in the estimation of refractive errors. By paralyzing the parasympathetic nerve supply, all accommodation for near sight can be abolished and refractive errors which before were latent are made manifest. The dilation of the pupil moreover makes the technique of estimating the error easier and helps to allow a thorough and easy examination of the interior of the eye (Elder, 1993)

Cycloplegic Refraction

A cycloplegic agent should be used for refraction in children of pre-school age and for any individual in whom subjective responses are unreliable, including those who are illiterate, intellectually challenged or experiencing a language barrier.

Comparison of Cycloplegic and Non-Cycloplegic Retinoscopy

Young et al (1971) compared the non-cycloplegic and cycloplegic ametropias of Inuit children between six and fifteen years of age. The Inuit and the Chinese have a racial relationship and have similar iris pigmentation. Either three drops of cyclopentolate 1 percent were instilled ten minutes apart, or two drops of cyclopentolate 1 percent plus one drop of tropicamide 1 percent were instilled ten minutes apart. The author did not explain the reason for using tropicamide instead of cyclopentolate. A minimum of forty minutes was allowed for cycloplegia to develop before refraction was performed. The researchers found that the value of E (that is, the difference between the refractive error found before and after cycloplegia) increased with hyperopia. Their findings are summarized in Table 1.

In a separate study, Hiatt et al (1973, p. 76) recruited 130 subjects from clinic and private practice populations in Tennessee. Although the ages of the subjects ranged from six to forty-one years, 87 percent were under fourteen years of age. Two drops each of cyclopentolate 1 percent and tropicamide 1 percent were instilled and this dose was repeated after ten minutes. An additional thirty-five minutes were allowed for cycloplegia to develop before the refraction was performed.

Table 1: Summary of Findings - Young et al (1971, p. 24).

Refractive Error Under Cycloplegia		Number of Eyes	L.E. (Latent Errors)	
E	(D)		E	(D)
	+3.0 D	31		2.06
	-0.25 to -3.0 D	206		0.6
	-0.26 to -3.0 D	71		0.38

There was no explanation for using tropicamide 1 percent, but four drops of solution instilled at a time into each eye is likely to cause a significant loss of solution. This study found E to be greater in the six to ten year-old group than in the eleven to twenty-five year-old group and that its value diminished in older subjects. The findings of this study are summarized in Table 2.

Shultz (1975) studied the variation in ametropia induced by cyclopentolate 1 percent in 85 clinical patients aged seven to eighteen years. However no information was given about their skin and iris colouration. Two drops of solution were instilled into each eye five minutes apart. Eighty three of the 170 eyes were hypermetropic, 82 were myopic and five were emmetropic when measured under cycloplegia. Shultz (1975) also found that E increased with increasing hyperopia. Table 3 summarizes his findings. All of these studies show that E increases with increasing positive refractive errors, and decreases with increasing age.

Chan and Edwards (1993) recruited thirty-one children for their study from routine kindergarten vision screenings. Every tenth child screened was invited to participate in the study. Subjects were between the ages of three and fifteen years. Parents of the selected children gave approval for the refraction examination on their children in the optometric clinic at the Hong Kong Polytechnic.

Table 2: Summary of Findings - Hiatt, et al (1973)

Refractive Error Without Cycloplegia (Em)		Number of Eyes	Latent Error E. (D)	
Myopia	+ 1.0 D		68	
Hyperopia	+ 6.5 D	912		0.5
				2.0

Table 3: Summary of Findings - Shultz (1975)

Refractive Error Under Cycloplegia		Number of Eyes	L.E.	
(E)	(D)		E.	(D)
	2.00	18		2.00
	0.00	-		-
	0.25 to + 2.00	65		0.75
	0.00	5		0.00
	- 0.25 to - 2.00	50		0.00
	- 2.00	32		0.00

Static retinoscopy was performed twice on every child by the same retinoscopist, once before the instillation of the cycloplegic and again forty-five to sixty minutes after the instillation of the cycloplegic. The first and second retinoscopy results were recorded on different sheets to minimize the effects of knowledge of previous findings on the second result, although the effects of the examiner's memory on the findings can not be completely excluded.

Chan and Edwards (1993) used a working distance of 67cm. During the retinoscopy, every child wore a pair of + 1.5 D plastic multicoated lenses to discourage accommodation (Bigsby, et. al., 1984). One drop of cyclopentolate 1 percent was instilled in each eye, followed by another drop five minutes later. The pupil was occluded for twenty to twenty-five minutes each time the drug was instilled. If the pupil showed no mydriasis twenty to twenty-five minutes after the initial instillation, a third drop was instilled; no child needed a fourth drop.

Chan and Edwards (1993) analyzed only the results obtained from the left eye of the children in the study. To compare their results with those obtained in previous studies, they divided twenty-seven subjects into three groups (A, B, and C) according to their cycloplegic retinoscopy findings as shown in Table 4.

Table 4: Classification of Refractive Error in Chan and Edward’s Study

Group	Spherical Equivalent of E.
A	0.00 D
B	Hyperopia of + 2.00 D
C	Hyperopia of + 2.00 D

The retinoscopy findings of all subjects measured before and after cycloplegic refraction in each group are shown in Table 5: A B and C. The mean value of E increased with the amount of hyperopia and is the smallest in group A and greatest in group C. The results show that the maximum difference astigmatic power measured with and without cycloplegia was only 0.25D. The change in spherical component power, consequently, was the chief factor that affected the value of E.

The results obtained by Chan and Edwards (1993) support those of the previous studies. The mean value of E increases as the amount of hyperopia increased. Although the age of the subjects recruited for their studies varied, all of the comparisons were made using the youngest groups (ages six to fourteen or fifteen years). Their values of E in the myopic and hyperopic groups generally matched those of previous studies, although a smaller value for E was obtained in the high hyperopic group. They attributed this to the fact that Hong Kong Chinese children tend to have smaller amounts of hyperopia than Caucasian children (Edwards, 1991; Lam & Goh, 1991).

Table 5: Retinoscopic Results for all Subjects in Groups A, B and C

Group	Before Cycloplegia (D)			Under Cycloplegia (D)				E(D) Equivalent
	Age in Months	Sphere	Cylinder	Spherical	Sphere Equivalent	Cylinder	Spherical	
A	43	0.00	-2.00	-1.00	0.00	-1.75	-0.85	0.10
	47	-0.75	-0.50	-1.00	-0.75	-0.50	-1.00	0.00
B						Mean	Change	
	37	+0.25	- 1.25	-0.375	+0.75	-1.25	+0.125	0.50
	50	+0.50	- 2.00	-0.50	+1.25	-2.00	+0.25	0.75
	65	+0.50	- 1.25	-0.125	+1.00	-1.50	+0.25	0.375
	55	0.00	- 0.75	-0.375	+0.75	-0.75	+0.375	0.75
	61	+0.25	- 0.50	0.00	+0.75	-0.50	+0.50	0.50
	45	+0.50	- 1.25	+0.125	+1.25	-1.25	+0.625	0.75
	52	+0.25	- 0.25	+0.125	+0.75	-0.00	+0.625	0.50
	39	+0.25	0.00	+0.25	+1.75	-2.00	+0.75	0.50
	44	+0.75	- 2.25	-0.375	+1.50	-1.25	+0.75	1.125
	62	+0.75+0.50	- 1.00	+0.25	+1.00	0.00	+0.875	0.625
	54	+1.00+1.00	0.00	+0.50	+1.50	0.75	+1.00	0.50
	59	+0.75	0.50	+0.75	+1.50	0.75	+1.25	0.375
	51	+1.25	0.75	+0.625	+1.50	0.50	+1.25	0.50
	60	+1.25	0.75	+0.50	+1.50	0.75	+1.25	0.75
	49	+1.00	0.00	+0.875	+0.875	0.75	+1.375	0.50
58	+1.00+0.75	0.75	+0.875	+1.00	-0.75	+1.375	0.50	
50		0.00	+1.00	+0.625	0.00	+1.50	0.50	
55		0.75	+0.625	+0.75	-0.50	+1.50	0.875	
61		0.00	+0.75	+0.75	0.00	+1.50	0.75	
C						Mean	Change	
	43	+1.00	-0.75	+0.625	+2.50	-0.50	+2.225	1.625
	60	+2.00	-1.50	+1.25	+3.25	-1.75	+2.375	1.125
	50	+1.50	-1.00	+1.00	+3.00	-1.00	+2.50	1.50
	50	+1.75	-1.00	+1.25	+3.00	-1.00	+2.50	1.75
	59	+1.50	-1.25	+0.825	+3.25	-1.25	+2.625	1.25
	63	+2.50	-1.50	+1.75	+3.75	-1.50	+3.00	1.42

Comparison of Cyclopentolate versus Tropicamide Cycloplegia in Children

Egashira et al. (1993) conducted a comparison study involving ten girls and ten boys, ages six to twelve (mean age = 8.8 + 2.2 years). Of the twenty subjects, sixteen were white (80 percent), two were black (10 percent), one was Hispanic (5 percent) and one was Asian (5 percent). They found the cycloplegic refractive errors of the children ranged from + 0.25 to + 4.50 D with a mean refractive sphere (+5D) of + 1.48 to + 1.10 D using a canon 12 = 1 autorefractor. All subjects were confirmed to have normal ocular health, no strabismus or amblyopia, and were able to respond to subjective refraction.

They tested each subject twice, once with tropicamide 1 percent (Mydracyl – Alcon, Fort Worth, T X) and once with cyclopentolate 1 percent (Cyclogyl C – Alcon, Fort Worth, T X). The average time that elapsed between testing sessions was nineteen days with a range of four to eighty-seven days. Only the right eye was tested on both visits. The study was conducted using a double masked design: an investigator who was not involved in the direct measurements randomly selected either tropicamide or cyclopentolate as the drop to be instilled at the first visit. Neither the investigator taking the measurements, the children being tested, nor their parents knew which drop had been instilled. After taking non-cycloplegic measurements, the researchers instilled one drop of proparacaine 0.5 percent into the subject’s eye followed by two separate drops of the chosen cycloplegic agent. Proparacaine was used to increase the subject’s comfort, to decrease reflex lacrimation and to increase corneal penetration by the cycloplegic agent. Systemic absorption and discomfort were minimized by asking the subject to close his/her eyes for thirty seconds after each drop of the cycloplegic agent.

Table 6 shows retinoscopy, subjective refraction and autorefraction results for all twenty subjects before drug instillation and for each drug at the generally accepted time of peak cycloplegia (tropicamide at thirty minutes and cyclopentolate at sixty minutes). Egashira et al. (1993) evaluated the refractive data using only the spherical component of the refractive error as expressed in minus cylinder form. The comparison of the cylindrical component obtained by autorefraction for each individual subject (mean = 50 for tropicamide at thirty minutes = 0.77 = 0.93D and for cyclopentolate at sixty minutes = 0.69 + 82D) showed that this measurement did not vary significantly throughout the study (students paired test; p = 0.22).

Although retinoscopy revealed more plus than either subjective refraction (+ 0.15D, p < 0.005) or autorefraction (+ 0.29D, p < 0.001) when no cycloplegic was used, all three methods yielded similar results when either cycloplegic agent was used (student’s paired E-test p = 0.24).

Table 6: Refractive Data. The Spherical Component of the Refractive Error by Subjects Obtained Using No Cycloplegic, Tropicamide 1 percent at Thirty Minutes and Cyclopentolate 1 percent at Sixty Minutes Measured in Diopters

Subject No.	Retinoscopy (D)			Subjective (D)			Autorefraction (D)		
	Noncycloplegic	Tropicamide	Cyclopentolate	Noncycloplegic	Tropicamide	Cyclopentolate	Noncycloplegic	Tropicamide	Cyclopentolate
1	2.50	2.25	2.75	2.38	2.50	2.75	1.69	2.82	2.63
2	2.25	2.50	2.50	2.25	2.50	2.75	1.99	2.32	2.03
3	1.00	1.00	1.25	0.88	1.00	1.25	0.68	1.22	1.49
4	1.00	2.25	2.25	0.63	2.00	1.75	0.48	2.04	2.03
5	0.88	2.00	2.50	0.38	2.00	2.00	0.99	2.19	2.23
6	3.75	4.50	4.00	3.75	4.50	4.00	3.46	4.20	4.56
7	0.75	1.50	1.00	0.75	0.75	1.00	0.39	1.15	0.70
8	1.00	1.00	1.50	1.00	1.25	1.50	0.33	0.72	1.29
9	1.88	2.00	2.25	1.63	2.50	2.00	1.69	2.35	2.35
10	-0.13	1.00	1.25	0.00	0.75	1.25	-0.30	0.58	1.25
11	0.50	1.50	2.00	0.25	1.25	1.75	-0.02	1.56	1.84

12	0.50	0.20	0.50	0.13	0.25	0.25	0.42	0.48	0.71
13	0.50	1.00	1.00	0.25	0.75	0.50	0.08	0.84	0.64
14	-0.25	-0.25	0.00	0.00	0.25	0.25	-0.18	0.23	0.26
15	0.38	1.00	0.75	0.25	0.75	0.75	0.29	0.94	1.11
16	0.00	0.50	0.25	0.00	0.50	0.75	-0.25	0.55	0.87
17	0.38	0.75	0.75	0.25	0.50	1.25	-0.02	0.43	0.90
18	1.13	1.75	1.75	0.50	1.75	1.75	0.59	1.76	2.11
19	1.38	2.75	2.75	1.38	2.75	2.75	1.21	2.38	2.73
20	0.63	0.75	1.25	0.38	1.00	0.50	0.68	0.84	0.71
Mean	+ 1.00	+ 1.50	+ 1.61	+ 0.85	+ 1.48	+ 1.54	+ 0.71	+1.48	+1.62
± SD	± 0.97	± 1.06	± 1.00	± 0.98	± 1.08	± 0.98	± 0.92	±1.01	±1.01

Autorefracton and subjective refracton were not statistically different under any of the three conditions (student's paired E test; $p = 0.05$) (Sherri, et. al, 1993).

