

*Full Length Research Paper*

# Promising environmental education practices at primary schools: Study reflections from Geography primary teachers and pupils

Johaiven Kashaigili<sup>1\*</sup> and Kalafunja Mlang'a Osaki<sup>2</sup>

<sup>1</sup>Department of Language, Fine and Performing Arts Education, The University of Dodoma, Dodoma – Tanzania

<sup>2</sup>School of Graduate Studies, St Augustine University of Tanzania, Dar Centre, Tanzania.

Environmental education continues to be a crucial component of curricula at all levels of education. Waste management remains a serious challenge in our communities and schools, which must be addressed in school and in extra curricula activities in order to reduce waste accumulation and its undesirable effect on human life. This paper describes a study that tested a model to stimulate the teaching and learning of Environmental Education (EE) in primary schools through development and trial of Pupil-Centred Approach Mind Map Exemplary Lesson Materials (PCAMM-ELM) focusing on waste management. The Wastes topic received diverse understandings among teachers. As a result, the teaching of waste management topics faces complex problems including poor waste knowledge among teachers, lack of relevant and stimulating learning materials along with use of conventional teaching approaches. The three aspects are addressed intensively in this paper. The study adopted a quasi-experimental research design in which the respondents were standard seven Geography teachers and learners from two primary schools in Dodoma Municipality. The results disclose that the material and approach applied in intervention school influenced performance, motivation and interests of teachers and pupils. Secondly, there was a reasonable change in pre-test and posttest performance of learners between the control and treatment schools, whereby in treatment school mean score was significantly different when compared to the control school. The study concludes that learners and teachers' motivation, performance and interests on practices of teaching and learning EE may be enhanced and adopted through use of the designed PCAMM-ELM accordingly. The study recommends further design, validation and development of local procedural EE lesson materials based on developing competences that update primary teachers' pedagogical knowledge in order to build a user friendly community practices for sustainable environment.

**Key words:** Education, waste, environment.

## INTRODUCTION

The environment is continually experiencing challenges and problems which in turn affect the health of living things over the earth (Kimario, 2011; United Nations Educational, Scientific and Cultural Organization

(UNESCO), 1978; Nordstrom, 2008). Studies state that despite natural calamities such as earthquakes, human beings of all ages play the large role to available problems and challenges, either knowingly or

unknowingly. These problems are in our societies at local, nation, region and global level (UNESCO, 1978). This situation makes environmental education (EE) to continue to be a crucial curriculum component at all education levels (Kashaigili, 2012; MoEC, 1995; Osaki, 1995; Kimaryo, 2011). EE is an educative process that enhances peoples' knowledge about their environment and to develop responsible environmental behavior and skills for the purpose of improving the quality of the environment (UNESCO, 1978; Nordstrom, 2008). For many years now, EE has been considered a cross cutting issue in education in many countries (Kashaigili, 2012; MoEC, 1995; Mtaita, 2007).

As it is in most local communities, primary schools in Tanzania experience similar challenges like in other countries (Kashaigili, 2012; Kimaryo, 2011; Osaki, 1995; Open University of Tanzania (OUT), 1998). Large class size and poor classroom evaluation system are also observed to be the weaknesses in past Tanzanian studies. Daily activities such as sweeping of school surrounding and smokes from burns of wastes subject school environment to soil erosion, air pollution, degradation of the beauty of the environment and endangering of human health (Kashaigili, 2012). Wastes are scattered where we live but the community plays less attention to them. Generally, we eat the stuffs of our own unfriendly practices to the environment. Waste management (WM) remains a serious challenge in our community, and intentional efforts are needed to address it in school and in extra curricula activities in order to reduce waste accumulation, along with its undesirable effects on the environment and human life. This research gap necessitated developing and testing a model to encourage teaching and learning of EE in primary schools through development of PCAMM-ELM, as a way to intervene pedagogically. Four research questions guided this study, namely: 1) how can exemplary EE lesson materials on waste management be organized to support the sequential teaching and learning of EE among learners in primary level Geography? 2) What form of waste management materials are practically feasible in normal primary school setting? 3) What change in learners' performance is possible after learning by using the new WM material and approach? 4) How effective would the designed materials and approach be in enhancing learning and attitude change?

