International Journal of the Physical Sciences Vol. 6(8), pp. 2169-2174, 18 April, 2011
Available online at http://www.academicjournals.org/IJPS
ISSN 1992 - 1950 ©2011 Academic Journals

Full Length Research Paper

Contextualization of science knowledge: A case study of Malaysian and Nigerian serving and pre-service teachers

Kunle Oke Oloruntegbe[1], Gazi Mahabubul Alam[1]*, Sharifat Norul Akmar Syed Zamri[1], Christopher Kalu Okwun[1], Talukder Golam Rabby[2] and Salami Dada Kareem[2]

[1]Faculty of Education, University of Malaya and INSTED, IIUM, Kuala Lumpur, Malaysia.
[2]Faculty of Economics and Administration, University of Malaya, Malaysia.

Accepted 24 March, 2011

This study was meant to ascertain how well Malaysian and Nigerian university science education undergraduates and their counterparts (already on the field) contextualize science concepts they are learning or have learned and how well they can help the students they teach connect science with real-life in their teaching. The designs employed in the study were survey and causal comparative. The sample consisted of 240 subjects, 120 from each country drawn from serving and pre-service teachers from Malaysia and Nigeria using stratified sampling technique. Two research questions were raised to guide the study and two hypotheses formulated for testing. A validated instrument labeled contextualization of science knowledge was used for data collection. The psychometric properties and the reliability coefficient of the test were determined for content and construct validity through a pilot study. The instrument was administered and the data collected were analyzed using t-test. The findings are that: a large proportion of the respondents could not contextualize science since the total mean scores of the entire sample are less than half, there was a significant difference in the contextualization of science knowledge among the undergraduates with the Malaysian sample performing better and no significant difference among the serving science teachers.

Key words: Contextualization, science knowledge, social, cultural and religious variables, economic development, infrastructural development.

INTRODUCTION

In spite of the notable breakthroughs in science and technology, the problems the world is facing are of equal magnitudes (Alam and Khalifa, 2009; Oloruntegbe et al., 2010; Alam et al, 2011). Talk about diseases ravaging the entire human race, the fluctuations of global climates resulting in disasters in various parts of the world and economic downturn, the list of abilities is as long as that of inabilities of scientists and technologists in making life worth living on the earth. These inabilities might not be unconnected with the ways the young people of today conceptualize science knowledge, skills and attitudes in solving problems of daily living and in decision making (Alam, 2011). The situation may not be that different with the teachers teaching these young ones (Haque et al., 2010).

Studies like those of Djalo (2004), Sjoberg (2005) and Alam (2011) remind us that these young ones are no longer interested in science, particularly in developing countries (Alam et al., 2010d; Orlando, 2004). Enrolments in chemistry, one of the enabled sciences, are in decline in the upper class with serious implications for social and economic development (Oloruntegbe et al., 2010; Alam et al., 2010c; Watters, 2004). Hardworking scientists are no longer role models but football players, film stars and pop artists (Orlando, 2004). The image of a conscientious and diligent scientist of the past is gradually becoming a stuff of history (Alam et al., 2011; Sjoberg, 2001). The eagerness to use new technology is not matched with eagerness to study the disciplines that underlie them (Alam, 2009a; Sjoberg, 2005). Of more grave concern too is the absence of the virtues and

*Corresponding author. E-mail: gazimalamb@yahoo.com, gazi.alam@um.edu.my.

ethics of science and technology in the lives of graduates from our schools (Connect, 2004). The situation pictured above is not helped by the way science is being delivered in schools. The development of scientific ways of thinking is abandoned in favor of the learning of definitions and standard procedures (Zaidan et al., 2011; Alam et al., 2010c; O'Connor, 2003). These have provoked a barrage of questions. What is the purpose of the science we teach in schools? How relevant is it to the students' daily lives? How much of an influence does science have on the daily lives of people in our society? Are we giving students tools to make responsible decisions in future? Are we emphasizing there is a link between decision making and science?

A search for answers to these questions is the main concern of this paper. How are the present crop of science teachers and the ones undergoing training in our colleges and universities conceptualizing science knowledge that they themselves are imparting to the students? Can we see what the science teachers' teach in their own lives?

There have been calls by many nations on people to imbibe sound ethics and attitudinal change in daily lives, particularly in workplace (Alam et al., 2009a). Wherever and whenever school graduates fall short of expected standards, the school system and teachers particularly science ones, are singled out for blame for not doing enough (Alam et al., 2010c; Alam and Hoque, 2010; Alam and Khalifa, 2009; Alam, 2009b). The shortcomings that provoke these calls are evident in Malaysia and Nigeria and many other developing nations (Alam et al., 2010c; Oloruntegbe et al., 2010a, b). Thus a comparative evaluation study of contextualization of science among teachers of these two nations becomes imperative. The teachers being the major determinants of success and lack of it at the foundational levels of science teaching need be evaluated. Such evaluation will reveal what directions efforts should be concentrated to remedy the shortcomings. This is the focus of this paper.

