The Interplay of Culture and Mathematics: The Rural Shona Classroom

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Abstract

This article is motivated by the challenges faced by the rural Shona learners in their mathematics education. It explores how the rural Shona learners can benefit in their learning of mathematics from approaches that involve their environment. The paper further explores how various Shona cultural activities and games can be of help in a rural Shona mathematics class. The researchers argue that there is wisdom in injecting cultural and relevant environmental issues into the methods of teaching mathematics in rural Shona and this will make the subject relevant to the learners' everyday experiences and therefore worthwhile learning. For future research, the researchers recommend that experiments be carried out with the identified cultural objects, activities and games in order to establish how the learners can benefit from using them in the mathematics classes.

Introduction

The learning of mathematics and English at all levels is an issue that has attracted the attention of educators, researchers and other stakeholders in Zimbabwe. These two subjects have earned more prominence for the wrong reasons of low passes or high numbers of failures in the subject areas. This is despite the fact that the two subject areas are a requirement for any entry into college or the job market. One has to pass them at Ordinary ('O') level. Despite that, many learners pass or still fail these key subjects after several attempts. This situation has assumed alarming proportions more so in the rural areas which are beset by lack of resources since Zimbabwe is an emerging economy.

The *Sunday Mail [1]* of 17-23 January 2010 recorded that some rural schools recorded zero (%) percentage pass rate from the 2009 Grade Seven examinations. The Grade Seven (7) examinations used to comprise only mathematics and English until recently when an indigenous language (Shona or Ndebele) and General papers were added.

Though there are many parallels regarding the learning of English and mathematics in Zimbabwe, this paper is focused on mathematics. The researchers explore the link between mathematics and Shona culture, or ethnomathematics, with the view that this may help the rural Shona learners see and appreciate the link and the relevance of the subject in their day to day activities. Most people in Zimbabwe are quick to confess their hatred and fear of mathematics and how they fared in the subject during their school days. What the USA National Research Council [2] (1989) assets of mathematics is also very true of Zimbabwe and Mathematics:

> Mathematics is the worst curricular villain in driving students to fail in school. When mathematics acts as a filter, it only filters students out of careers, but frequently out of school itself. Cited in Ezeife [3] (2002: 176)

The situation is worse for the Zimbabwean rural learners whose harsh rural background puts them at a disadvantage when compared to their urban counterparts.

This paper focuses on Zimbabwean rural schools where the researchers would like to suggest some intervention strategies. The reasons for the high failure rate in rural schools include the medium of instruction, English. Urban learners are better placed at understanding the English language as compared to the rural ones because they start using English from pre-school and crèche. Most rural peoples come across English for the first time when they enrol for Grade One (1) while urban ones start using English from crèche and Grade Zero. Also the urban people have high chances of supervised homework by their mainly literate middle and working class parents who can even afford to send them for extra lessons.

On the other hand, the rural learners face a lot of challenges where they have to balance school and family chores. They are part of family labour. They work in the fields; they herd cattle if they are boys and do the dishes if they are girls. In short, they have to fend for their upkeep in addition to school work. Most rural parents do not have any formal education and therefore, have no capacity to supervise their children's homework. They are also not formally employed which means they do not have extra cash to pay teachers who can take their children for extra tuition.

The textbooks also present the rural learners with very difficult challenges. To begin with, they are written in the English language which poses a huge challenge for them. Secondly, the examples used are in the majority of cases far removed from the rural setting. These include supermarkets, banks, and masses of truck loads, cricket and wickets. This paper exploits the close link that is there between mathematics and Shona culture. It is hoped this will enable the rural learners see the link between mathematics and their rural life which will lead in their appreciating the relevance of the subject in their day to day lives. It is hoped that exploiting that link will enable the rural Shona pupils grasp mathematical concepts easily using rural Shona environmental phenomena, materials and relevant traditional practices.