## MATERIALS AND METHODS

This was a developmental research study (van den Akker, 1999) in which the pretest-posttest non-equivalent control group design (Wiersma, 2004) was used to compare outcomes of both the

treatment school (School I) and the control school (School C) during implementation. The study had three stages, namely: needs assessment, design and appraisal of the lesson material, piloting the material in semi controlled condition and major field testing. The major field testing process included pretesting, implementation of PCAMM-ELM, and administration of posttest. Participants included 165; 2 standard seven teachers and 163 pupils who were purposely selected because it was a standard seven Geography topic (MoEVT, 2005a, b, c). Data collection was done through interviews to teachers and students, administering a questionnaire, observation of teaching and learning process, administering tests and reviewing relevant curriculum documents including the schemes of work, lesson plans and lesson notes with a focus on objectives, teaching methods and activities, teaching resources and assessment practices to determine if they reflect actual understanding, interpretation and EE practices of teachers.. The semi-structured interview process collected opinions, feelings, attitudes and implementation practices in the trial school. The observation protocol generated classroom interaction data from all lesson development stages. A pre-retest and posttest was administered in both the intervention and control schools in order to determine whether there was a change in pupils' learning. The test comprised of six multiple choice items, six matching items and six short answers items. A semi-structured Likert scale questionnaire with six items and six open ended questions collected perceptions data from pupils in treatment school. Practicality of the designed material was determined by use of pictures. The data from questionnaire and the test were analyzed using descriptive statistics and independent sample t-test for significance of the means (pretest and posttest) between the Schools I and C. Qualitative data from semi-structured interviews were thematically analyzed. The permission to conduct the study was sought from responsible authorities and oral consent from parents whose pupils participated in the study via the office of the head teacher. The goal of the study was communicated to teachers in order to allow their willingness to take part in this study.

## FINDINGS AND DISCUSSION

**Question 1:** *How should EE exemplary lesson materials on waste management for primary schools be organized to support the sequential teaching and learning in Tanzanian primary level?*

The findings are drawn from the context analysis and the design of the exemplary lesson materials. Using the interview with primary teachers, the results showed that teachers lacked EE knowledge and skills, procedural materials, insufficient time, pre-service and in-service training, and motivation. One teacher said,

*"I failed to get EE message to communicate to my students from the syllabus;. . . there are no books. This makes it difficult in designing effective EE learning activities".*

Osaki (1995) and Kimaryo (2011) revealed similar

\*Corresponding author. E mail: tecus@saut.ac.tz.

situation to teachers. These results together with review of literature enabled us to formulate seven specifications and guidelines for the design of PCAMM-ELM and formative evaluation of lesson prototypes in this study. The design guidelines were: EE learning objectives, learners' active learning, content and pedagogical support, flexible and active learning environment, fit with the school timetable, alignment with the current curriculum and inquiry thinking. Design specifications focused on: lesson overview, intended learning objectives, preparation of the lesson, readings, subject matter, teaching strategies and learning assessment mode. Similarly, various studies design and use guidelines and specification in the design of educative exemplary materials (Kamugisha, 2013; Mafumiko, 2006; Tilya, 2003). Design guidelines and specifications shaped the designing, development and implementation of PCAMM-ELM, the learning anticipated, and formative evaluation of lesson prototypes. According to Mutebi (2000), design guidelines and specifications are identified as the teaching practices and perform similar roles.