LITERATURE REVIEW

Cognitive scientists and science educators over the years have advocated the overall development of the child (Dewey, 1933; Piaget, 1965; Swaim et al., 1974). Hence, phrases like balanced curriculum, child-centered teaching (Allens, 2009; Katsuko, 1995; Swanson, 2008; Yeung, 2009), humanistic approach to teaching (Alam, 2009b) and the development of the total child are commonly heard or read about in intellectual gatherings and meetings (Rabby et al., 2011). There is no doubting the fact of excellence of these and several other reforms and the efforts the various nations are making in implementing them (Alam et al., 2010d; Oloruntegbe et al., 2010a). However, that science remains to be seen in the lives of students inside and outside the classroom is still evident (Sjoberg, 2005; Orlando, 2004). Kroto (2008) submitted that the society becomes less-and-less aware of what science can do even as we become more ever dependent on scientific and engineering advances. As we are going towards the second decade of the 21st century, the need thus becomes ever more urgent that everyone should have a deeper understanding of the way scientific principles underpin our lives (Alam, 2011; Alam et al, 2011).

The ability of science students to make rational decisions about simple but consequential matter like what we eat and drink, how we relate to the environment making sure we do not render it unable to support us, how we go about solving daily problems without infringing on the rights of others and that of the society, how we use but not abuse scientific and technological products, how we contribute to intellectual and scientific debates, the display of appropriate scientific habits of mind like honesty, responsibility and perseverance go to tell if our students have actually imbibed the science culture or not. This calls for evaluation and a comparative one among nations' nation builders (the science teachers) (Alam, 2011; Haque et al., 2011; Haque et al., 2010). This will serve to show what directions in science education we are to follow next as we move to the next decade. Should we embark on mass training, retraining or outright system overhaul?

No doubt science is a universal discipline, applying it to solve problems peculiar to certain areas demands consideration of cultural milieu. Malaysia and Nigeria have many things in common. Though they belong to different races almost the same climate, agricultural products, feeding habit and religious beliefs can be found in the two settings. Additionally the curricular they operate for primary and secondary science look the same. Would these social, cultural and religious variables influence the way the sample selected contextualize science knowledge among serving and pre-service science teachers? Bearing in mind these cultural resemblances, this study is designed to see if the outcome would follow the same patterns of resemblance.

THE ROLE OF SCIENCE IN DEVELOPMENT

The role of science in development may seem remote. The conventional concept of the development effort is a focus on essential basics: basic needs, basic commodities, basic services and basic infrastructure. Science, by contrast, implies options and higher level discretionary expenditure — areas of interest that might be attended to after the basics have been satisfied. Yet science has a high impact on development and is vitally relevant to the development process in two ways:

1. It can ameliorate the deprivation associated with poverty and low level development.

2. It can produce and expand wealth.

Several of the Millennium Development Goals depend on scientific or technological attention to be met. There are also important aspects of the development mosaic outside the MDGs that are highly responsive to science, such as human reproductive health and energy.

The aim of development assistance, and the intention of the development community, is to move people out of deprivation and insure that they do not lapse back into it. People in poor countries are generally deprived of food, health, a sustainable environment and opportunity. Science and technology are powerful tools for providing these things. The capacity of science to improve food and health conditions has been well established. Environmental sustainability is an issue of broad, global importance; but localized problems — such as deforestation, clean water and sanitation — are harder on the poor than on other people because the poor have less control over their immediate surroundings than do other people. Opportunity refers to meaningful available choices that enable economic well-being — choices on education, employment and mode of living. Scientific and technological applications to reduce poverty and ease deprivation are on-going in various centers in sometimes seemingly innocuous or even obscure ways.