Relevance of Mathematics

Mathematics is a science related to measurements, calculations, discovering relationships and dealing with problems. It involves critical thinking, researching and problem solving of space. It has a peculiar language in which symbols occupy a most important position (Sudhir and Ratnalikar [4] 2003: 4). Everybody irrespective of class makes use of mathematical knowledge in one way or another. Many people may fail to see the link because of the way it is taught and the inability to understand the symbols used. Failure to use appropriate teaching methods and learning aids on students may lead to rote learning, using the symbols mechanically without much understanding, appreciation and linking the subject to real life. The misconception of non-utility of mathematics in actual life arises because of the fact that mathematics taught in the classroom is generally divorced from the mathematics of real life (Sudhir and Ratnalikar [5] 2003: 5) and yet mathematics can lead to organized life. A well organized life involves fixing time, prices, wages, rates, ratios, fares, percentages, targets exchanges, discounts, areas, volumes and many other measurements without which life would be disorderly and chaotic. For example, if a person has to meet targets set, that person has to be clear of time management. And by time management here is not just meant the western perception of time but the African one as well. For example the Shona have a saying that shows the importance of time management. The saying is, *basa mangwanani* (start working early in the morning in order to accomplish your tasks) People also have to understand the concept of pricing in order to keep within budgets. Pricing to the Shona goes beyond the money economy. Selling and buying can take place when the parties involved exchange farm produce for commodities such as clothing and processed food items. This also requires right measurements in order to satisfy both parties. What these simple examples show is that mathematics is for everybody and their everyday uses rather than just for the mathematicians.

Culture

Culture emphasizes beliefs and values which are often deeply rooted in a group's history and traditions. It is the custom of people including language and religion (Stebbing [6] 1999: 317). In short it is a way of life for a people. Hollins [7] (1996) cited in Antony [8] (2002: 179) views culture as a man's medium when he asserts that:

> there is not one aspect of human life that is not touched and altered by culture. This means personality, how people express themselves (including shows of emotion), the way they think, how they move, how problems are solved….. Culture is …the essence of who we are and how we exist in the world. It is derived from understandings acquired by people through experience and observation…about how to interact with the physical environment and knowledge or beliefs about their relationships or positions within the universe.

Thus, an analysis of this definition shows that culture has an effect even on how a group of people will live and learn. This means that the culture of the Shona would have an influence on how they learn and retain what they are taught in school. One can say this culture can be able to shape even their habits in mathematics. This is not peculiar to Shona but to other cultures as well. (See Simard [9] 1994; Shirley [10] 1995; Hanson [11] 1999; Semken and Morgan [12] 2000; and Nyota and Mapara [13] 2008).

Teaching Mathematics in Urban and Rural Settings

Mathematics like any subject on the curriculum in Zimbabwean schools is being taught in English (from the fourth grade up to university), the medium of instruction in Zimbabwe as is set out in the Education Act [14] of 1987 which was reviewed in 1997. The problem is that, English is a second language to most Zimbabweans. This means that the learners struggle with both language and mathematics concepts. The current researchers found out that teachers in the rural areas use aids like sticks and stones to explain counting yet there are a whole range of cultural aspects that rural pupils meet every day that can be used to illustrate mathematical concepts. Examples cited in textbooks are the same for both rural and urban children. Some of the examples are more suitable for the urban than the rural areas. For example, there are word problems in the Grade Seven, *New Ventures in Mathematics* textbook that refer to mass of coal, a metre of canvas, entering a supermarket and getting cash invoice, selling and buying of light bulbs and saving money in a savings bank when most rural people do not have the extra cash to save or access to supermarkets or light bulbs for that matter. The rural areas have their own equivalents of all these concepts which are unfortunately not employed by most teachers in rural Zimbabwe. For example, when teaching the concept, 'frequency', a rural child can benefit more if reference to planting of maize seed after a certain number of furrows *kudonhedza chibage* (dropping maize seed).

During teaching of shapes, learners are asked to read the names of shapes drawn, draw each shape without referring to concrete everyday examples of shapes such as those that can be made from clay which is readily available in rural settings which the rural child play and experiment with everyday when herding cattle. Cultural activities that measure rainfall, temperature, wind direction, speed, clouds and hours of sunshine are not considered and yet they are there. Topics that refer to population quote numbers from different countries like Switzerland and yet reference can be made to individual pupils' family trees and village population up to the national figures.

Generally, mathematics is taught just for its own sake. The current researchers found out that learners are given worked examples and asked to work the rest in the same manner. Such approaches make the researchers agree with Anghilen [15] (1995:12) who asserts that school mathematics by contrast is often carried out for its own sake, unrelated to any real or particular context, and almost always involves recording using written symbols. Such approaches relegate mathematics to the textbook.