**Question 2:** *Are the waste management materials practical in normal primary school setting?*

This part evaluated practicality of PCAMM-ELM implementation in the classroom settings. It included study appraisals from the piloting, iteration and major field implementation. Through observation and interviewing teacher and pupils, the piloting results of five lessons indicated that lesson one and four spent extra time and lesson one was less interactive. This feedback enabled reorganization by splitting lesson one and four into two, hence seven lessons as a way to maximize the lesson time. Seven lessons included: *the conception of wastes, types of wastes, sources of wastes, effects of wastes, conception of WM, waste separation and its importance and strategic techniques of WM (4Rs)*.

Pupils were observed to enjoy the lessons, showed competence, were interactive and presented well in group activities as they moved experience from lesson one to five. Teaching and learning based on PCAMM-ELM integrated teachers and pupils prior EE experiences that among them developed discussions, curiosity, hands-on activities, motivation, collaboration in learning, link of community/school WM practices and the theory. These indicators made teachers and pupils like the material and approach. All the changes were accommodated in order to allow the iteration process. The iteration of PCAMM-ELM aimed to settle challenges likely to hinder the implementation including ownership

issues. After a week of iteration exercise, the teacher and some pupils were interviewed. Both the teacher and pupils said that the material has reasonable coverage of content, clear layout, enough learning activities, helpful to teachers and pupils, and environmentally friendly lessons. The teacher claimed that time allocated in project work was short and suggested use of questions and answers to replace school surrounding visits due to limited time. The teacher said;

*'I suggest using question and answers in place of a visit around the school and group presentation. If changes accepted, lesson coverage will comply with the time'.*

The PCAMM-ELM was validated by incorporating inputs from the iteration in order to get the final prototype for the major field.

The major field implementation engaged the treatment school (School I) and control school (School C) distanced from each other for about thirty kilometers. The PCAMM-ELM was implemented in School I, and School C carried normal teaching in the same topic. The sequence started with the pretest, then PCAMM-ELM implementation, and lastly posttest administration.

## **Pre-test in School I and C: Administration and results**

Administration of pretest was conducted by the researcher, research assistant and classroom teachers in the same day in order to get the comparable pupils' entry abilities in the aspect of WM. The pretest mean scores results of between School I and C were  $M=29.09$  ( $SD=11.27$ ;  $N=102$ ) and  $M=27.23$  ( $SD=12.66$ ;  $N=61$ ), respectively and statistical testing at  $t(95)$  was 0.973, and  $p$ -value of 0.332. Having slight difference in mean scores and  $p$ -value of 0.332  $>0.05$  level of significance implied that the effect was not statistically significant. The results concur with the argument of Wiserna and Jurs (2004) that  $p>0.05$  level of significance indicates that the effect obtained is not statistically significant; therefore, similar pupils' entry abilities. Likewise, procedural and results in this study correspond with that employed in studies by Mpama (2011) and William (2006), and results disagree with Kamugisha (2010).

Classroom implementation of PCAMM-ELM sequentially started lesson one to seven. Lessons included a range of WM engaging activities that gave pupils opportunities to integrate their experiences, make presentations, project works, small groups and visiting the school to record focused things. The results from



**Plate 1.** Pupils are discussing in their groups.



**Plate 2.** Pupil presentation.  
Source: Field data (2012)

observation and interview to pupils and teachers revealed a diverse interactive learning that pupils felt free to their learning, sought EE first-hand information, developed critics and sharing of ideas or experiences (Plate 1). Pupils increased interest on lessons, built cooperating spirit and analytical and problem-solving skills to act ethically to the environment.

These findings concur with those of Kamugisha (2010), Mafumiko (2006) and William (2009) who argue that use of learner centered approach greater roles to learners than the teacher. Similarly, Tilya and Mafumiko (2010) advocate that learner centered approach help pupils learn of opportunities to work together in constructing

knowledge. Kyriacou (2009) argues that effective small group work creates a reasonable climate for a sense of security and self-confidence; and an optimum opportunity for learners to talk reflectively with each other. However, in lesson seven the pupils felt limiting time for discussions; an aspect that was also experienced in studies by Kamugisha (2010) and William (2009) who claim it when new teaching approach is used for the first time and in discussions of group work activities.