USES OF CYCLOPLEGICS

Ciliary Spasm

Ciliary spasm is often controlled using cycloplegic agents. This is a common condition noticed after the completion of the refracton by a subjective technique, when examination discloses a remote near point of accommodation or the punctum proximum is remote for the individual's age indicating a hypertonicity of the ciliary muscle (Gettes, 1961).

Uveitis

In the treatment of anterior uveitis, atropine becomes of help as a mydriatic as well as a cycloplegic agent. This provides comfort by relaxing the ciliary muscles which spasm in anterior uveitis. A short acting mydriatic such as tropicamide and cyclopentolate is also needed to prevent the formation of posterior synechia (that is, adhesion of the iris to the anterior surface of the crystalline lens) by maintaining pupil mobility. In mild cases of chronic anterior uveitis, however, the mydriatic can be instilled once daily at bedtime to prevent difficulties associated with accommodation during the day. Note the pupil should not be kept in a fixedly dilated position in chronic anterior uveitis (Kanski, 1988). Kanski (1988) also supports the use of intensive topical mydriatic therapy to break already formed synechia due to the fact that the synechia is unwanted because it interferes with the normal pupil action leading to pupil block glaucoma as a result of seclusic pupillae (Kanski, 1988).

Occlusion

Management of amblyopia may involve the use of atropine if cycloplegia will reduce the acuity of the good eye below that of the amblyopic eye, thereby avoiding the mechanical and cosmetic nuisance of patching. However, prolonged occlusion is not of benefit if the amblyopic eye is fixed eccentrically.

Higher Centres

Parasympatholytics can decrease muscle tremor and stiffness in Parkinsonism (Paralysis agents). This is attributed to the antagonism of acetylcholine (ACH) at the central synapses (Dipalma, 1976).

Arterioles and Capillaries

The vasoconstriction effect of mydriatics helps to control bleeding from capillaries and small arterioles but is ineffective against haemorrhages from large vessels. During most ophthalmic operations, it is the oozing of blood from these vessels that obscures surgical details, hence the preliminary use of epinephrine is still of considerable importance in eye surgery (Havener, 1975)

Bronchi

The smooth muscles of the bronchioles are slightly relaxed by tropicamide and cyclopentolate, thereby blocking the constrictor effects of the vagus nerves. Their dilator action is minimal and is seldom used in the treatment of bronchitis, although they may occasionally be of help (Dipalma, 1976).

Factors Affecting the Choice of a Cycloplegic

Age: the amplitude of accommodation in children is always greater than that of adults. For instance, at eight years of age, the dioptric power of the eye can be as high as 12.00D while at the age of twenty, it falls to 11.00D. At 30 years it decreases to 9.00D and at 50 years it is less than 2.00D. In other words, the younger the patient, the more potent the drug must be in action. It is important that younger children are first examined for the presence of a muscle imbalance or muscle anomaly. For this age bracket, however subjective examination and responses are usually unreliable and the utility of a more potent cycloplegic agent cannot be ignored. At the same time, in young children short acting cycloplegics are sometimes irritative and may actually induce a temporary spasm of accommodation.

Appearance of the Anterior Chamber: a shallow anterior chamber should be regarded with suspicion no matter the patient's age. In the course of an eye examination, any shallow anterior chamber presupposes potential narrow angle glaucoma. This can usually be confirmed with the use of tonometer-determined intra ocular pressure (IOP) and gonioscopy to assess the visibility of the angle of the anterior chamber.

Pigmentation of the Iris: it is quickly evident to an examiner with much clinical experience that greatly pigmented irides, such as are seen in non-Caucasians, will dilate with greater difficulty than the lightly pigmented eye. The fair skinned blue eyed patient will respond to weaker dilution much more readily than will darker skinned-darker eyed patients (Okafor, 1995).

Occupation: excluding the young child, in using cycloplegic agents in therapeutic for diagnosis the more committed or in-demand an individual is, the greater the need for an agent with rapid restoration of accommodation so that the student or employed person can quickly return to their occupation.

The Drug Tropicamide

Structure and Chemistry of Tropicamide

Wilder (1961) gave tropicamide the clinical name N-ethyl (-2-phenyl) N-(4-pyridyl methyl)-hydracrylamie but regarded tropicamide as less satisfactory than either homatropine (5 percent) or cyclopentolate (1 percent). This was based on the fact that an ideal cycloplegic should provide: maximum relaxation of accommodation and mydriasis, rapid onset of action and rapid attainment of maximum effect, short duration and rapid recovery, consistency in its efficacy, and freedom from toxicity, irritation or sensitivity. Concurring with Goodman and Gilman (1975) observed that tropicamide is a synthetically prepared derivative of tropic acid which is a constituent of, but still dissimilar from the belladonna alkaloids (Goodman & Gilman, 1975).

According to the British Pharmacopaedia (1973), tropicamide is N-ethyl-4-(4-piperidyl methyl) tropicamide. It contains not less than 99.0 percent, not more than 101.0 percent, and not more than the equivalent of 101.0 percent $C_{17}H_{20}N_2O_2$ calculated with reference to the dried substance which is a white or almost white crystalline powder that is odourless or almost odourless. It is soluble in 160 parts of water in 3.5 parts alcohol (95 percent) and 2 parts chloroform and has a molecular weight of 284.4.

Tropicamide along with Lachesine, Dibutoline, and Oxyphenonium are synthetic analogues of atropine. They are all muscarine blocking agents and therefore show similar effects to atropine. These properties are also attributable to cyclopentolate. Also much like atropine, tropicamide does not affect nerve impulse and does not prevent the release of acetylcholine (ACH) (Vale & Cox, 1984). Tropicamide (0.5 percent) and (1 percent) are available in both single and multidose forms.

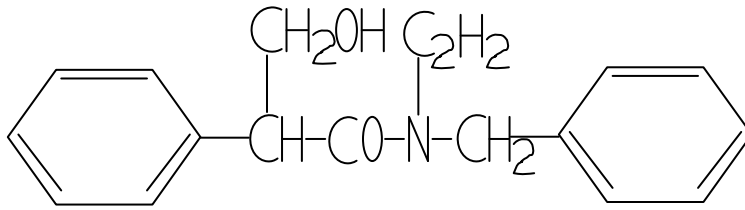


Figure 1: Structure of Tropicamide

Mode of Action

Tropicamide causes mydriasis by:

- Unbalancing the system in favour of the sympathetic side;
- Diminishing the responsiveness of the sphincter pupillae to parasympatholytic activity

Tropicamide thus belongs to the parasympatholytic drug group and is an antimuscarinic agent that acts as a competitive antagonist to acetylcholine and other muscarinic drugs. The actions of acetylcholine are inhibited by tropicamide at the structures innervated by the postganglionic cholinergic nerves of certain smooth muscles. Tropicamide and all others in the antimuscarinic class block the action of the sphincter muscle of the iris and the ciliary muscles of the lens to cholinergic stimulation, thereby dilating the pupil and inhibiting accommodation (cycloplegia).

Action in the Eye

The interest in tropicamide results from its mydriatic action which is known to be greater than its cycloplegic action. When a 0.5 percent or a 1 percent solution of tropicamide is used, mydriasis is rapid in onset reaching its peak in 15–30 minutes with a return to normal occurring in 8–9 hours. Tropicamide's cycloplegic action is relatively weak reaching its maximum effect after 25 minutes and with full amplitude having returned after 6 hours (Vale and Cox, 1984).

Merill et. al. (1960), as well as Stine (1960), report that the 0.5 percent solution is inadequate for routine refraction and that maximum cycloplegia can be attained with the 1 percent solution in 20 to 30 minutes. In their study, Merrill, Goldberry and Zavell compared similar age groups where 1 percent tropicamide, 1 percent cyclopentolate and 5 percent homatropine had been used. Tropicamide appeared to be the most effective drug, in that it produced the least amount of residual accommodation 30 minutes after instillation (Merrill, et al., 1960; Stine, 1960).

Gettes (1961) showed that tropicamide (1 percent) is an effective cycloplegic agent provided examination is performed 20 – 30 minutes after the instillation of a second drop. Using this time interval, the agent was effective in 90 percent of 96 eyes. If the elapsed time is extended to 45 minutes, its effectiveness drops to 79 percent, and at 45 minutes the cycloplegic was inadequate for clinical purposes because practically every case showed more than 3.50D of accommodation. Gettes also stated that the 0.5 percent solution of tropicamide is a very effective mydriatic preparation and is indicated when rapid and short-acting dilation is desired. There is generally a rapid recovery of accommodation and the cycloplegic effect is gone in 2 – 4 hours with the complete return of accommodation within six hours.

In their quest for an ideal cycloplegic agent, Gettes and Belmont (1961), compared and evaluated the so-called short-acting cyclopentolate hydrochloride and homatropine. This comparison was based on the following (Table 9):

- (1) The effectiveness of the cycloplegic;
- (2) The duration of cycloplegia; and
- (3) The rapidity of the return of accommodation.

Table 7: One drop of Tropicamide 1 percent Solution

Time after Instillation(minutes)	No. of eyes instilled	Number Effective	% Effective
20 – 25	30	16	53
20 – 30	75	30	40
20 – 35	108	43	38
20 – 40	133	47	35
20 – 45	145	48	33
20 – 60	266	48	29

Table 8: Two drops of Tropicamide 1 percent Solution

Time after Second drop(minutes)	No. of eyes instilled	Number Effective	% Effective
20 – 25	44	44	100
20 – 30	70	65	93
20 – 35	76	69	90
20 – 40	96	76	79
20 – 60	106	76	74

Table 9: Comparing the Time and Duration of Adequate Cycloplegia, and Time for Recovery from Cycloplegia of the Drugs

Drug (1%)	Time and Duration of Adequate Cycloplegic (minutes)	Time for Recovery (hours)
Homatropine in Hydroxy amphetamine hydrobromine	40 – 90	36 – 48
Cyclopentolate	25 – 75	6 – 24
Tropicamide	20 – 35	2 – 6

A series of patients had 1 percent tropicamide instilled into one eye with a second drop at least five minutes later. In the opposite eye, one drop of 1 percent cyclopentolate was instilled. Another group had 1 percent tropicamide in one eye and homatropine in the other eye. In all cases, where tropicamide was instilled in one eye and one of the other drugs in the other eye, recovery of accommodation and the ability to read fine print were more rapid in the eye with tropicamide. Both examiners noted the similarity of patient complaints, namely: "I can read with one eye but the other eye is blurred and has a larger pupil."

The fact that tropicamide is an effective mydriatic can not be over stressed. Hadded et. al. (1970) found that two drops of 2.5 percent phenylephrine produced as much mydriasis as did one drop of 10 percent phenylephrine. Among younger groups, however, one drop of 0.5 percent tropicamide produced faster and greater mydriasis than either dose phenylephrine.

Adverse Reaction to Tropicamide

For many years, there have been wide-spread reports in the literature related to the toxicity of cycloplegic agents used during refraction. Most of these, however, offer evidence other than a symptomatic description of the intoxication (Hoefnagel, 1961; Mackenzie, 1971).

Correspondence with the manufacturers, Alcon Labs, led to a simple report of what may be termed an adverse reaction: a patient fainted after instillation of one drop of 0.5 percent tropicamide (Wahl, 1969). Wahl (1969) and

Garston (1975) reported that 0.5 percent of 22 subjects who received 0.5 percent tropicamide complained of a stinging sensation in the eye and irritation of the corneal tissue.

Smith, in 1975 reported that tropicamide, atropine and homatropine had no significant effect on the heart rate of frogs and rabbits, while Jennings and Sullivan (1986) likewise reported no systolic or diastolic blood pressure and pulse increase for any of the treatment groups. A similar study, however, did find a decrease in systolic and diastolic blood pressure and pulses in patients given 1 percent tropicamide, as well as in a second group receiving 10 percent phenylephrine at different time intervals (Brown et al., 1980).

Neither Leopold (1966) nor Havener (1970), however, reported any ill effect from this medication. In 1961, Gettes reported that having used this drug in all age groups, including children as young as six years of age, no local or systemic toxic effects were observed. Nonetheless, Lyle and Hopkins (1977) stated that adverse reactions to tropicamide in the literature are "conspicuous by their rarity."

Tropicamide and Iris Pigmentation

Physicians and optometrists have generally held the belief that heavily pigmented dark irides are more difficult to dilate, while lightly pigmented irides dilate more easily and faster resulting in a large papillary aperture (Dillon, et. al., 1977; Havener, 1975). It is thus generally accepted that mydriatic and cycloplegic agents are required in both greater quantity and higher concentration to obtain an adequate degree of mydriasis and cycloplegia in dark irides (Dillon, et. al., 1977; Harrison and Galin, 1971), and that this has the potential to increase the risk and severity of possible adverse reactions.

Gettes, in 1961, noted that the eyes of those with dark skin and eyes were more difficult to dilate with 0.25 percent, 0.5 percent and 0.1 percent solutions of tropicamide, but stated that optimal dilation was approximately the same for all subjects (both those with light and dark irides) using 0.5 percent tropicamide. Emiru (1971) also felt that dark African pupils dilate more sluggishly in response to a mydriatic than those of lighter skinned races or albino Africans. Conversely, Richardson, (1982) reported that contrary to previous beliefs, iris pigmentation is not a factor in the degree of dilation achieved, but that a light iris is significantly larger than a dark iris prior to any instillation.

Mydriasis and the Precipitation of Glaucoma

Increases in intra-ocular pressure by most cycloplegic mydriatic drugs have been noted to occur in eyes in which the filtration angle remains open during mydriasis. Cyclopentolate and tropicamide have similar effects in patients being treated with pilocarpine. In normal eyes, as well as those with ill-treated open angle glaucoma, these drugs have a relatively weak effect on intra-ocular pressure (Portney & Paurcell, 1995). Anytime the dilator pupillae relaxes, however, the resistance within the trabecular meshwork increases and the drainage of aqueous is slowed which results in an increase in intra-ocular pressure (IOP) (Cohen and Hajoft, 1982).