English and Shona in Zimbabwe

Shona and English exist in a dualistic relationship where English enjoys official use when compared to Shona. English and Shona respectively exist in the form of (H)igh and (L)ow with (H) representing the dominantly used language and (L) as the language of informal usage. Most Shona speakers regard (H) as superior to (L) in a number of respects. Learned words and technical terms exist mainly in (H) form which has a vast literary heritage as compared to the (L) (Ferguson [16] 1959 and Fishman [17] 1972).

In Zimbabwe, most young people and adults want to be part of the prestige surrounding the English language to the extent of being blind to the importance of their own language, which is Shona. The feeling of (H) being superior is sometimes so strong that (H) is regarded as real and (L) non-existent. This has been supported by Saville-Troiker [18] (1982) who observed that English is seen as a high language which is learnt at school while the local language which is regarded as less prestigious, is a low language learnt at home and other informal situations. In the case of Zimbabwe, English is used as a medium of instruction for all subjects and the local languages, that include Shona, are used only when the language is being taught and during informal situations.

Rural versus Urban Learners

Urban learners have better contact with the English language, the language of instruction in Zimbabwe than the rural learners. Most of them go through pre-schools and zero grades where English is used as medium of instruction, and the current environment has affected the school system in a large way. For example, due to the current Zimbabwean economic crisis, parents are forced to give incentives in monetary form to teachers in order to keep their children in school. In turn, teachers in urban schools and mission schools get much more than those in rural schools since most urban parents are employed and can spare a few dollars for the teachers of their children's incentives.

The rural set up on the other hand is quite different since most parents are farmers with very little money to spare for the teacher if any, plus the foreign currencies being used in Zimbabwe are hard to get if one is not gainfully employed. This has implications on the effectiveness of rural teaching in contrast to most urban teachers who have improvised by offering extra tuition to students who pay while their rural counterparts cannot be that flexible because most of the rural parents cannot afford extra cost for lessons. And again most urban learners have all the time to do homework and other school work as compared to their rural counterparts, because most working class urban parents hire housemaids and garden workers to help with all the work at home whereas the rural learner does all the extra chores of ploughing, cattle herding, looking for firewood and fetching water, cooking and washing dishes themselves. This reality entirely works against the rural child, starting with the language problem, to teaching methodologies, textbook examples and problems associated with access to income.

Thus, when all these problems are considered, the rural learners seem to be experiencing unique problems which call for unique intervention. However, we are aware that we cannot focus on all the mentioned problems of rural learners in this paper; we mention the problems so one can understand the burden carried by these learners. The focus here is on a methodology that takes the rural cultural environment into consideration in order to make mathematics relevant and therefore, easy to follow for the rural learners as well. Below we present sets of cultural activities and games which we gathered in the rural cultural environment and for which we suggest possible uses in a rural Shona mathematics class. Therefore we advocate that the rural learners be accorded opportunities to exploit their environment during their learning of mathematics. Below are some examples of gathered data.

Cultural Activity	**Use/s**
Games	
Nhodo	Addition and Subtraction, Sets
Tsoro/ draft	Dividing, sharing an sets
Rolling an iron wheel using wire	Balance and force
Pada/ Arauru	Balancing and Counting
See saw (using planks)	Balance and weight
Skipping	Counting and balance
Mamhuza (mud Play/Playing house)	Problem solving and shapes
Hide and seek/ scavenger hunt	Memory training and counting
Tug of war	Mass and Balance
Zai rakaora	Counting
Sarura wako	Sets
Other Cultural Activities	
Preparations of dressing accessories For cultural dances (e.g. *Jerusarema, Jikinya*)	Quantities, numbers and volume
Chivhiriri/ sling/ catapult	Direction, Speed, distance and time
Bow and arrow	angles and direction, speed
Riva	Weight and mass
Weaving /Making of mats using grass	Colours, Patterns, Shapes and problem solving
Making rid toys	Measurement, observation and designing
Riddles	Mental mathematics
Dare	Problem solving and group work
Building of round huts	Compass, area and circumference
Veldt Fires	Heat, temperature
Kurudza (Winnowing)	Force, direction
duwo (Fish nets)	mass, weight, probability, balance
mumvuri (Shadow)	Time
Making of beads	patterns and counting
Mud ovens and *mapfiya*	heat and balance
Fetching of water	balancing
Swimming	width, depth and speed
Muridzo (whistling)	sound, distance and speed
Herding cattle	Sets, time, size and colour