Following use of learner centred approach, pupils' freedom and integration of their experiences; two innovations emerged: making charcoal out of reject papers and welcome of waste collector.

Making of charcoal emerged from the pupil's response as a way to recycle reject papers scattered in the local environment. The researcher's question wanted pupils to mention types of wastes likely to be recycled or recovered from our environment. As the slogan that 'learning has no end', the pupil had to present how rejected papers result into charcoal. The pupil demonstrated competence, confidence, courage, and preciseness in presenting, answering questions and elaborating the process. Plates 2, 3, and 4 show the pupil's presentation.

The presentation addressed the required resources, procedures, precautions and advantages. *Resources* included rejected papers, buckets/tins/dish, water and socks. *Procedures*: 1) collect reject papers; 2) tear reject papers into small pieces; 3) put small pieced papers in the bucket/dish/tin; 4) wet pieced papers in the dish of water (wait for three days), 5) scratch watered pieced papers until it turns into porridge like; 6) squeeze the porridge-like papers into socks; 7) take out oval shape squeezed papers in any dry surface; 8) wait for at least 4 days to dry and 9) start using the 'charcoal'. *Precautions*: 1) the place must be free from water and/or humidity, 2) if bags like open cement are used to dry oval shaped papers, leave them open, and 3) the finest porridge-like produces high quality charcoal and the vice versa is true. *Advantages*: 1) It saves the cost of buying kerosene or making charcoal from trees, 2) It is environmental friendly-no smokes that pollute the environment; 3) too economical as it generates money by selling the product; 4) the charcoals burn slowly and therefore saves energy where a slow cooking foodstuff is on the cooker, 5) they are reject paper produced products in our surrounding that litters the environment, and 6) the process is so easy to manage.

Teachers and pupils were involved in touching and smelling the charcoal, asking questions and elaborations, observing the process as well as watching the burning of





**Plate 3.** Drying charcoal.  
Source: Field data (2012).



**Plate 4.** Burning the charcoal.  
Source: Field data (2012).

charcoal that also revealed their inquisitiveness. Two questions among many asked by teachers were: *'Is this type of charcoal able to cook food for a long time? Can they be extinguished by using water?'* The pupil responded that the charcoal burns slowly, is good for cooking foods that required longer time to cook and once extinguished by water it cannot burn again. This innovation left the teachers blaming traditional teaching and that most things are unfolded by thinking that pupils are not innovative.

These are some quotes:

*'...our pupils know things we don't know. I could not expect a pupil in our school and my class who are knowledgeable as I saw one girl demonstrating... teachers think pupils are unable'*

[Interview (20/4/2012, Teacher B)].

Another teacher said;

*'...I did not expect to see oval made charcoal burning but I have witnessed it...I have learnt a new thing and experience in my life from one of my pupil I teach'* [Interview, (20/4/2012, Teacher C)].

The results corroborate those of Evans et al. (1996) and Palmberg (1996) that pupils' knowledge influence positively parent environmental performance. Since the school is part of the community (Kimaryo, 2011), primary pupils can therefore act as social change agents in the home and in community (Uzzell et al., 1994).

In lesson six 'waste separation', the researcher welcomed a guest 'waste collector' in order to share experiences. Through the guest presentation, an average of 40 kg of disposed plastic and metal materials is collected every day. A kilogram of plastic bottles in the factory costs Tsh 300 and the metal materials cost Tsh 400. Plate 5 shows the presentation of the guest.

Both the pupils and subject teacher appreciated the presentation and noted various strategies of sustaining the environment. However, the pupils found that the guest earns Tsh 360,000 per month (for plastic bottles) and Tsh 480,000 (for metal materials); the entrepreneurship skills in activities that conserve the environment.