The most conspicuous and frequently mentioned adverse effect of ocular mydriatics is the possibility of inducing a rapid elevation in intra-ocular pressure (Terry, 1977; Diane et. al., 1980; Rengstoff and Daughty, 1982). Any agents that dilate the pupils also increase susceptibility to an attack of glaucoma, though the risk of inducing a glaucomatous attack is rare. In their study Rengstoff and Daughty (1982), showed that of 58 narrow-angled eyes dilated with 0.5 percent tropicamide, 33 percent (19) developed angle closure and a significantly increased IOP. Aviner (1977) found that three of six eyes examined with a shallow anterior chamber and narrow but open angles had raised intra-ocular pressure which was subsequently relieved through emergency measures. Portney and Pupillae (1995), studied intra-ocular pressure among fifty patients with open-angle glaucoma and found less than a five mmHg increase forty minutes after two drops of 1 percent tropicamide. This outcome, an increase in intra-ocular pressure in an eye predisposed to narrow angle glaucoma, occurs because the dilated iris blocks drainage of the intra-ocular fluid from the angle of the anterior chamber (Terry, 1977; Gyton, 1981).

In 1958, Becker and Thompson reported using mydriatics as a provocative test for patients with narrow-angle glaucoma. They found that only 15 of 58 patients (28 percent) exhibited a rise in intra-ocular pressure of eight mmHg or more and that only 14 of 32 eyes with narrow angle glaucoma found to be closeable (that is, with a history of closure in the other eye) showed the rise. They did not report any cases of closure during their testing.

It is important here to highlight the views of Harris (1968) and Havener (1975). According to Harris, no mydriasis provocative test for angle closure using a cycloplegic agent can be considered positive until angle closure is determined by gonioscopy. Havener noted that he observed increased pressure after mydriasis as a positive result of a

provocative test. Certainly, it is better to discover glaucoma through such an increase and to treat it, then to watch the patient go blind ignoring the debility of the disease (Havener, 1975).

Cyclopentolate

Cyclopentolate is the most widely used contemporary cycloplegic with well-recorded and broad recognition in ophthalmic diagnosis and therapy. It is generally known as cyclopentolate hydrochloride (cyclogyl), and is also a mydriatic agent. It is a synthetic anti-spasmodic agent which produces rapid, intense cycloplegia and mydriasis of moderate duration after topical ocular administration. The compound is dimethylaminoethyl (1-Hydroxycyclopentyl) phenylacetate hydrochloride with the following structural formula:

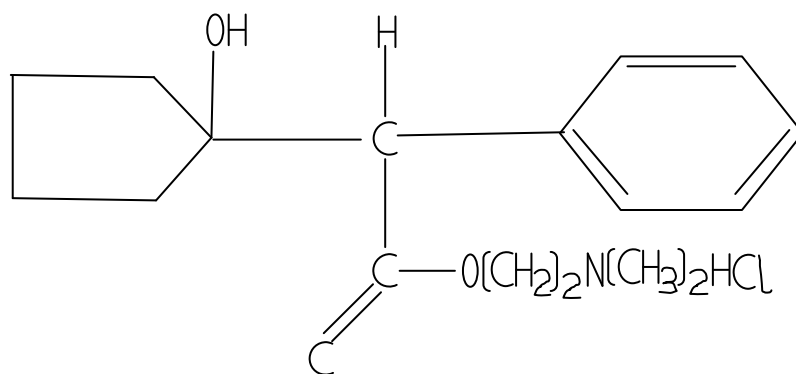


Figure 2: Structure of Cyclogyl

Cyclogyl is a parasympatholytic drug. It is similar to atropine and homatropine in action; a similarity which relates to its chemical property as a basic ester and quaternary derivative of β -hydroxyl acid - β -dimethylaminoethyl - (1-hydroxycyclopentyl) - phenylacetate hydrochloride. Structurally, cyclogyl shares a dimethylated side chain [$-N(CH_3)_2$] in common with many tranquilizers and psychoactive drugs and some hallucinogens.

Physical Properties

Cyclopentolate hydrochloride is a white odourless crystalline with a solid melting point of 137 – 141°C. It is very soluble in water and freely soluble in alcohol. The pH of 1 percent solution is 5.0 – 5.4.

The compound can be identified by dissolving 20mg of cyclopentolate hydrochloride in 10ml of water, and adding 2 drops of Nitric acid and 1ml of Silver nitrate. A curdy white precipitate will form which is insoluble in dilute nitric acid, but soluble in dilute ammonia solution (showing the presence of Chloride). This should be transferred into a 60ml separating funnel. Extract 0.5g of cyclopentolate hydrochloride and dissolve it in 10ml of water. Add 2.5g of potassium carbonate and extract the mixture with two 10ml portions of water. Dry the water extract above anhydrous potassium carbonate and filter it through a dry filter paper. Add about 0.2ml of dimethyl sulphate to the dry water solution and allow the reaction mixture to stand at room temperature for 2 hours. Filter the mixture, re-crystallize the solid in acetone and dry it in a vacuum desiccator over phosphorus pentoxide. The methyl sulphate derivative melts with decomposition at 139– 143C.

Mode of Action

Up to Twelve Years of Age

Usually only one drop of the 1 percent solution is necessary, but it should be repeated if little effect is measurable after 15 minutes. Retinoscopic refraction may then be performed in 40 to 60 minutes (or sooner, if desired, when the maximum cycloplegic effect is obtained earlier than this.)

Twelve Years of Age and Above

One drop of 0.5 percent solution, only repeated if there is no significant measurable in the amplitude of the accommodation within 15 to 20 minutes. This second drop is sometimes necessary in Caucasian patients with dark hair and irides. For dark-skinned adults, one drop of the 1 percent solution should be instilled, and the dose only repeated if the amplitude of accommodation is not falling at a satisfactory rate. Again retinoscopy is generally carried out after 40 – 60 minutes - the average time taken for the maximum effect of the drug to reduce the accommodation to less than 2.00D. Others have suggested, however, that where a deeper cycloplegia is not considered essential, a 0.125 percent solution, two drops of which will reduce the accommodation to approximately 1.50D (one drop to about 2.00D) in approximately 30 minutes, may be sufficient for patients between the ages of 20 and 40 years. However, it should be considered that this maximum effect requires that we restrict the use of this concentration in general practice to infrequent occasions.

Time Course

One or two drops of the cyclopentolate solution instilled into the conjunctival sac produces a mydriasis within a few minutes that reaches its maximum in 30 – 60 minutes, and sometimes as rapidly as 15 minutes or in rare occasions, 10 minutes. Cycloplegia starts almost simultaneously with mydriasis, and also generally reaches its peak between 30 and 60 minutes, but can vary from an exceptional 10 minutes to 60 minutes or thereabout. Because of the variation in the time taken to produce maximum cycloplegia, and also in view of the fact that the duration of this condition varies from 10 to 60 minutes (averaging about 40 minutes), the amplitude of accommodation should be measured every 10 minutes, after a time lag of 20 minutes following instillation, until no further fall in accommodation is recorded.

Depth of Cycloplegia

In almost all cases, the residual accommodation reaches 1.50D or less 40 to 60 minutes after instillation (although not infrequently, a second drop of solution may be necessary to reach this accommodation level), and it is during this interval that a retinoscopic refraction is usually performed. In practice, cyclopentolate satisfies approximately the ideal criteria for a cycloplegic or mydriatic than any other drug.

Priestly and Medine compared the depth of cycloplegia reached after one hour of instillation of two drops of 0.5 percent solution of cyclopentolate with a dosage of a 0.5 percent solution of homatropine in a group of more than 50 patients, including children and young adults. The cyclopentolate was instilled in the right eye and the homatropine in the left eye. Their results showed that residual accommodation for cyclopentolate ranged from 0.50 to 1.75D with an average of 1.25D, whereas with homatropine, the upper end of this range was 2.00D. In an endeavour to ensure that any existing anisocycloplegia did not affect their findings, the series was later executed using cyclopentolate in both eyes. Anisocycloplegia, a common occurrence, is the difference that may occur in the residual accommodation between two eyes of the same patient to the same dose of cycloplegic (often it amounts to 0.5D, but can reach 10.0D).

Rosenfield and Linfield (1986) proposed, as a measure of the degree of cycloplegia, the use of what they termed a “distance accommodation ability” measurement in which negative spherical lenses were introduced until the patient was no longer able to clearly read a line of Snellen letters. They considered it an easier test to perform than apparent near point, especially on young children. It is interesting that the average minimum near and distant accommodation were not significantly different when 1 percent and 0.5 percent cyclopentolate were compared. The residual accommodation was again found to be invariably less in these eyes when compared with homatropine recordings, where anisocycloplegia might well occur.

In another series involving eighty patients and the application of two drops of a 0.5 percent solution of the original American proprietary brand of cyclopentolate hydrochloride (cyclogyl), the average residual accommodation after one hour was found to be 1.0D. These results (with average residual accommodation measured after correction of any distant refractive error), are as shown in Table 10. Full recovery of the accommodation, without the instillation of a miotic, usually occurred within 4 and 12 hours, but in a few cases this was delayed for up to 24 hours. Reading, in practice a more important consideration than full restoration of accommodation, was usually possible after 3-4 hours. Recovery from mydriasis was shown to occur between 24 and 48 hours in all instances without the aid of a miotic.

These investigations were presumably carried out on normal eyes and found no increase in intra-ocular pressures. The author made no direct comparisons of residual accommodations to those encountered using a homatropine-hydroxyamphetamine combination, formerly the most popular combination of cycloplegic and

sympathomimetic drugs used by American ophthalmologists. Rather he considered that the cycloplegic effect obtained with cyclopentolate to be either equal to or more profound than that of the combination.

As with all other cycloplegics, with the exception of atropine, distance fixation during retinoscopy is necessary to relax as much residual accommodation as possible. Measuring of the latter before and after examination may be carried out with reasonable accuracy using a +3.00D sphere monocularly with the near point rule.

Table 10: Average residual accommodation measured after correction of any distant refractive error

Age Group (years)	Number of Cases	Residual Accommodation
10 – 20	28	1.14
20 – 30	29	0.97
30 – 40	23	0.97

Where children under the age of seven who had previously shown allergic reaction to atropine, require cycloplegic refraction, one or two drops of cyclopentolate hydrochloride eye drops at 1 percent may be substituted, immediately followed by very careful occlusion of the canaliculi for half a minute or so (Davies, 1989).

Medical Uses

Cyclopentolate may be used in the treatment of coeal ulceration, iritis, iridocyclitis and keratitis. For these conditions, one or two drops of the 0.5 percent solution instilled every 6 – 8 hours, to prevent the formation of posterior synechiae and “rest” the painful ciliary and sphincter pupillae muscles, can be helpful. Cyclopentolate is also useful in the treatment of choroiditis. For all these conditions, it acts as a mydriatic.

For the prevention of lenticular adhesions, or, in conjunction with the use of miotics, cyclopentolate can be used to break or prevent adhesions formed during and after infections. No significant variation of intra-ocular tension has been reported from its use in this way, although it is advisable to neutralize any cycloplegia in other patients in whom early unrecognized glaucomatous changes may be present. When breaking down lenticular adhesions, one or two drops of a 0.5 percent solution are instilled, followed six hours later by one or two drops of a 2 percent solution of pilocarpine nitrate; this alternating treatment is repeated daily.

METHODOLOGY

This research was based on the practical or clinical examination of subjects in whose eyes the agents/drugs (cyclopentolate and tropicamide, 1.0 percent solutions) were instilled. The subjects included young adults, both those attending and not attending university, between the ages of 17 and 29.

Since considering all individuals in a population of interest was unnecessary given the use of statistical sampling, random sampling, which gives every individual an equal chance of being selected, was used. Estimates made based on these samples can subsequently be generalized to the entire population being studied. All subjects were first asked to undergo a fundal examination to eliminate pathologies and a preliminary examination to estimate squint, eccentric fixation, anisocoria, etc. Those found to be fit for the study were then subjected to the test and informed on a step-by-step basis of what to expect after drug instillation into the eyes. Several control measurements (visual acuity, power of refractive error, if any, amplitude of accommodation, etc.) were made before and after instillation.

Study Population

The population in this study consisted of young adults aged between 17 and 29 years, both male and female who were myopes, hyperopes, astigmats or even emmetropes, selected from within and around the university community. Carrying out the research on all the young adults in the study area was impossible and so a method of random sampling was employed. This method provided every member of the community an equal opportunity of being selected for testing. The final sample was comprised of 25 individuals who were screened to rule out pathologies after their consent was obtained. Participants were made aware of the initial discomfort, such as stinging and/or irritation, which might be experienced immediately after instillation.

Data Collection

Measurements were made of the subjects' pupil size, far and near visual acuity (VA), phoria at far and near, and amplitude of accommodation (AA) before and after instillation of each of the two drugs. These measurements were central to the proper analysis of the results obtained after drug instillation. Members of each group were given one of the two drugs on their first visit and the second drug on their second visit, two weeks later. On each occasion, one drop of the drug used was instilled into the inferior cul-de-sac of one eye. Only one eye was tested so that the untested eye could still compensate for the reduced VA and other discomforts of the tested one. Each instillation was monitored at a regular interval of five minutes until the time of recovery.

Application of the drugs on each occasion was with a dropper held far enough from the conjunctiva so as to count the number of drops and to prevent the muzzle of the dropper from touching the conjunctiva, thus avoiding contamination. The size of the dropper used in each instillation was the same, and equal efforts were made to apply uniform pressure to the squeezer in the drug administration.

The measurement of pupil size before and after instillation was done under normal illumination conditions (although the term "normal illumination" varies from one person to another). Regardless, the illumination was held constant. Five minutes after the initial pupil size measurement, the drugs were instilled and pupil size and refractive error were measured at regular five minute intervals until maximum mydriasis and cycloplegia were reached. The other measurements were also repeated at these intervals and the time at which recovery started was recorded.