Shona Cultural Aspects Play in the Teaching and Learning of Mathematics

It is necessary to use students' culture to make what they learn more relevant, thus learning from the known to the unknown. This mathematically relevant cultural pedagogy is referred to as "ethnomathematics". The term, ethnomathematics, was coined by Ubiratan D'Ambrosio, a Brazilian mathematician in the 1980s who defined it generally as the way different cultural groups 'mathematise' (count, measure, relate, classify and infer), (D'Ambrosio [19] 1984: 469). In short, ethnomathematics examines how different cultural groups use mathematics. Ethnomathematics would encourage teachers to know and learn the practices of their students' families and communities and integrate these into their teaching. With ethnomathematics in mind, the researchers share what they see as the possible uses of some of the presented Shona cultural activities and games in a Shona rural mathematics class. The current researchers have encouraged some teachers in their rural areas to try injecting some of these cultural and environmental aspects in their lessons and the teachers reported that the practice increased participation by the learners during mathematics lessons. Here are some examples of activities:

- A game called *arauru* or *pada*, where a child balances on one foot and uses it to push a stone from one drawn rectangular box to the other can be used in the teaching of the concepts of balancing and counting. When playing the game, the player scores more by balancing on one foot without resorting to using the other foot and pushing the stone across squares drawn on the ground. In order to balance on one foot one has to strategically position oneself on that foot. The learners can then be asked to transfer that skill and use it when they learn the concepts of balancing, mass and weight in mathematics. They also learn to count in the process because one has to remember whether she/he will start from which box. A see-saw using a plank can also be used to teach balance, mass and weight. As the learners play the see saw game on planks, they can see that children of the same weight will balance the planks while those of different weights will enable the planks to move up and down. The skipping game may be used to teach concepts of counting and balancing. As they skip the rope they would be counting. The 'Play button' game which involves throwing a button into a ring helps in counting too.

- Mud play/Playing house (*mamhuza*) where children use clay/mud to bake cakes using different shapes of containers help in the teaching of shapes. Problem solving can be learnt when they do role plays as family members such as fathers mothers, children and the extended family members. Problems of money, food, buying and selling can be role played and the skills can be transferred into solving mathematical problems in class. Through sand and water play, children learn and practice most of the skills they need for their whole development (Stebbing, 1999:88). Mathematical skills are developed when they count, measure lengths, capacity and volume during their role play.

- During hide and seek and scavenger hunt games, learners count and memorise. They are made to remember what they have been instructed to look for. As they play hide and seek, some children hide in different places and those who remain must count to (10) before they run around looking for those in hiding. Those in hiding have to memorise what they are looking for. The same applies to those playing the scavenger game. Both the skills of counting and memorizing are crucial in mathematics.

- Tug of war involves two groups of people pulling a rope from both sides. The group pulled would follow the other and this can be used in the teaching of mass and balance.

- *Tsoro* or draft encourages pupils to divide and share when they give each other the playing stones, seeds or bottle tops and allocate each other into groups. Sets and addition is also learnt during the game. The game involves putting the stones or seeds into holes. There is a choice of the number of holes and the number of stones in each hole.

- *Zai rakaora* is a game where one people form a circle while sitting facing inside. One person holding a stone or stick moves round the circle singing “zai rakaora” and then unnoticed drops the stone behind somebody’s back. That individual should notice and run after the person who dropped the stone. This game teaches children to be observant and to concentrate.

- *Nhodo /inota* helps children to add and subtract. During the game, stones are placed in a hole. The first player throws a stone in the air and quickly tries to scoop all stones out of the hole before catching the stone again. The player then scoops one stone at a time back into the hole. During the second round, two stones are scooped back at a time and so forth until the player comes to a point where she scoops all the stones in the hole.

- *Sarura wako kadeyadeya* is a game where one sings and describes the person he/she wants to pick. This game teaches the children to be observant and learn to accommodate others during group activities. The teaching of sets can also be facilitated because the children would form groups.