### Pupils' project presentations

Five groups of pupils presented projects precisely sourced from the market, shops, bus stand, hospital and school. The project work aimed to develop skills such as observation, investigation, interview, recording and report writing, problem solving and analysis of EE issues at their early age. The results revealed that project reports were logical and argumentative; also, there was high pupils' participation irrespective of gender and the spirit of collaboration in a friendly way. Kimaryo (2011) asserts that pupils generate knowledge and various skills when they are exposed into carrying out investigations, which are important in the sustenance of the environment. Plate 6 shows a pupil presenting a project.

**Question 3:** *Is there any change in learner's performance after learning by PCAMM-ELM?*

The results revealed that the mean scores of pre-test between School I and C were  $M=29.09$  ( $SD= 11.27$ ;



**Plate 5.** Guest presentation.



**Plate 6.** Pupil's presentation.

N=102) and  $M=27.23$  ( $SD=12.66$ ;  $N=61$ ), respectively and statistical testing using an independent sample test at  $t(95)$  was 0.973, with p-value of 0.332. When the posttest was administered, the mean score results of School I became  $M=58.41$  ( $SD=17.52$ ;  $N=102$ ) and School C was  $M=40.79$  ( $SD=11.11$ ;  $N=61$ ). The results indicated that both schools increased the mean scores in a varied deviation when posttest was compared to pretest; thereafter, an independent sample test was applied. At the significance test, the  $t(95)$  was 0 and p-value = 0.332, which implied the significant difference. The results concur with that of previous researchers, namely Kamugisha (2010) and Mpama (2011) who found tremendous rise in mean scores and significant difference between the treatment and control schools.

#### **Question 4: What are learners' perceptions on the effectiveness of the PCAMM-ELM?**

The results on the participants' perceptions with PCAMM-ELM indicated that almost all aspects were rated positively. Some of these aspects included the logical approach, linkage of theory with practice; integrating local environmental experiences in learning and teaching curiosity under the new approach. Others were freedom of sharing and participating in discussions. The results concur with those of Kafanabo (2006) and William (2009) that students became interested and the learning was made easy due to activity-based materials. The questionnaire showed that learning through small groups, project activities, and presentation of group's ideas before the class; activity-works such as transforming reject paper into charcoals, freedom in classroom lesson activities, close and collaborative interaction among themselves was very promising. This agrees with Osaki (1999, 2000), Oser (1986) and several others who discourage use of traditional teaching because it involves pupils less and is less stimulating and motivating.

#### **Conclusion**

This study demonstrates that exposing pupils to new ideas, procedural resources, appropriate teaching methods and opportunities not only updates their understanding but also broadens responsiveness for them and encourages change of behavior and attitudes. Adherence to these aspects leads to freedom in learning; interactivity develops thinking and skills of conserving the environment. With PCAMM-ELM, teachers and pupils became empowered to change their practices of teaching and learning in their classrooms and social agent of EE issues in the community. The study recommends encouragement of more primary teachers to try out this approach in EE related topics. It also encourages curriculum developers to design, validate and develop procedural lesson materials and update teachers' pedagogical knowledge through in-service and pre-service training. It also suggests that similar studies involving several intervention and control schools (urban, rural, religious, private, government) can be conducted to determine whether they would get results comparable to the present study.

#### **CONFLICT OF INTERESTS**

The authors have not declared any conflict of interests.

## ACKNOWLEDGEMENTS

The authors appreciate all the teachers and pupils who took part in this study and the Dodoma Regional Education Office for allowing this study to be conducted in the schools.