Instruments/Materials for Data Collection

The instruments and materials used in this research included:

- Penlight/torchlight
- Streak retinoscope to determine refractive errors
- Hand-held direct ophthalmoscope
- Inter-pupillary distance (IPD) rule
- Phoropter for measuring amplitude of accommodation and phoria
- Snellen acuity chart at 6m (20ft) for far visual acuity (VA) measurement
- Reading chart at 40cm for near visual acuity (VA) measurement
- Mydriacyl (Tropicamide) 1 percent solution
- Cyclogyl (Cyclopentolate) 1 percent solution

Alcon Belgium

Pupillary Response

A penlight was held 10cm in front of the eye for the swinging flash-light test to determine pupillary response to light stimulus. Each pupil was alternately illuminated from an oblique angle using the penlight, at least thrice, to evaluate the light reflexes of the treated eye. During the test, the presence of pupillary abnormalities was ruled and an evaluation of direct and consensual pupillary reflexes was performed. Positive light responses were abbreviated as PERRLA, that is, pupil equal, regular, reacts to light and accommodation.

Measuring Pupil Size

The inter-pupillary distance (IPD) rule was used to measure pupil size with a hand held magnifier to adequately assess pupil diameter.

Ophthalmoscopy

This is an objective technique used for the exclusive observation of the interior (vascular and neurological) structures of the eye. In doing this, the ophthalmoscopist's interest is in the size and shape of the optic disc, the clarity and sharpness of the margins, the size of physiological cupping in relation to the disc, muscular reflex, the integrity of blood vessels, and pigmentation. The ophthalmoscope is the standard instrument used for this test and the one used here was a hand-held direct ophthalmoscope. In performing the examination, the instrument was held in the right hand

to view the right eye, and in the left hand to view the left eye. This is a monocular examination done under dim illumination.

Retinoscopy

A retinoscope was used for an objective determination of refractive errors. Each subject was seated six meters from the far VA chart and instructed to fixate their eyes on the chart. Like in ophthalmoscopy, the retinoscope is held in the right hand to scope the right eye and vice versa, under dim illumination. The scoping is performed along the two meridians (vertical and horizontal) and obliquely to determine the astigmatic error. The lenses in the phoropter are added in quarter increments until neutrality is reached. At the point of neutrality, the dioptric equivalent of working distance is subtracted from the total lenses added to arrive at the number of refractive errors.

Measurement of Amplitude of Accommodation

The amplitude of accommodation was determined using the phoropter. There are two methods of doing this: push-up-to-blur and minus-lens-to-blur. The latter was used in this study and involves adding or subtracting lenses in 0.25D steps while the subject fixates on the test target placed 33cm in front of the eye (monocularly). The addition or subtraction of lenses was stopped as soon as the subject reported a noticeable blurring of the letters and 2.50D was added above the total lenses in place and recorded as the amplitude of accommodation.

Phoria Measurement

Again, the phoropter was used to determine the phoria at far and near. To determine the distant phoria, the target was the 6/6 (20/20) Snellen letters. The subject was told to close his/her eyes and the dissociating device (6D prism up) and the measuring device (15D prism base-in) were positioned before the left and right eye respectively. The base-in prisms were reduced until the vertical alignment of targets was obtained. The base-in prisms that remained were recorded as diopters of exophoria; while base-out prisms were recorded as diopters of esophoria. At near, the testing distance was 40cm while fixating the Snellen letters. All other procedures were repeated at far.

Visual Acuity (VA)

The Snellen acuity chart and reading card were used to measure the far and near VA. Distance acuity was measured at a distance of 6m which is the optical infinity. The subject was asked to read the chart horizontally moving from one letter to the next and the point at which he or she stopped seeing the letters was recorded as the VA at far. The reading card was kept at a distance of 40cm and the subject was then instructed to read the paragraphs. The last paragraph he/she was able to read was recorded as the VA at near.

Data Analysis

A number of statistical analyses, including the t-test, were used to analyze the data collected in this study. The data was analyzed to compare the cycloplegic effect of tropicamide and cyclopentolate ($t = 0.05$ level of significance was used unless otherwise stated). All of the results were then tabulated for easy understanding and percentage values were used where necessary.

DISCUSSION

Tropicamide and cyclopentolate are cycloplegic drugs with common mydriatic and cycloplegic actions, although the strength and depth of these actions differs.

In the course of this study, both drugs were found to have a significant effect on the action of the sphincter pupillae muscle which controls the size of the pupil when one to two drops of the 1 percent solution of each were instilled into the cul-de-sac. A more significant effect was observed when the 1 percent solution of cyclopentolate was used. Of the 25 eyes tested with tropicamide, 19 showed a pupillary size increase from 3mm to 6mm; three showed an increase from 3mm to 4.50mm; two showed an increase from 3mm to 5.00 to 5.50mm; and one showed an increase to 6.50mm. When the 1 percent solution of cyclopentolate was used, 13 of the 25 subjects showed an increase in pupil

size to 6.50mm while 12 had their pupil size increase to 6.00mm from the initial size of 3mm. This represents an average additional increase of 0.48mm in pupil size compared to that obtained with tropicamide

It is generally accepted that pupil size can affect visual acuity, hence the larger the blur circle, the more likely stimulation is to overlap upon the immediate cone and eliminate the discrimination of two points. The smaller the blur circle can be made, the closer two points of regard can be and still not fall upon the intermediate retinal element (Borish, 1970). In other words, a larger pupil size results in a larger blur circle and consequently a blurrier image, and a smaller pupil size results in a sharper image and a smaller blur circle. This lowers and raises the visual acuity respectively. The size of the blur circle is affected by the refractive status and the size of pupil and any drug that affects the accommodative mechanism can also affect the refractive status, the blur circle and visual acuity.

In this study, the combined cycloplegic and mydriatic actions of tropicamide and cyclopentolate reasonably affected the visual acuity of the tested persons. A greater change in visual acuity was noticed at near than at far. Comparatively, the effect of the action was stronger and deeper with the instillation of one drop of 1 percent cyclopentolate than with tropicamide. Cyclopentolate reduced the visual acuity by two lines more than that of tropicamide at far, and by an average of three lines more at near.

In the measurement of phoria, both drugs affected the phoria at near and far. At both distances, the phoria tended towards esophoria or less exophoria though this was more pronounced at near than at far. And at either distance, cyclopentolate produced a greater and stronger effect than tropicamide. At far, a drop of 1 percent solution of cyclopentolate produced a mean change in phoria of 1.2 eso from an initial 0.8 exo, while tropicamide produced a mean change of 1 eso from an initial 0.8 exo, resulting in a mean variation of 0.4 eso between the effects of tropicamide and cyclopentolate. At near, one drop of the 1 percent solution of cyclopentolate produced a mean change of phoria of 1.56 exophoria from an initial 4.72 exophoria, while the 1 percent solution of tropicamide produced a mean change in phoria of 1.28 exo from an initial 4.72 exo, resulting in a mean variation of 0.28 exo between the effects of cyclopentolate and tropicamide.

The action of cycloplegic drugs is mainly directed at the accommodative function of the eye(s). In this study, the instillation of one drop of 1 percent solution of cyclopentolate and tropicamide certainly affected the amplitude of accommodation (AA) of the eye(s), with a significant difference between the reduction obtained with cyclopentolate and that obtained with tropicamide. One drop of 1 percent solution of cyclopentolate reduced the amplitude of accommodation from an average of 9.25D to an average of 3.41D (a 63 percent decrease) while one drop of 1 percent solution of tropicamide decreased the amplitude of accommodation from an average of 9.25D to an average of 3.93D (a 56 percent decrease). This represents a difference of 0.52D in the mean change in amplitude of accommodation or a difference of 5.6 percent.

Based on the intermittent measurement of the pupil size after instillation, it was determined that out of the 25 eyes tested with 1 percent tropicamide, mydriasis started after five minutes in nine eyes; after ten minutes in another nine eyes; after eight minutes in three eyes; after seven minutes in another three eyes; after six minutes in one eye. When one drop of 1 percent solution of cyclopentolate was used, eight out of the 25 tested eyes showed papillary dilation after ten minutes; seven dilated after 11-12 minutes; five dilated after 13-15 minutes; four dilated after 8-9 minutes and only one pupil took just five minutes to dilate. Since mydriasis and cycloplegia start almost simultaneously (Davies, 1989), the average time of onset with one drop, 1 percent solution of tropicamide was 7.44 minutes compared with an onset after 10.92 minutes with one drop of 1 percent solution of cyclopentolate; a mean difference of 3.48 minutes in the on-set time of action between the two drugs. On average, their actions peaked after 19.4 minutes and 23.84 minutes, respectively. The difference in the mean time of maximum actions between the two drugs was 4.44 minutes.

By intermittently measuring pupil size after peak mydriasis, it was determined that papillary dilation started decreasing in 1 hour and 48 minutes after the onset of mydriasis when one drop of 1 percent solution of tropicamide was used and in 2 hours and 8 seconds when one drop of 1 percent cyclopentolate was used. The mean difference in the recovery time of the two drugs was 36 minutes.

During the course of this study, no serious adverse effects were observed with the instillation of one drop of 1 percent solution of tropicamide, except for a little transient pain felt in the eye immediately after instillation. A greater number of those tested complained of this pain when either of the drugs was used. All subjects noted the usual blurring of vision, especially at far.

In addition to the side effects noticed with tropicamide, a few systemic reactions were exhibited when some subjects were tested with one drop of 1 percent solution of cyclopentolate. Five subjects reported that they felt like they took two tablets of chloroquine; four reported feeling sleepy after the test, while seven felt nauseous. The fundoscopic examinations, however, showed no changes.

CONCLUSION AND RECOMMENDATIONS

The need for optometric diagnostic and/or therapeutic agents is an utmost necessity in everyday medical and paramedical practice, especially if their health benefits outweigh complications during and after use. The benefits and complications of treatments can be assessed in terms of onset of drug action, duration of action and the time after which the drug effect starts diminishing until the patient regains his/her normal health condition. Other factors to be considered are the presence and absence of ocular and systemic reactions, drug-to-drug interaction, and the strength and depth of the desired effect.

In this study which compared the cycloplegic effect of tropicamide and cyclopentolate in their one drop, 1 percent solution concentration, cyclopentolate is more efficacious in achieving the desired effect as demonstrated by its action on pupil size, far and near visual acuity, far and near phorias and amplitude of accommodation for the 25 study subjects. The one drop 1 percent solution of cyclopentolate, for instance, reduced amplitude from an initial 9.25D to an average of 3.41D compared to the 3.93D obtained with the same quantity and concentration of tropicamide. What cyclopentolate gains in strength and depth of action, however, it loses in its longer time of peak mydriasis and cycloplegia and time of recovery, which averaged 2 hours 8 seconds compared to 1 hour 48 minutes with tropicamide. Perhaps the most significant advantage of tropicamide was that it was found to have little or no adverse ocular/systemic reaction while cyclopentolate is associated with mild to severe ocular/systemic reactions such as nausea, vomiting, drowsiness, hallucination, etc.

Based on the above findings and observations, for optimal and complication free diagnostic and therapeutic procedures, the use of tropicamide in an appropriate concentration of 0.5 percent to 1 percent is recommended over the use of cyclopentolate.

Limitations of the Study

This study encountered two main limitations in its execution. Foremost, many people are rightfully protective of their eyes as their most precious sense organ and were therefore unwilling to participate in this study. This drastically reduced the sample population in the study. Despite all the appropriate precautions having been taken, it was very difficult convincing subjects that no damage would be done by the drugs to their eyes.

It was also difficult getting the subjects commit to a second visit and a number of participants asked for financial compensation before they would comply. The length of time required before full recovery was between 8 and 9 hours which was considered too long, and this called for the limiting of the study to just the onset of recovery. Drug procurement also posed somewhat of a challenge given that these drugs are not of the over the counter (OTC) variety. Lastly, there would have been a more elaborate literature review of the study topic had there been better access to current journals and textbooks.

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Micro-Credit for Micro-Enterprise: A Study of Women “Petty” Traders in Central Region, Ghana

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Abstract

This paper examines factors that constrain women petty traders' access to microcredit, and the innovative measures initiated to counter these constraints. This paper also addresses the impact of micro finance credit on poverty alleviation for women petty traders in Ghana. This paper is based on an aided questionnaire and in-depth interviews with women micro-entrepreneurs drawn from a convenience sample of 150 petty traders in the market towns of Cape Coast, Elimina, Mankessim, Jukwa and Swedru, all in the central region. Three main constraints are identified – internal, socio-cultural and policy-induced – as being the key moderating influences on women petty traders' ability to access to micro-credit. Considering the sample size and research context, the generalisation of the findings may need to be applied with caution. However, this paper does identify similar findings in other studies in comparable contexts.

Keywords: Micro and Small Enterprises (MSEs), Micro Finance, Petty Trade, Ghana, Women Petty Traders, Poverty Alleviation

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INTRODUCTION

A common sight in Africa's sprawling peri-urban areas is the widespread proliferation of petty traders, hawking everything from garden produce to imported consumer goods. These small-scale merchants represent perhaps the fastest growing segment of the labour market in Africa, attracting the unemployed, the displaced, and the impoverished. Recent economic stagnation and restructuring on the continent spurred new growth in this sector, as waged employment declined and inflation spiraled. At least part of the restructuring has been under the watchful eyes of the International Monetary Fund (IMF) and the World Bank, whose programs have slashed public sector employment, urban subsidies (including subsidies on food), and the exchange value of local currencies. All of this has made it difficult for many Africans to subsist without holding multiple occupations, including involvement in all types of trade (Little, 1999).

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Mamdani (1990) points out in the case of Uganda, that the economic reforms and restructuring of the past decade have turned waged workers and others into “part-time hawkers.” This burgeoning petty trade, often euphemistically labeled the ‘informal sector,’ (Daily Observer, 1992) has been praised by some as a sign of a healthy private sector, without recognition that its growth is symptomatic of larger structural problems in the economy which leave many individuals with little choice but ‘to trade to eat.’ The sheer volume of petty merchants in towns such as Maputo (Mozambique) or Accra (Ghana), defies any attempt at estimating their population, since they greatly outnumber waged workers and ‘officially’ licensed traders.