Besides games, there are other items that are made or practised by rural folk that can also help in the teaching of mathematics. One of them is the preparation of dressing up accessories for cultural dances using scarves, sisal or leaf streams and bamboo hoops. They are worn around ankles and wrists and can help in the teaching of quantities, numbers and volume. They have to know the quantity that makes good sound and the number of seeds to put in a ‘*hosho’* if they are going to tie these around their legs.

Also, the making of musical instruments like the drum, jingle, *hosho*, *mbira*, *marimba*, cow horn, rattle, tambourine helps in problem solving. Some make mates using board with nails or sticks. Winding wool or hemp (*bote*) or grass around the nails help children is pattern identification and even problem solving. Weaving baskets or mates using banana leaves in stripes alternating colours or using straw or *tsanga* (reeds), orange bags, branches or wire help in the teaching of colours, patterns and shapes. Beads are made using seeds from trees or clay. This concept teaches patterns and counting.

The Shona additionally make sling or catapult (*chivhiriri/ ndande*) that they use to kill birds. This will teach them about wind direction, speed, direction, distance and time so as to aim at the object. They also make *museve* (arrow) which is also used to aim at animals during hunting. This can be used to teach angles and direction. '*Riva'* used to catch mice and even birds for meat. This goes a long way in teaching about weight and mass. Once the animal/bird triggers the big stone, it falls onto the animal.

The unity between mathematics and culture is limitless, and Shona culture is no exception, especially when we know that within the culture:

- Paper gilders or kites are made using thick grass stalks as frames, and plastic. For stabilizing, they may add a tail. From this children learn the concept of balance and weight and also learn about wind direction. Boys favour very much to make wire toys especially cars. This teaches them measuring, observation and designing.

- Making brushes/brooms using grass or reed (*tsanga*) helps children learn sets. They have to group certain type of grass or size of reeds to produce certain types of brooms. Pot making using clay helps children practice concepts such as shapes, size and numbers. There are different sizes and shapes of pots. The building of round huts can be used during the teaching of drawing circles which lead to the use of compass. The teaching of circumference and area of a circle is also made easier. Fire places are made using mud or stones, '*mapfiya'*. This teaches preservation of heat and balance.

- Predicting can be taught using examples that the Shona people believe in. An example is when the rainbow appears when it is raining and is taken to mean that the rain is going to stop. A chicken coming out during drizzle means there would be rain preparing to fall (*guti*). The Shona find shades from trees when they are eating. This concept can also explain the time of day. They know when shade is at its fullest. The length of shadows versus that of trees can be used to teach measurement and angles as well.

- Men usually meet at a place in the home, outside called '*dare'*. It is at the 'dare' that they try to solve problems. Everyone's idea and contribution is respected. This concept teaches problem solving and being able to work as a group by working towards an answer step by step. Recently families have been resettled in some A1 and A2 farms. This concept can be used to teach statistics and census.

- Veldt fires (*rutsva* in Shona) during summer are done during particular periods. This is usually early in the morning or after the sun has set. These can be used to explain heat and measurement of temperature. Fish nets can be used to explain mass, weight, balances and probability. Fishing teaches sets when they sort fish according to size, colour, shape and type. The casting of a fish line into the water helps in the teaching of length and speed. It also teaches weight. The feel of the fish line indicate to the fisherman that there is a fish caught. Winnowing, (kurudza) which is done after harvesting grains like sorghum, rice and wheat can be used to teach force and wind direction.

- Problem solving is learnt by performing certain non-taught activities. One such example is when women go to fetch water using open buckets, and they put leaves on top of the water to avoid the splashing of water. Other examples include that of quieting a crying baby by shaking one's back while carrying the baby at the back, making house cool on hot days, lighting fire without matches by making use of borrowed burning firewood or charcoal and making a box with wood and nails but no hammer. A stone can be used as a hammer. Children in rural areas swim in rivers. They teach themselves and from this they learn to float and at what speed to travel depending on length, width and depth of the dam or river and the strength of the current. When children share fruits like oranges, *mazhanje*, *matohwe* etc, they break them into pieces (zvidimbu) using their hands. This is a way of teaching fractions. *Matohwe* have shapes that show demarcations and hence the idea of fraction can easily be explained.