## REFERENCES

- Evans SM, Gill ME, Merchant J (1996). School Children as Educators: The Indirect Influence of Environmental Education in Schools on Parent's Attitudes towards the Environment. *Journal of Biological Education* 30(4):243-248.
- Kafanabo E (2006). An Investigation into the Interaction between Multiple Intelligences and Performances of Learners in Open ended Digital Learning Class, Pretoria, Unpublished Doctoral dissertation, University of Pretoria.
- Kamugisha NR (2010). Implementing A learner-Centered Approach in Geographical Research Techniques at A' Level, Unpublished MA.Education, University of Dodoma.
- Kashaigili J (2012). Enhancing the Teaching and Learning of Environmental Education in Primary Schools: Design of Materials for Primary School Teachers in Tanzania, M.A Ed dissertation, University of Dodoma.
- Kimario LA (2011). Integrating Environmental Education in Primary School Education in Tanzania: Teachers' Perceptions and Teaching Practices. PARGAS, Abo Akademi University Press.
- Kyriacou C (2009). *Effective Teaching in Schools: Theory and Practice*, 3<sup>rd</sup> Edition, Cheltenham, Nelson Thornes Ltd.
- Mafumiko F (2006). Micro-scale Experiments as a catalyst for Improving the Chemistry Curriculum in Tanzania, Ph.D Thesis, University of Twente.
- Ministry of Education and Culture (MoEC). (1995). *Education and Training Policy*, Ministry of Education and Culture, Dar es salaam.
- Ministry of Education and Vocational Training (MoEVT) (2005a). *Muhutatasi wa Jiografia kwa Shule za Msingi*, Dar es salaam.
- Ministry of Education and Vocational Training (MoEVT) (2005b). *Muhutatasi wa Stadi za Kazi kwa Shule za Msingi*, Dar es salaam.
- Ministry of Education and Vocational Training (MoEVT) (2005c). *Muhutatasi wa Sayansi kwa Shule za Msingi*, Dar es salaam.
- Mpama D (2011). A Study of the Influence of Teaching and Learning Practices on Classroom Engagement and Student's Performance in Advanced level Secondary School Science Classrooms. M. A. Ed dissertation. University of Dodoma.
- Mtaita UY (2007). Stakeholders Perception of their Participation in Environmental Education in Tanzania. Unpublished Thesis submitted in Partial Fulfillment of the Requirements for the Degree of Master of Education, Waikato University, New Zealand.
- Mutebi PM (2000). *Environmental Education Sourcebook: A Teaching and Training Guide*, Pan Africa Books, Nairobi.
- Nordstrom HK (2008). Environmental Education and Multicultural Education-Too Close to Be Separate?, *International Research in Geographical and Environmental Education* 17(2):131-144.
- Open University of Tanzania (OUT) (1998). *Environmental Education: OED 106*, The Open University of Tanzania, Dar es salaam.
- Osaki KM (1995). Environmental Education as an Interdisciplinary/Multidisciplinary subject, Unpublished Paper Presented at the Environmental Education Workshop at Morogoro Hotel.
- Oser F (1986). Moral Education and Values Education: The Discourse Perspective". in Wittrock, M. (eds.), *Handbook of Research on Teaching* pp917-914, Macmillan Pub, New York.
- Palmberg IE (1996). The Environmental Actors and Informants" in F. M. Molero (Ed), *Proceedings of the II International Congress on Environmental Education*, Universidad Complutense De Madrid.
- Tilya F (2003). Teacher Support for the Use of MBL in Activity-Based Physics Teaching in Tanzania, PhD Thesis, University of Twente.
- United Nations Educational, Scientific and Cultural Organization (UNESCO) (1978). The Tbilisi Declaration. *Connect.* 111(1):1-8. UNESCO-UNEP Environmental Education Newsletter.
- Uzzell DL, Davalon J, Fontes PJ, Gottesdiener H, Jensen BB, Kofoed J, Uhrenholdt G, Vognsen C (1994). Children as Catalyst of Change: Report of an Investigation of Environmental Education. Final Report", Brussels, European Commission.
- Van den Akker J (1988). The teacher as learner in curriculum implementation. *Journal of Curriculum Studies* 20(1):47-55.
- Wiersma W, Jurs SG (2004). *Research Methods in Education: An Introduction*, 8<sup>th</sup> Edition, Allyn and Bacon.
- William F (2009). Design and Trial of Activity-Based Approach and Materials on Acids, Bases and Indicators for Improving Teaching and Learning of Chemistry in Tanzanian Secondary Schools, M. Ed Dissertation, University of Dar es Salaam.