According to Adei (2006), Micro Small Enterprises (MSEs) account for about 60 per cent of GDP, with three-quarters of the population deriving their livelihood from this sector. Official statistics on MSEs in Ghana, however, were woefully inadequate, sketchy and not current in many instances. For Adei, the picture that emerged overwhelmingly endorsed the fact that the Ghanaian economy was predominantly made up of SMEs. National economic policies, however, generally did not reflect the size and importance of these informal, micro, small and medium enterprises.

Although barriers encountered by smaller enterprises have attracted the attention of a handful of researchers from all over the world, little is still known about the barriers faced by small African enterprises. Recent efforts have been made to better understand this subject in the African context, including research by the Global Entrepreneurship Monitor (GEM) (2010). This research focused on only a few African countries, and did not include petty traders in Ghana. There is thus little information available about the barriers faced by petty traders in Ghana, an important emerging economy in West Africa.

Problem Statement

Street trading is one of the major occupations of the urban informal sector and petty traders are its main constituents. Women petty traders in the urban informal sector help to provide goods and services to needy persons at the right time, in the right places, in the right quantities and at reasonable prices. They have become indispensable within the distribution system, catering to the needs of particularly the lower middle-class and the poor. There are, in fact, certain commodities sold exclusively in the informal trade sector. In the process, this sector provides jobs to the jobless and offers fairly good remuneration to those largely unemployed before trading. Nonetheless, this sector receives little or no attention from policy makers and there exist serious cultural and funding challenges when it comes to accessing both formal and informal financial institutions.

This paper thus examines the constraints and barriers encountered by women petty traders from the Central Region of Ghana. The measure of constraints assumes “access to micro-credit” as a proxy. This paper aims to identify and highlight some of the innovative measures taken by these petty traders to overcome such constraints. Understanding these barriers to micro-credit access can inform policy adjustments; understanding the innovative measures taken to lessen these constraints and may trigger a consciousness in the minds of observers and prompt the replication of these measures in other contexts.

Research Questions

This paper explores the challenges that women petty traders face when accessing micro-credit and aims to answer the following questions:

- What challenges are preventing the further development of petty trading in Ghana, especially among women?
- What prevents women petty traders from accessing micro-credit?
- What innovative measures have these women implemented in terms of credit access and management?

LITRATURE REVIEW

Evolution of the Microfinance Sub-Sector in Ghana

The concept of microfinance is not new in Ghana. There has long been a tradition of people saving and/or taking small loans from individuals and groups within the context of self-help to start businesses or farming ventures. Records suggest that the first credit union in Africa was established in Northern Ghana in 1955 by Canadian Catholic

missionaries. However, Susu, a microfinance schemes in Ghana, is thought to have originated from Nigeria and spread to Ghana in the early twentieth century.

Over the years, the microfinance sector has thrived and evolved into its current state in part because of various financial sector policies and programmes undertaken by different governments after independence. These include the:

- Provision of subsidized credits in the 1950s;
- Establishment of the Agricultural Development Bank in 1965 to address the financial needs of the fisheries and agricultural sector;
- Establishment of Rural and Community Banks (RCBs), and the introduction of regulations (commercial banks being required to set aside 20% of their total portfolio to promote lending to agriculture and small scale industries in the 1970s and early 1980s);
- Shifting from a restrictive financial sector regime to a liberalized regime in 1986;
- Promulgation of PNDC Law 328 in 1991 to allow the establishment of different categories of non-bank financial institutions, including savings and loans companies, and credit unions (Asiama, 2007).

The policies have led to the emergence of three broad categories of microfinance institutions. These are:

- Formal suppliers: savings and loans companies, rural and community banks, as well as some development and commercial banks;
- Semi-formal suppliers: credit unions, financial non-governmental organizations (FNGOs), and cooperatives; and
- Informal suppliers: Susu collectors and clubs, rotating and accumulating savings and credit associations (ROSCAs and ASCAs), traders, moneylenders and other individuals.

In terms of the regulatory framework, rural and community banks are regulated under the Banking Act 2004 (Act 673), while Savings and Loans Companies are currently regulated under the Non-Bank Financial Institutions (NBFI) Law 1993 (PNDCL 328).

Microfinance and Development

Microfinance encompasses the provision of financial services and the management of small amounts of money through a range of products and a system of intermediary functions targeted at low income clients (United Nations, 2005). It includes loans, savings, insurance, transfer services among other financial products and services. Microfinance is thus a critical dimension of the broad range of financial tools available to the global poor, and its increasing role in development has emanated from a number of key factors that include (United Nations, 2000):

- Recognition of the need of the global poor to access productive resources, with financial services being a key resource, if they are to be able to improve their conditions of life;
- Realization that the poor have the capacity to use loans effectively for income-generation, to save and to re-pay loans;
- Realization that the formal financial sector provides few to no services to low-income people, creating a high demand for credit and savings services amongst the poor;
- View that microfinance is viable and can become sustainable and achieve full cost recovery; and
- Recognition that microfinance can have a significant impact on interrelated issues including women's empowerment, the spread of HIV/AIDS and environmental degradation and social indicators such as education, housing and health.

Studies have shown that micro-finance plays three broad roles in development:

- It helps very poor households to meet basic needs and it protects against risks;
- It is associated with improvements in household economic welfare; and
- It helps to empower women by supporting women's economic participation and so promotes gender equity.

Literature on micro-finance suggests that it creates access to productive capital for the poor, which together with human capital, enhanced through education and training, and social capital, achieved through local organization building, enables people to move out of poverty. By providing material capital to a poor person, their sense of dignity is strengthened and this can help to empower them to participate in the economy and society (Otero, 1999).

The aim of micro-finance according to Otero (1999) is not just about providing capital to the poor to combat poverty on an individual level, it also has a role at an institutional level. It seeks to create institutions that deliver financial services to the poor, who are continuously ignored by the formal banking sector. Littlefield and Rosenberg (2004) argue that the poor are generally excluded from the financial services sector of the economy so Microfinance Institutions (MFIs) have emerged to address this market failure. By addressing this gap in the market in a financially sustainable manner, an MFI can become part of the formal financial system of a country and so can access capital markets to fund their lending portfolios, allowing them to dramatically increase the number of poor people they can reach (Otero, 1999).

Recently, commentators including Littlefield, Murdugh and Hashemi (2003), Simanowitz and Brody (2004) and the IMF (2005) have commented on the critical role of micro-credit in achieving the Millennium Development Goals (MDGs). According to Simanowitz and Brody (2004), micro-credit is a key strategy in achieving the MDGs and in building global financial systems that meet the needs of the poorest people. Littlefield, Murdugh and Hashemi (2003) note that "micro-credit is unique among development interventions: it can deliver social benefits on an ongoing, permanent basis and on a large scale".

Some theorists and schools of thought, however, remain skeptical about the role of micro-credit in development. For example, while acknowledging the role micro-credit can play in helping to reduce poverty, Hulme and Mosley (1996) concluded from their research that "most contemporary schemes are less effective than they might be". The authors argue that micro-credit is not a panacea for poverty-alleviation and that in some cases the poorest people have been made worse-off.

Notwithstanding these observations, microfinance has emerged globally as a leading and effective strategy for poverty reduction with the potential for far-reaching impact in transforming the lives of poor people. According to most observers, microfinance can indeed facilitate the achievement of the Millennium Development Goals (MDGs) as well as national policies that target poverty reduction, women's empowerment, vulnerable groups, and improving standards of living. As noted by former UN Secretary General, Kofi Annan, during the launch of the International Year of Micro Credit (2005), "sustainable access to microfinance helps alleviate poverty by generating income, creating jobs, allowing children to go to school, enabling families to obtain health care, and empowering people to make the choices that best serve their needs" (United Nations, 2004; Asiama, 2007).

Although microfinance is not a panacea for poverty reduction and its related development challenges, when properly harnessed it can make sustainable contributions through financial investment to the empowerment of people, which in turn promotes confidence, self-esteem, and civic and economic participation, particularly for women.

Microfinance and Poverty Reduction in Ghana

The main goals of Ghana's Growth and Poverty Reduction Strategy (GPRS II) are to foster "sustainable equitable growth, accelerated poverty reduction and the protection of the vulnerable and excluded within a decentralized, democratic environment". Its intention is to eliminate widespread poverty and growing income inequality, especially among the productive poor who constitute the majority of the working population.

According to the 2000 Population and Housing Census, 80% of the working population is found in the private informal sector. This group is characterized by a lack of access to credit, which constrains the development and growth of that sector of the economy. Clearly, access to financial services is imperative for the development of the informal sector. It also helps to absorb excess liquidity by making savings available as investment capital for national development (World Bank, 1999). Unfortunately, in spite of the obvious roles that microfinance institutions have come to play in the economy over the last twenty years, there remains a lack of data on their operations.

It is known that loans advanced by microfinance institutions are generally used for housing, petty trade, and as "startup" loans for farmers to buy inputs for farming such as rice seeds, fertilizers and agricultural tools. Some loans are used for a variety of non-crop activities including dairy cow raising, cattle fattening, poultry farming, weaving, basket making, leasing farm and other capital machinery, and woodworking. Funds may be used for a number of other activities, such as crop and animal trading, cloth trading and pottery manufacture. There are other instances where credit is given to groups consisting of a number of borrowers for collective enterprises including irrigation pumps, building sanitary latrines, power looms, leasing markets or leasing land for cooperative farming.

Loans and advances extended to small businesses, individuals and groups by Non-Bank Financial Institutions (NBFIs) in Ghana amounted to GH¢50.97 million in 2002 as compared with GH¢39.64 million in 2001, a 28.6 per cent growth rates. Loans extended by NBFIs further increased from GH¢70.63 million in 2003 to GH¢72.85 million in 2004, or growth of 3.1 per cent. In 2006 alone, GH¢160.47 million was extended to clients, 48.8 per cent more than the previous year's total loans and advances. These upward trends among NBFI's suggest marked improvements in level of microfinance in the country.

Challenges Facing the Microfinance Sector

Generally, since the beginning of government involvement in microfinance in the 1950s, the sector has operated without specific policy guidelines and goals. This partially accounts for the slow growth of the sector, and its apparent fragmentation and lack of direction and coordination. There has so far not been a coherent approach to dealing with the constraints facing the sector which include inappropriate institutional arrangements, a poor regulatory environment, inadequate institutional capacities, a lack of coordination and collaboration, poor institutional linkages, lack of criteria to categorize beneficiaries, the channeling of funds by MDAs, the lack of linkages between formal and informal financial institutions, inadequate skills and professionalism, and inadequate capital. Better coordination and collaboration among key stakeholders including development partners, governments and other agencies could help to better integrate microfinance with the development of the overall financial sector.

Secondly, traditional commercial banking approaches to microfinance delivery often do not work. According to traditional commercial banking principles, the credit methodology requires documentary evidence, long-standing bank-customer relationship and collateral, which most micro and small businesses do not possess. The commercial banking system, with approximately twenty-three (23) major banks in Ghana, reaches only about 5% of households and captures 40% of the money supply (World Bank, 2004). There is thus room to expand the microfinance sector in Ghana.

Barclays Bank of Ghana (BBG) Ltd launched a microbanking scheme in December 2005 which established a formal link between modern finance and Susu collection (one of Africa's most ancient forms of banking) in an unconventional cross country mobile initiative. The scheme aims to extend microfinance to some of the least affluent in Ghana, like the small trader at the market or the micro-entrepreneur selling from road-side stalls. Though their individual income is too small for 'high street' banking, collectively it estimated to be a \$150 million economy thriving below the traditional banking radar. Ghana's 4,000-strong Susu collectors offer basic banking to the needy. For a small fee they personally gather the income of their clients and return it at the end of each month, providing greater security for their client's money. With financing from Barclays, the Susu Collectors are able to provide their clients with loans, helping them to establish or develop their business. In the words of BBG CEO, Margaret Mwanakatwe (WP/BOG 2007):

What we are doing is somewhat unique. Not only are we creating an account for Susu Collectors to deposit their funds, we are also providing them with loans of their own, which they can 'lend-on' to their customers, helping them build their capital. In the process, we are laying the building blocks for a truly financially inclusive society. Currently, over three quarters of Ghanaian society may not have access to high street banking. We are also providing capacity building training to Susu Collectors to make sure that they do their credit risk correctly and any training needs they may need (pg. 14).

It is gratifying to note that the Government of Ghana has adopted microfinance as one of its strategies for poverty reduction, wealth creation and MDG achievement. Recognizing the role various institutions and individuals can play in ensuring the success of this national vision (and of Ghana's vision to become a middle income country by 2015), there is a need to quicken the pace of reforms in the microfinance sector in order to realize accelerated growth and poverty reduction (Asiama, 2007).

Finally, while Ghana has a reasonably diversified and supervised regulatory framework for formal financial institutions licensed by Bank of Ghana (BoG), there is concern that appropriate regulation needs to be extended to other institutions in the microfinance sub-sector in order to improve the sub-sector's outreach, sustainability and efficiency of savings, credit delivery, and institutional arrangements.

Table 1: Credit Flow to Micro Enterprises and SMEs in Ghana

Source	Examples of Schemes
1. Financial Institutions	Major Banks, Rural banks, Community banks, non-bank financial Institutions, etc.
2. Donor/Government Credit Schemes	GRATIS, FUSMED, NBSSI schemes
3. Donor-Assisted SME Loan Projects	IFAD, DANIDA, CIDA, FAO, USAID etc
4. Informal Financial NGOs, Credit Unions	Sinapi Aba Trust, CARE International etc.
5. Government Schemes	BAF, SIF (Micro-Finance Capitalisation), Poverty Alleviation Fund (PAF), EDIF, MPSD and PSI schemes, MOTI, MASLOC,

Sourc: Adopted from Asiamama, 2007

Financing Women Entrepreneurs

There is increasing awareness among policy makers of the important contribution that women entrepreneurs can make to employment and the economic growth of their countries. According to the National Foundation for Women Business Owners (NFWBO), women entrepreneurs represent one-quarter to one-third of the total business population (OECD, 2000). In developed countries such as the United States, women own 38 per cent of small enterprises, which employ 52 per cent of the private sector workforce and generate 51 per cent of private sector output (Milken Institute, 2000). In some countries such as Brazil, the Republic of Ireland, Spain and the United States, women are creating new enterprises at a faster rate than men (OECD, 2001).