- The Shona way of counting after 10 (*gumi*) is very clear that its 10+1 or 10+2 i.e *gumi neimwe* (ten and one), *gumi nembiri* (ten and two) etc. This way of counting can help in the teaching of addition, multiplication and counting.

- Herding cattle can also be used to teach sets where children look for those that belong to their families and sometimes know them because of their colour. There is also time factor when they decide on time to take the cattle and goats out of and back to the kraals. Whistling (muridzo) is used when calling each other and this teaches them sound, distance and speed.

In short, we discover that mathematics can be found in all children's indoor and outdoor games and plays, in art and craft, and during their participation in household chores. Some of the pre-mathematics activities that are practiced through play are sorting, partitioning, comparing and matching, sequencing, counting, recognizing shapes, recognizing capacity, weighing, measuring and understanding time. (Stebbing [20] 1999).

Conclusion

This paper has looked at the challenges faced by the rural Shona learners in their learning of mathematics, and thus explored the possibilities of using some relevant Shona cultural activities in the teaching of mathematics. The few trials that were done showed that such approaches motivate the rural learners since they made the teaching of mathematics relevant to the lives of the learners. Therefore there is indeed wisdom in and a potential benefit in using the approach of injecting students' culture and environment into mathematics teaching in rural Shona classrooms via a culture-sensitive approach which removed the idea that mathematics learning in rural Shona classrooms is an alien phenomenon.

References

Anghilen, J. 1995. *Children's Mathematics Thinking in the Primary Years*, Cassell: London.

D'Ambrosio, U. 1992. *Ethnomathematics: A research programme on the history and philosophy of mathematics with pedagogical implications*. "Notices of the American Mathematics Society," 39, pp 83-85.

D'Ambrosio, U. 1984 "The intercultural transmission of mathematical knowledge: Effects on mathematical education." *Camninas*: UNICAMP.

Fasold, R. 1984. *The Sociolinguistics of Society*. Oxford: Basil Blackwell

Ferguson, 1959 "Diglossia" in Giglioli, P. P (ed), *Language and Social Context.* Harmondsworth: Penguin. p 232 - 251.

Fishman, J.A. 1972. "The Sociology of Language" in Giglioli, P. P (ed), *Language and Social Context.* Harmondsworth: Penguin. pp 45-58.

Hanson, C. 1994. 'Effective methods of teaching Native studies.' In K.P. Binda (Ed), *Critical Issues in First Nations Education,* (pp. 87-98). BUNTEP, Faculty of Education, Brandon University, Brandon, Manitoba, Canada.

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Hollins, E.R. 1996. *Culture in school learning: Revealing the deep meaning*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Nyota, S. and Mapara, J. (2008), Shona Traditional Children's Games, Songs and Play: as indigenous ways of knowing. (Report), *Journal of Pan African Studies*, Vol. 2. No. 4, p. 189 – 202. June 1, 2008. www.jpanafrican.com/docs/vol2no4/2.4_Shona_Traditional_Children.pdf

Saville-Troike, M. (1982), *Language in Society: The Ethnology of Communication: An Introduction*, Oxford, Basil Blackwell.

Semken, S.C. and Morgan, F. 2000. 'Navajo pedagogy and earth systems.' *The Manitoba Science Teacher,* 41(39, 7-10).

Shirley, L. 1995. Using ethinomathematics to find multicultural mathematics connections. In P.A. House and A.F. Coxford (Eds)., *Connecting mathematics across the curriculum*, (pp.34-43). Rostom, Virginia: The National Council of teachers of Mathematics, Inc.

Simard, L. 1994. Curriculum adaptation: Just do it. In K.P. Binda (Ed), *Critical Issues in First Nations education,* (pp78-86). BUNTEP, Faculty of Education, Brandon University, Brandon, Manitoba, Canada.

Stebbing, B. 1999. Learning through Play: A Manual for ECEC Teachers. In Pacey, P. H. (Ed). Ministry of Education Sport and Culture. UNICEF. Harare. Mazongororo Paper Converters. Harare.

Sudhir Kumar and Ratnalikar, D. N. (2003), *Teaching of Mathematics*, Anmol Publication, New Dehli.

Sunday Mail, 17-23, p. 2. January, 2010. Zimbabwe.

The USA National Research Council 1989.

Education Act of 1987 (amended in 1996), Harare Govt. Printers: Zimbabwe.