Nevertheless, several studies have shown that women in developing and developed countries encounter serious difficulties when accessing finance especially for start-ups, but also for the expansion of established enterprises. Women entrepreneurs who deal with financial institutions are often confronted with problems associated with gender bias. "Gender bias refers to lender behaviour that fosters inappropriate consideration of the applicant's gender in the credit underwriting and approval process. Gender-biased behaviour can severely hamper women seeking small business credit and impede the formation of profitable customer relationships, even before customers' needs or loan requests are assessed" (Woos, 1994).

When there is gender bias at high levels of management, loan requests will require additional and unnecessary documentation, additional guarantees or co-signers or other conditions different from male applications. Some examples of the difficulties that women experience when working with financial institutions are: a general lack of interest in women entrepreneurs' projects; questions from loan officers regarding personal and family situations such as the spouse's view of the business, marriage plans, plans for childbearing or other remarks unrelated to the financial aspects of the application; delays in the loan application process; limited information about alternative financial products and lack of explanations when financing requests are denied.

Evidence shows, however, that once women obtain loans they can be "good credit risks" since they have low default rates. As observed by UNCTAD, "experience with micro-financing, where the vast majority of client borrowers are women, shows high repayment rates, with figures of 95-98 per cent. The lesson of this experience is that financial institutions should reconsider the potential of their women clients" (2000).

Particular Difficulties Encountered by Women Entrepreneurs

Due to social-cultural constraints, women often have a more difficult time accessing finance than men, forcing them to depend on their savings or that of their relatives and on informal sources of finance. The particular difficulties encountered by women entrepreneurs may be explained by the following:

- Small size of the enterprises: women entrepreneurs own small enterprises and are on average more likely to have micro-enterprises, located in the service and retail sectors. Thus, women require small loan amounts that are not considered profitable by banks.
- Lack of collateral: women in general have less personal capital/fewer assets to start a business or to be used as collateral. This may be due to social and legal disadvantages, such as lower wage incomes or limitations in the ownership of property. "In many countries, women cannot even hold land titles, thus they are effectively barred from formal sector credit. Another type of constraint is the requirement for the male spouse's co-signature; and it is also often a requirement that women must obtain a guarantee declaration from their

husband or father” (International Labour Organization, ILO, 1999). Moreover, since women’s enterprises are usually in the service sector and do not have tangible assets for collateral, such firms rely mainly on intangibles assets (which are difficult and costly to evaluate for financing institutions).

- Lack of skills: women entrepreneurs have lower education levels and less professional experience than male entrepreneurs. They lack management skills and competencies in finance and accounting, which are key to improving access to finance. Furthermore, due to social and educational factors, they fear complicated bank procedures and lack confidence to deal with lending institutions and effectively convey their business proposals.
- Lack of information: women entrepreneurs often lack information on the existence of credit facilities, financial instruments, networks and the borrowing conditions of financial institutions.
- Lack of track records: women entrepreneurs have difficulty showing past business performance information or continuous business activity since they are often forced to interrupt their careers to take care of their families.
- Family obligations: women entrepreneurs normally combine their business activities with their family obligations, which may be viewed with distrust by financial institutions.

In addition to these particular difficulties, evidence has shown that there is still insufficient data about women entrepreneurs, their needs, demands and available financing mechanisms, which is a significant obstacle to creating financing programmes adapted to their needs.

Research Approach and Method

The primary objective of this study was to examine the constraints barring Ghanaian women from accessing micro-credit, as well as to highlight the alternative measures they adopted to overcome such constraints. The choice of the central region women is informed by the fact that the region is among the poorest in Ghana. In-depth interviews and closed-ended questionnaires were used for a number of compelling reasons, including that these are the preferred research instrument for studies of this kind. Davidson et al. (2010) used the same technique based on their belief that interviews guided conversations designed to elicit rich, detailed information particularly when attempting to access information regarding sensitive areas of study.

The interviews were conducted over a reasonable period of time between late February and early May 2012. The intent of the interviews was to elicit personal narratives of key constraints facing micro-enterprises (petty traders in this case), especially those owned and run by women. Issues such as access to finance were the key drivers in the interviews with women between 18 and 45 years of age (the youngest woman was 18 and the oldest 45 years at the time of data collection).

Sample Selection and Size

The sample for this study consisted of women in petty trade, including those who may or may not fall under the standard categorisation of SMEs such as street hawkers, road side traders and other non-store traders. In selecting the sample, no particular emphasis was placed on the nature of the businesses these women were engaged in and included hairdressers (those engaged in traditional weaving, plaiting and braiding), hawkers (engaged in selling food and drinks to both men and women on market days), and grocers (those with market stalls) amongst others. In other words size of the business (i.e. micro), rather than sector, was considered to be of significance.

In terms of sample size, a convenience sample of 150 market women formed the unit of analysis. Snowball sampling was used and respondents were given the opportunity to tell their stories in their own style and on their own time, as well as to recommend others who may have similar experiences to share. These approaches helped elicit important dimensions that may go unnoticed when using other research designs such as self-administered questionnaires only.

RESULTS

General

Out of the 150 women petty traders sampled, 40 are mobile, 105 are semi-static and 15 belong to the permanently located category. Thus, the petty traders in the study belong mainly to the semi-static category whose stalls are usually removed at the end of the business day. These units generally operate on pedestrian walkways and public streets.

In terms of whether a petty trader comes from within the district or outside the district or even outside the region, the study shows that 65 percent are either the district or from the region and 35 percent are migrants from outside the region. This contrasts with greater Accra where the majority of petty traders are from outside the region (Aseidu & Agyei-Mensah, 2008). The volume of activities increases significantly in three of the five study areas during market days (Swedru, Mankessim and Jukwa).

The majority of the interviewed traders are not married (single, divorcee or widow). Most either do not have any formal education or junior high school (about 92 percent of respondents). Only 8 percent had secondary education. This is indeed an accurate reflection of the high dropout rate in Ghana where more than 50 per cent of junior high school graduates do not get the chance to complete their education.

Working Conditions

Petty trading units in the study areas are not co-operate entities. They are mostly owned by single individuals and are largely operated as household units. The work schedule of petty traders is on average 12 hours a day and most work 6 days a week. Petty trading activities need not be considered transitory as most of the respondents have been at their petty trading activities for a considerable amount of time, averaging 8.5 years and indicating a high degree of occupational stability.

Credit Relationship

Only 1.3 percent of the petty traders had access to credit from formal institutions such as banks. However, informal credit arrangements were widespread. In Cape Coast, Swedru and Mankessim for example, 64 per cent of women traders received credit from their suppliers, generally by delaying payments to suppliers until after sale of the produce. More than 50 per cent of traders who regularly dealt with the same supplier(s) received some type of credit from them, particularly for women in the semi-static and permanent categories. In some cases the supplier provided the initial capital to help the trader establish the business, and then regularly provided products on credit.

In many cases, the larger wholesaler and/or transporters provided some produce to their trader clients on a loan basis. Retail traders enter into such fixed arrangements to insure a regular supply of produce at a fair price. Prices may be agreed upon on a weekly or monthly basis, and traders note that in order to maintain the stability of the relationship they buy from the same supplier(s) even when lower prices can be obtained on the open market. In Swedru and Mankessim more than 30 percent of traders have some type of informal buying arrangement with a supplier.

Sources of Investment Finance for Women Petty Traders in Central Region

There is wide consensus in Ghana that government policies favour the formal sector over the informal sector. This situation weighs heavily on the MSEs. While formal sector enterprises enjoy such direct benefits as access to credit and foreign technology, restrictions on competition through tariffs and quotas, and trade licensing, the informal sector is often ignored and even harassed by the authorities. Individuals and enterprises within this sector operate largely outside the system of government benefits and therefore have no access to formal credit institutions and the main sources of technology transfer.

Many of the economic agents within this sector operate illegally, although they are pursuing economic activities similar to those in the formal sector, such as marketing foodstuffs and consumer goods, repair and maintenance of machinery and consumer durables, and running transport services. Illegality in this case is generally not due to the nature of the economic activity, but to an official limitation of access to legitimate activity (ILO, 1973). These official limitations sometimes include requiring enterprises to register their businesses and pay high registration fees; file certain statements of accounts; provide information about their activities (which the enterprises may consider to be confidential); and pay taxes. These conditions have tended to limit not only the activities of MSEs but also their sources of financing.

There are three main sources of enterprise financing open to MSEs in Ghana:

- Formal financial institutions such as commercial banks, merchant banks, savings and development banks, and assets and fund management companies;
- Informal financial institutions consisting of money lenders, landlords, credit and saving associations (credit unions, co-operative societies), Susu, and friends and relations; and
- Personal savings

Table 2: Sources Finance Based on Survey

Sources of Finance	Number of respondents	Percentage %
Owners' savings	87	58
Assisted by:		
Formal Banks	2	1.3
Government Institutions	0	0
Micro-credit institutions	20	13.3
Spouses, Relatives and Friends	40	26.7
Money lenders	1	0.7
Total	150	100

Having identified the generally available sources of finance, this study sought to determine the sources of finance used by petty traders in the study areas. As shown in Table 2, only 2 or less than 2 per cent of the respondents have accessed credit from formal banks. Fifty-eight per cent of respondents used their own savings, 26.7 per cent borrowed from spouses, relatives and friends and 13.3 per cent accessed loans from micro-finance institutions. Of those who borrowed from the microfinance institutions, most did not invest directly in their trading activities but used this money to pay the school fees of their wards or take care of other family expenses. This borrowing pattern was corroborated by the management of Mustard Seed Cooperative Credit Union which operates in four of the five study areas.

Even though more than 70 percent of our Susu contributors are women, they rarely take this type of loan to expand their operations. The few who do take Susu loans, use them for purposes other than expanding their businesses.

DISCUSSION

This study identifies a number of factors constraining women micro-entrepreneurs from accessing business development micro-credit. A number of innovative measures have been adopted by these women to cope with these challenges. These constraints and measures are discussed under the following headings: internal constraints, socio-cultural constraints and policy constraints.

Internal Constraints

In an attempt to capture these “internal constraints”, we noted that most of the women made reference to “lack of finance” as a serious problem hindering their business – what Mordi et al. (2010) conceptualised as a market-based factor. Paradoxically, very few of these women considered MFIs as a first choice source of finance for the development of their businesses (Katwalo & Madichie, 2008; Madichie, 2009; Mordi et al., 2010). This study also noted the lack of searching for micro-credits from licensed MFIs, as most of these women exhibited a penchant for other sources of finance such as borrowing from spouses, friends and family. This raises the question of whether these women have an adequate understanding of the benefits of micro-credit how to proactively seek out these finance sources in order to advance their businesses.

A number of factors are responsible for this lack of “mental access” to micro-credit. Many of the women appeared reluctant about, or at least wary of, growing their business, noting that they are not confident in the riskier steps needed to grow the business or access support from financial institutions because they stand to lose their few existing assets if they are unable to pay the loan. They also fear being harassed by the police and the possible legal battles should they not be able to repay their loans.

Socio-Cultural constraints

In general, successful women entrepreneurs are not receiving the kind of public attention, recognition and media focus which is increasingly observed in industrialized and emerging economies (Zewde and Associates, 2002). There are a number of social role that continue to be ascribed to Ghanaian women. They are, for example, largely responsible for household tasks and the raising of children (Mordi et al., 2010). These and other acquired roles often subjugate them into thinking that business is for men. In situations where these women may wish to venture into certain businesses, the responsibilities associated with their ascribed and acquired roles can limit such ambitions. They tend not to have the time to plan and think of such businesses. This view is consistent with the “too busy to train” theory expressed by Walker et al., (2007) in the context of SMEs in general.

Negative attitudes and beliefs about women’s traditional roles have significant impacts on women entrepreneurs, including:

- Not being able to access appropriate resources;
- Being regarded as minors, which limits their ability to own assets, enter into legal contracts and build collateral;
- Being physically limited in where and how they can operate their businesses, and;
- Being especially vulnerable to harassment from male officials and businessmen.

Such attitudes deter many women from even considering business ownership as an option, and certainly do not encourage them to actively pursue such an option. Indeed, self-censorship and self-restraint by women, because of anticipated societal and institutional obstacles, help to perpetuate and reinforce discriminatory practices against women entrepreneurs.

Policy Constraints

No matter how accessible any type of credit might be to poor women entrepreneurs, if the operating environment is not conducive for micro-enterprises to flourish, women micro-entrepreneurs may be reluctant to access it. The Ghanaian operating environment has been unsupportive for micro-entrepreneurs in certain respects, obviously as a result of policy failures (Fajana 2008; Obamuyi, 2009). These non-supportive policy constraints refer to the hostile environmental forces that are within the ambit of public policy, such as poor financial, regulatory and physical infrastructure, high interest rates and the unfriendly atmosphere of formal banking institutions. Laws that make petty trading, especially street hawking, illegal are inimical to the development of petty trading in the study area and other major cities in Ghana.

CONCLUSION

The proliferation of petty traders in most peri-urban areas can be interpreted as an unhealthy symptom of economic underdevelopment. Employment problems and low incomes, as well as an increase in the number of migrants contribute to the growth in the petty trade sector in the study areas and throughout Sub-Saharan Africa. With access to credit and lucrative wage employment increasingly rare and high failure rates in basic school, recent migrants enter the street trade in order to survive. Although petty trading allows this group to survive (minimally), it does represent a large underclass of the unemployed and underemployed. To view it as a burgeoning class of private sector entrepreneurs paints an unrealistically rosy portrait of the situation.

The purpose of this paper has been to highlight some of the barriers facing women petty traders in the central region of Ghana in order to better understand their inability to access microcredit. These impediments, as confirmed

through interviews can be summarised into three broad categories – internal constraints and barriers, socio-cultural constraints, and non-supportive policy constraints.

Internal constraints are those factors that are demonstrated by women micro-entrepreneurs, such as a lack of confidence (phobia and anxiety) a lack of understanding of micro-credit and MFIs, a fear of the consequences of default, and the myth that “bank facilities are meant only for the rich.” These constraints are largely planted and nurtured by the myths surrounding conventional banking practices in the country.

The second category, socio-culturally induced constraints, are comprised of factors such as family and cultural expectations, multiple roles in the family and society, spousal influence, and traditions embedded in ethnicity. Typically, Ghanaian culture, like most other African cultures (Darley and Blankson, 2008), is built around patriarchal archetypes (the belief that men are superior to women), and women tend to accept this, especially in rural areas. This means that only men can go to war and women are therefore, “not to undertake risky ventures”, as one of our respondents recounted. This belief – which has also been elaborately discussed in Faseke’s (2001) *The Ghanaian Woman* – undoubtedly affects the attitude and behaviour of women who are unsure of micro-financing.

Third, non-supportive policy constraints refer to the hostile environmental forces that are within the ambit of public policy, such as poor financial, regulatory and physical infrastructure, high interest rates and the unfriendly atmosphere of formal banking institutions. These factors dampen the enthusiasm with which women micro-entrepreneurs take up enterprise development and growth via MFIs. These constraints thus make the world of business venturing more risky and costly for women entrepreneurs. The numerous levies and taxes imposed by local authorities and the high cost of transportation also fall under this category.

Despite these impediments, however, alternatives have been explored by central region women petty traders. These groups provide credit to members, facilitate the use of family networks to raise credit, and provide seed money and other supports for their business. In most cases, therefore, and similar to recent research in the Ugandan context (Katwalo & Madichie, 2008) micro-credit from MFIs and formal banks is considered a last resort in the credit options hierarchy.

The potential economic benefits of sustainable microfinance in Ghana are compelling, and its potential effects on the development process cannot be understated. This calls for a holistic approach to facilitating the development of the microfinance sub-sector thereby unleashing its potential for accelerated growth and development.

Practical Implications

Women have shown that they are strong entrepreneurs, borrowers and change agents through women’s small and medium enterprises (WSMEs). This paper posits that the lack of access to credit promotes market exclusion, and deepens the socioeconomic and political vulnerability of women. This paper has far reaching implications for public policy support geared towards leveraging and mainstreaming these initiatives for maximum outreach.

Recommendations

One of the main reasons for the proliferation of petty trading activities in urban areas is the large-scale migration of rural residents in search of new livelihoods in towns and cities. The cause of this migration can be traced to rural 'push' rather than urban 'pull' factors. Governments and policy makers must realize that although the growth of tiny enterprises has resulted largely from the lack of alternative employment opportunities, they are often viable undertakings which make an important contribution to the economic survival of the poor. As such, governments should encourage the establishment of more micro-enterprises in the form of small-scale cottage and other agro-based industries. Governments must also recognize that these undertakings need to be supported by better access to institutional finance.

Micro-finance institutions (MFIs) should carry out business analyses of the practical business needs of their customers so as to be able to formulate better and more appropriate modes of repayment. The main areas of concern and priority are:

- Often no grace period is provided for entrepreneurs. Lending institutions should offer more flexibility around repayments.
- Loan durations are often too short for the needs of many women entrepreneurs. MFIs should introduce a wider range of loan repayment periods in response to differing needs.
- There is a gap between the provision of micro-level short-term loans and medium-term loans. It is recommended that MFIs introduce a wider range of loan sizes within their portfolios.

The current way in which collateral is demanded by the financial institutions tends to exclude (or at least discriminate against) women entrepreneurs more than men. The government and MFIs should set out to tackle this by establishing mechanisms such as a guaranteed fund to help women entrepreneurs to overcome this barrier. Women entrepreneurs also need to have more and better access to information about their rights and entitlements, as well as about best practice models for women starting and running their own enterprises. It is recommended that a one-stop-shop solution be developed to contribute to the provision of these supports and services.

The eradication of most of these societal constraints should be seen by all stakeholders (both society and government) as a sure first step towards lifting Ghanaian women up from the bottom-of-the-pyramid. This would facilitate their potential contributions to the development of economic activity in the private sector, as well as the sustainability of the informal sector as it begins to align with the formal sector. With this in place, it would not be long until the MDG of poverty eradication at local, national, regional and international levels begins to bear fruit.

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Drug Abuse in Nigerian Schools: A Study of Selected Secondary Institutions in Bayelsa State, South-South, Nigeria

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Abstract

Drug abuse is becoming increasingly problematic in Nigeria. A number of recent studies suggest that almost all Nigerian youth experiment with drugs at some point, particularly alcohol and nicotine. The foremost concern is the number of these youth that will form an addiction to serious substances, jeopardizing their own health and safety and creating difficulties for their families and the public at large. Drug use, it is widely accepted, has negative consequences for the academic, social, psychological and physical development of users. This study aims to explore the perceptions of public secondary school students around drugs and substance abuse and how these perceptions influence their behaviours. This study was carried out in four secondary schools in Bayelsa State, Nigeria. The data obtained was analyzed using descriptive and inferential statistics. The findings of this study reveal that the perceptions the students with regards to drugs and substance abuse contributed considerably to their behaviour on these issues.

Keywords: Drugs, Perceptions of Drugs, Secondary School Students, Institutions, Bayelsa, Nigeria.

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INTRODUCTION

According to a United Nations Office on Drugs and Crime (UNODC) Report (2005), some 200 million people, or 5 percent of the world's population aged 15 - 64 have used drugs at least once in the last 12 months – 15 million more than the previous year's estimate. Likewise, according to the World Drug Report (2005), the use of illicit drugs in all nations has increased in recent years. The report goes on to note that the increasing availability of a variety of drugs to an ever widening socio-economic spectrum of consumers is disconcerting, although the main problem at the global level continues to be opiates (notably heroine) followed by cocaine. For most of Europe and Asia, opiates accounted for 62 percent of all drug treatment sought in 2003. While 3.3 to 4.1 per cent of the global population admits to consuming drugs, the most worrisome trend for the UNDCP Executive Director is the younger and younger ages at

which people are becoming addicted. In Pakistan for example, the share of those who started heroine use at 15-20 years of age has doubled to almost 24 percent. A survey in the Czech Republic showed that 37 percent of new drug users were teenagers between 15 and 19 years old. In Egypt, drug use - in particular heroin use - is becoming a serious problem and nearly 6 percent of secondary school students admit to having experimented with drugs.

Drug abuse has a negative impact on the education of secondary school students. The overall health of the user is affected negatively and behaviours associated with drug abuse predispose the abuser to crime and contagious diseases including HIV/AIDS (CDC, 2000). Drug abuse has thus become a national concern in Nigeria, given its impacts on education and future leadership, innovations and human resources. Secondary school students are particularly at risk given that they are in their formative years of education, career development, social skills and identity formation.

Reports from education officials in Bayelsa State suggest that students are using alcohol and nicotine, in particular, at a rate that is causing concern. Despite National Agency for Food and Drug Administration and Control (NAFDAC) and other organization-based interventions, drug abuse is on the rise with over 40% of students abusing various types of drugs. Drug abuse appears to be a well-entrenched behaviour among secondary school students. In shopping centres and other public spaces, students who have dropped out of school because of drug abuse, can be found loitering and participating in other forms of criminal activity. Given the availability, consequences and increasing use of drugs in Nigeria, it is important to establish students' perception of drugs and substance abuse and how these perceptions influence their behaviour when it comes to drugs and drug users. It is against this background that the current study was undertaken. This study seeks to establish student perceptions of the drug problem and to critically analyze strategies used to address the problem.

Objectives of the Study

The overall purposes of this study are to assess drug abuse among students in secondary schools in Nigeria, assess student perceptions of drugs and drug abuse, and analyze the strategies used to address the problem. This study aspires to contribute to the knowledge and understanding needed to ultimately help decrease drug abuse among students.

The specific objectives of this study are to:

- (a) Examine the causes and extent of drug abuse among secondary school students;
- (b) Identify commonly abused drugs among secondary school students;
- (c) Identify student perception of drugs and substance abuse;
- (d) Identify and evaluate strategies used in secondary schools to address drug abuse and the effectiveness and shortcomings of these strategies; and
- (e) Identify new strategies that may help to decrease drug abuse in secondary schools.

Operational Definition of Key Terms

Drug: Any product other than food or water that affects the way people feel, think, see, and behave. It is a substance that, due to its chemical nature, affects physical, mental and emotional functioning. It can enter the body through chewing, inhaling, smoking, drinking, rubbing on the skin, or injection.

Drug abuse: Use of drugs for non-medical purposes. Drug abuse refers to the misuse of any psychotropic substances resulting in changes in bodily functions, thus affecting the individual socially, cognitively or physically. Social effects may be reflected in an individual's enhanced tendency to engage in conflicts with friends, teachers, and other school authorities. Cognitive effects can be seen in the individual's lack of concentration on academic work and memory loss (Eysenck, 2002).

Drug addiction: Addiction to drugs or alcohol means that a person's body can no longer function without these substances. An addicted person may show a decline in academic performance, frequently fail to attend classes, lose interest in school work and display weakened motor coordination, poor health, and a lack of interest in old friendships.

Addiction by its nature distorts thinking processes giving prominence to thoughts, which justify the addictive behaviour and minimize or exclude thoughts about ceasing the behaviour (Miller, 2002; Diclemente, 2006).

Drug related problems: This term is used to describe all the negative effects associated with drug abuse including ill health, violence, conflicts with friends or school authorities, destruction of school property and academic underperformance.

Illegal/legal drugs: In this study illegal drugs refer to the substances deemed harmful to the mental and physical wellbeing of the individual by the government who seeks to control or discourage consumption by law. Legal drugs refer to those such as alcohol and tobacco that are potentially dangerous but whose consumption the government allows.

Intervention: Attempts to help drug users positively modify their behaviour and change their attitude towards the misuse of drugs are referred to as interventions. These can include activities and programmes put in place to address or end drug abuse.

Prevention: Prevention is best understood when explained in its totality which includes three levels of prevention: primary, secondary and tertiary. Primary prevention involves preventing the initiation of psychoactive substance use or delaying the age at which use begins (UNICEF & WHO, 2006). Secondary prevention is intervention aimed at individuals in the early stages of psychoactive substance use. The goal here is to prevent substance abuse from becoming a problem thereby limiting the degree of damage to the individual (Rossi, 2000). Tertiary prevention aims to end dependence and minimize problems resulting from use/abuse. This type of prevention strives to enable the individual to achieve and maintain improved levels of functioning and health. Tertiary prevention is sometimes called rehabilitation or relapse prevention (UNICEF & WHO, 2006). For the purposes of this study, prevention will refer to educational activities, programmes or policies aimed at enabling young people to stay healthy and productive and inhabit an environment free from drug abuse (primary prevention). It also refers to the education of young people about the effects of substance abuse with the intention of preventing their use/abuse and enabling them to make informed decisions when faced with offers of illegal substances.

Protective factors/risk factors: Research has shown that in order to prevent substance abuse, two things must happen (O'Malley, et al., 2001) factors that increase the risk of the problem must be identified, and ways to reduce the impact of those factors must be developed.

Factors that help to prevent substance abuse are called protective factors and those that contribute to or increase the risk of abuse are called risk factors. Knowledge of these various factors can help those in drug prevention to better understand the dynamics of drug use and to develop strategies that will enhance the protective factors while minimizing the risk factors.

Psychoactive Substance: Refers to any substance that when taken can modify perception, mood, cognition, behaviour, or motor functions (UNICEF & WHO, 2006).

Strategies: This term refers to the methods or approaches that schools have put in place to address drug related problems.

Substance abuse: Refers to the use of all chemicals, drugs and industrial solvents that can produce dependence (psychological and physical) (Cheryl & Gert, 2003). It can also refer to repeated non-medical use of potentially addictive chemical and organic substances. According to UNICEF and WHO (2006), substance abuse includes the use of chemicals in excess of normally prescribed treatment dosage and frequency, even with knowledge that they may cause serious problems and eventually lead to addiction.

Youth: Refers to young people between 13 and 25 years of age or their activities and their characteristics. The majority of students in Nigerian secondary schools are between 13 and 19 years, a stage referred to as adolescence. The term youth therefore includes this age bracket of students.

Drugs and Substance Abuse

Drugs are substances which when introduced into the body will alter the normal biological and psychological functioning of the body, especially the central nervous system (Escandon & Galvez, 2006). The term 'drug' in a general sense includes all substances that can alter brain functions and create dependence. UNICEF and the World Health Organisation (2006) defines drug abuse as the self-administration of any drug in a manner that diverts from approved medical or social patterns within a given culture. Legal or licit drugs and substances are socially accepted and their use does not constitute any criminal offence. In Nigeria, these include alcohol and nicotine. Drug abuse among students is dominated by the use of these legal drugs and substances. Among the illegal drugs commonly used by students are cannabis, ecstasy, heroine, mandrax and lysergic acid diethylamide (NAFDAC, 2004).

Prescription and over the counter drugs are abused when taken without the specified medical condition and/or proper prescription. Some of these drugs can be mood elevators, pain killers or antidepressants. Prescription drugs include pain killers with codeine, *phenorbaritone*, valium, *piriton* and sleep control drugs. A study by Rew (2005) found that these psychoactive substances can produce feelings of surplus energy, euphoria, stimulation, depression, relaxation, hallucinations, a temporary feeling of well being, drowsiness and sleepiness. Their misuse often leads to physical or physiological addiction.

Drug abuse by students in western countries is also alarming (Portner, 1998). The United States, one of the world's largest markets and a country that sets standards for many other countries, has experienced a notable recent increase in marijuana use. This has influenced the decisions of students from other countries in terms of drug use. Many American films and magazines with young audiences sensationalize drug use. This portrayal of drugs can be highly deceiving, making youth in America and elsewhere more vulnerable to drug addiction. A report by NAFDAC (2008) noted that the abuse of licit and illicit drugs is forming a student sub-culture in Nigeria. This development is a significant concern for Nigerian society and immediate attention is required. When a drug is abused it causes injury to the brain and often irreversible alterations in the central nervous systems. When psychoactive substances destroy several thousand neurons, the consequences are fatal and a number of students have died from drug overdoses.

Types of Drugs and Substance Abused by Students

According to the National Institute on Drug Abuse (2000), alcohol is the most abused psychoactive drug in the United States with approximately 90% of students using it before they leave high school. In Nigeria a report by NAFDAC (2008) found that alcohol is also the most commonly abused drug with about 61% of the population engaging in its use. The same report indicated that 40.9% of students were abusing alcohol in Nairobi Province and 26.3% in Central Province. According to Perkinson (2002), alcohol is a central nervous system depressant and dulls the brain making learning a difficult task. When students abuse alcohol their reasoning becomes impaired and education becomes of less priority in their life.

Research by Nte (2008), found that 37% of the students in Bayelsa State were abusing tobacco products. Tobacco products are readily available in Nigeria. Research in Australia revealed that bhang smoking leads to the use of other more serious drugs. In the Bayelsa it was found out that 5.3% of the students were smoking *bhang*.

The Effects of Drugs Abuse

Drug use by students has hampered education and management in Nigerian secondary schools. In Nigeria, recent statistics suggest that one in every three secondary school students consumes alcohol. Another 8.3% smoke cigarettes while almost one in every ten (9.1%) chew Miraa. About 3% smoke bhang and use hard drugs like heroin, cocaine, mandrax and tranquilizers (The DailyTimes, 2004).

Drugs have varied physiological effects. Some adverse consequences include insomnia, prolonged loss of appetite, increased body temperature, greater risk of hepatitis and HIV/AIDS infection (Perkinson, 2002), death, various forms of cancers, ulcers and brain damage. A study by Winger, Wood and Hofmann (2004) identified

accelerated heartbeat, speeding in the peripheral circulation of the blood, alteration of blood pressure, breathing rate and other body functions as potential effects. Cannabis affects the hormonal and reproductive system and the regular use of cannabis can reduce male testosterone and sperm cells. Drug abuse contributes to the formation of uric acid which accelerates conditions like arthritis, gout, osteoporosis, and heart attacks, particularly those with pre-existing coronary hypertensive problems.

Drug abuse also affects the brain, resulting in a major decline in its functions. Drugs can affect a student's concentration and thus interest in school and extracurricular activities. This leads to increased absenteeism and drop outs. Most psychoactive drugs affect the decision making process of students, their creative thinking and the development of necessary life and social skills. Drugs also interfere with an individual's awareness of their unique potential and thus their interest in their career development (Louw, 2001).

Drug habits also affect an individual's self-concept. Self concept refers to the way an individual perceives himself or herself in a variety of areas for example academically, physically, and socially (Luow, 2001). Low self-esteem can lead to a detrimental redefinition of self-concept and this in turn can lead the student to indulge in escapist behaviour such as drug and substance abuse. A study by Merki (1993) found that when the students are feeling bad about themselves or are feeling unworthy, unloved or rejected, they turn to drugs. Students are affected more by these emotions and their inability to cope given their adolescent stage of development. During this stage, identity formation is important and self-concept plays a major role (Erikson, 1974). Addiction can develop when students' insecurities combine with the influence of peers and the media. Drugs then become the social and emotional focus at the expense of other interests and activities. This gradually leads to social, emotional and physical problems and new feelings of guilt, despair and helplessness.

THEORETICAL FRAMEWORK

The Modified Social Stress Model (MSSM) for understanding drug use guides this study (ESCAP 2000). The model was developed by Rodes and Jason (1988) and modified by the World Health Organization/Programme on Substance Abuse (WHO/PSA) to include the effects of drugs or substances, the personal response of the individual to drugs and additional environmental, social and cultural variables.

Research has shown that in order to prevent substance abuse, two things must be taken into consideration: factors that increase the risk of developing the problem must be identified, and ways to reduce the impact of these factors must be developed. This theory maintains that risk factors are those factors that encourage drug use. Factors that make people less likely to abuse drugs are called protective factors. The key to health and healthy families is increasing the protective factors while decreasing the risk factors.

According to this model, if many risk factors are present in a person's life, that person is more likely to begin, intensify and continue the use of drugs. The model identifies risk factors as including: stress (which could be due to the school or home environment, and adolescent developmental changes); the normalization of substance use which could be seen in terms of legality and law enforcement; the availability and cost of drugs; and advertising, sponsorship and promotion through media, as well as the cultural value attached to various drugs.

The more protective factors that are present, the less likely a person is to become involved with drugs. Protective factors are identified as: attachments to people such as family members and peers, and institutions such as religion and school; physical and performance capabilities that help people succeed in life; the availability of resources, within the person or the environment, that help people meet their emotional and physical needs; positive role models; and anti-drug campaigns along with guidance and counseling services.

According to this model, it is easier to understand the drug problem if risk and protective factors are considered at the same time. Probability of drug abuse is determined by these factors and this framework is useful as a way of planning interventions to prevent or treat problems related to drugs. It is important to note that the factors listed above are not exhaustive. The presence of risk and protective factors is context dependent and the proportions of their contribution depend on their intensity in given situations. Thus, it was important to examine the factors unique to students in Bayelsa State, Nigeria.

METHODOLOGY

Sampling Method

Substance abuse is one of the foremost problems affecting secondary schools in Nigeria. It impacts negatively on the academic, social, psychological and physical development of abusers. The goal of this study was to explore the perceptions of public secondary school students of drugs and substance abuse and how their perception influences their behaviours.

The target population of this study was four public secondary schools: Southern Ijaw Secondary School (Oporoma), Community Secondary School (Eniwari), Government Secondary School (Amassoma), and Community Secondary School (Angiama), all in southern Ijaw Local Government Area of Bayelsa State, Nigeria. The survey research design was used in this study. According to Ololube (2009), survey research seeks to obtain information that discloses existing phenomenon by asking individuals about their perceptions, attitudes, behaviours or beliefs (Mugenda & Mugenda, 2003). The purposive sampling method was used to select two schools and stratified random sampling was used to select the sample size of the study respondents. A representative sample was randomly selected from the classes two, three, four and five. A questionnaire was used to gather information from student respondents and an interview schedule was used for teachers and counselors. The questionnaire and interview schedule were self-administered to ensure confidentiality. Piloting was done for the purpose of establishing the reliability and construct validity of the instruments. Reliability was tested using the Cronbach alpha method, and was established at alpha 0.7. The data obtained was analyzed using descriptive and inferential statistics and the representation was done through frequencies, percentages and t-tests. The Statistical Package for Social Science (SPSS) Version 16 was used in the data analysis.

Methods of Data Collection

Data was collected through a student questionnaire and an interview schedule for teacher counselors in the selected schools. The student questionnaires were used to obtain information on the age, gender, class, and category of school of the student. The sets of questions in the questionnaire were designed to help determine the perceptions of secondary school students towards drug and substance abuse and how these affected their behaviour when it came to drug abuse. The questionnaire was divided into four sections. Section B consisted of statements that were coupled with a five-point Likert-type scale. Scores on this scale ranged from 1 to 5 and the respondents checked the box that best reflected their view on drugs and substance abuse.

The validity of a questionnaire was established and refers to the extent to which the questionnaire measures what it claims to measure (Ololube, 2009). Validity means the extent to which the scores and the conclusions based on these scores can be used for the intended purpose of the questionnaire. Put differently, it is the degree to which results obtained from the analysis of the data actually represents the phenomena under the study. For the purpose of this research, face validity and content validity of the instruments were measured. The study ascertained the reliability of the instrument by applying the Cronbach alpha method. The reliability coefficient was established as 0.7 after piloting the instruments and modifying some of the items.

Data Collection and Analysis

The researcher began this study after seeking and obtaining permission from school management. The sampled schools were visited and the principals informed about the study. The purpose of the study was explained to the respondents. Confidentiality was assured and questionnaires were self-administered. The interview schedule for teacher counselors was used after explaining to them the purpose of the study. The data collected was organized, tabulated and analyzed using descriptive and inferential statistics. Frequencies and percentages were used and the presentation of data was done through summary graphs. Gender differences on perceptions of drug abuse were analyzed with the t-test at the 0.05 level of significance. The Statistical Package for the Social Sciences (SPSS) Version 16 for Windows assisted in the data analysis. The data from the interview schedule for teacher counselors was also analysed using descriptive statistics.

RESULTS AND DISCUSSIONS

The purpose of this study was to investigate the perceptions of secondary school students towards drugs and substance abuse and the effect of their perceptions on their behaviour. Based on the study objectives the following findings were established. The study established that 116 (31.4%) of student respondents had a positive perception of drug abuse. A far greater number of students, 222 (60.0%), had a negative perception of drugs and substance abuse. This suggests that the majority of the students were aware of the dangers of drug use. The minority, however, cannot be ignored, given their likely influence of those in the majority. The remaining 8.6% of students had a neutral perception of drug abuse, meaning they didn't identify a positive or negative perception of drug abuse. Six (60%) of the teacher counsellors reported that students who have been going to counseling for drug abuse had a positive perception about the abuse. The teacher counsellors also reported that peer influence was playing a major role in the perceptions held by students about drug abuse.

In terms of the rate of drug abuse among students, this study established that 125 (33.8%) of the study participants were abusing drugs and 245 (66.2%) were not abusing. All the teacher counsellors agreed that there was a certain level of drug abuse in their schools. The teacher counsellors reported that alcohol and cigarettes were most frequently used along with miraa and bhang. The teacher counselors and students agreed that there is a certain laziness and lack of concentration among students abusing drugs. Other effects of drug abuse included a poor relationship with others, lack of interest in studies, absenteeism, withdrawal and indiscipline.

T-test analysis results indicated that there was a significant difference, at $p < 0.05$, between boys and girls in their perceptions of drugs. Specifically, boys showed a lower drug perception mean scores than girls, indicating that boys had a higher proclivity for drug abuse than girls. The percentage of girls using drugs, however, is on the rise.

The findings of this study can be summarised as follows: A good percentage of secondary school students have a positive perception of drug and substance abuse; this perception has been formed mainly from their immediate environment. The types of drugs and substances abused by secondary school students include alcohol, cigarettes, marijuana and bhang, although alcohol was the most commonly used. The impacts of drug abuse on student behaviour include laziness and lack of concentration, poor relationships with others, lack of interest in school work, absenteeism from school, withdrawal, and indiscipline. This study also found that the perception of students towards drugs affects their behaviour in terms of drug use. The majority of those who had positive perceptions about drugs were drug users (35%).

CONCLUSION

In this study, an undertaking has been made to examine the consequences, and panacea for drug abuse in Nigerian schools. Drug abuse, and its detrimental personal and social consequences, is rampant in schools today. Based on the findings of this study, it could be concluded that most students have a negative perception of drug abuse. As some still have a positive perception, a cognitive restructuring program is necessary. Students' perceptions about drugs had an impact on their behaviour when it came to drug use. The drugs which were most often used, were legally and culturally substances including alcohol, cigarettes and marijuana. The use of these drugs had detrimental effects on students' academic progress and their interpersonal relationships.

Recommendations

Based on the findings of this study, the following recommendations are offered as a way of mitigating the problem of drug and substance abuse:

Behaviour modification techniques: These are associated with interventionist approaches, which though reactive, respond to problems as they arise. This is an approach that is concerned with the modification of behaviour through positive and negative reinforcements. It assumes that any action that is rewarded will tend to be repeated and learned whereas actions which have no favourable consequences will cease to be done. Some educators question the goal of behaviour change and propose a more education-oriented approach to drug prevention in schools.

Preventive methods: Most drug users begin the habit before the age of twenty and schools are the primary institutions with access to this group. Preventive methods aim at developing structures and approaches geared towards

reducing problems since they anticipate crisis within the school itself. One of the reasons for disaffection in secondary schools is the abject failure of pastoral care – students’ needs are not met on time thus increasing disaffection leading to misbehavior especially drugs use. Research programmes need to be comprehensive and have sufficient intensity to reasonably expect that skills can be taught. Content areas that are necessary include normative education, social skills, social influence, protective factors, and refusal skills.

Educational programme interventions: Drug prevention programmes known as life skills training have been found to be successful with young adolescents. Life skills training is based on findings that most adolescents first use drugs in social situations and that their decisions are influenced not just by one factor but a variety. Effective programs focus on enhancing problem solving skills and aiding students to evaluate the influence of the media. Effective programs help improve self-esteem, and reduce stress and anxiety. These skills are taught using a combination of methods including demonstration, practice, feedback and praise. Another proven approach is training designed to teach skills to confront a problem-specific focus, emphasizing the application of skills directly to the problem of substance abuse (American Academy of Paediatrics, 2007).

Role of the community: Because of the complexity of the problem, co-ordination of prevention messages and activities with other institutions in a student’s life is essential. The community, not the school, is where most students’ drug use occurs. Communities can be active in changing and supporting non-use norms and reinforcing messages given at school. Communities can send a clear and consistent message by developing and implementing a broad, comprehensive approach to dealing with substance abuse.


Punitive methods: These methods are associated with crisis management approaches which are reactive in their policies and locate the problem in students. Punitive methods rely on the infliction of punishment with the aim of deterring students from committing the crime. This method applies the principal of stimulus-response connection. The purpose of punishment should be communicated, understood and accepted if it is to be effective in enforcing student discipline. Obviously, however, drug abusers cannot be rehabilitated through punishment alone.

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