PROBLEM STATEMENT

So far, literature is replete for calls and curriculum reforms for the development of science knowledge, skills and attitudes. There have been local and international calls too. However, not much has been done on whether students could actually contextualize these science learning outcomes outside the classrooms in real-world life, work place, homes and the society at large (Alam, 2011; Alam et al., 2011). For the science teachers, it is always a taken-for-granted affair that they have not only developed science knowledge, skills and attitudes sufficient enough to discharge their duties of teaching the young ones but that they have been manifesting the same at work place and in their lives (Alam et al., 2010a; d). This is not always a correct position since many teachers have been found to be so grossly bereft of scientific ideas outside the classrooms and in their real-world lives (Hoque et al., 2010; Alam et al., 2010c). Bulte et al. (2006) found that it is quiet difficult for even experienced teachers to link an introductory context with chemistry content. On the other hand, Bower (2005) also submitted that the problem with public science education is that a large percentage of teachers are incompetent and are under-motivated to teach science because they do not understand how exciting it is. Not knowing how exciting science is means that they down play or could down play the importance and potency of science in transforming the society and its citizens. A study designed to contextualize science knowledge among serving and pre-service science teachers to ascertain the authenticity or otherwise of these claims is therefore very important. What makes the study all the more important still is that there has been the paucity of cross-cultural comparisons in this area. The authors chose a comparative study of Malaysian and Nigerian samples. It is the belief of the authors that this kind of study can lead to curriculum reform that could meet the standard of internationalization and globalization of science education as well as motivating local innovations. The problem of the study simply put is, how would Malaysian and Nigerian serving and pre-service teachers contextualize science knowledge in lives in and outside the classrooms?

Research questions

The following questions were raised in this study:

(i) How would Malaysian and Nigerian serving and pre-service teachers contextualize science knowledge in their lives in and outside of classrooms?
(ii) Would there be any difference between Malaysian and Nigerian serving and pre-service teachers in their contextualization of science knowledge?

Research hypotheses

The following hypotheses are formulated for testing in the study:

(i) There is no significant difference in contextualization of science knowledge between Malaysia and Nigerian pre-service teachers.
(ii) There is no significant difference in contextualization of science knowledge between Malaysia and Nigerian serving teachers.

METHODS

The research design employed is casual comparative design since the variable measured already existed within the teachers and students. The population of the study was made up of serving and pre-service science teachers in Malaysia and Nigeria. The serving teachers are those on the field teaching science in secondary schools, while the pre-service ones are science education undergraduate students in universities in the two countries. The sample was made up of 240 subjects in all, 120 from each country. Stratified sampling technique was used to draw samples in both cases. The science education undergraduates were drawn from both national and state universities in similar proportion as in serving teachers. t-Test was used for data collection. The test was meant to measure how the subjects conceptualized science knowledge. In other words it measured the application of science knowledge to real world life. A “panel of expert’s” technique was employed in establishing the content and construct validity. This

Table 1. Mean and standard deviation of pre-service and serving science teachers.

Variable	n	Mean	Standard deviation
Pre-service teachers	120	11.4	3.147
Serving teachers	120	9.78	2.836

Table 2. Mean, standard deviation and t-test analysis of Malaysian and Nigerian pre-service science teachers.

Variable	Mean	SD	n	df	t_{value}	$t_{critical}$	Sig. (2-tailed)
Mal pre-service	12.6000	3.36683	60	118	4.356	1.96	0.000
Nig pre-service	10.2000	2.83919	60				

P< 0.05.

Table 3. Mean, standard deviation and t-test analysis of Malaysian and Nigerian serving science teachers.

Variable	Mean	SD	n	df	t_{value}	$t_{critical}$	Sig. (2-tailed)
Mal serving	9.9000	3.39341	60	118	.4.43	1.96	0.659
Nig serving	9.6667	1.91042	60				

P< 0.05.

involved subjecting the instrument to analysis by experts (three academics) in the field that the instrument examines –science education and three in tests and measurement. The psychometric properties determined for internal consistency of the test include item difficulty and item discrimination indexes. The same data was also analyzed for reliability using Kuder-Richardson Formula 20. The coefficient of reliability was found to be 0.84.

RESULTS

The data collected from the test were subjected to statistical analysis and t-test. Scores on specific items were analyzed using descriptive statistics. This was meant to show the trend in characteristic behavior of the subjects on factors demanding the daily use of science. The results were presented as answers to research questions and tests of hypotheses.

To answer the first research question; do Malaysian and Nigerian serving and pre-service teachers contextualize science knowledge in their lives in and outside of classrooms, descriptive analysis was employed. The mean scores and standard deviation of the entire subjects are analyzed and presented in Table 1. The mean scores of both groups of subjects were less than half of the total obtainable score which is 25. Since the mean scores are less than half, it can be said that a large proportion of the subjects could not contextualize science thus answering research question one.

H_1: There is no significant difference in the mean score of Malaysian and Nigerian Pre-service science teachers. The t-test result of this analysis is presented in Table 2 where it shows that the null hypothesis is significant (rejected calculated value being greater than critical value, 4.356>1.96). This means that there is a difference in the mean score of the two groups making Malaysian subjects superior to their Nigerian counterparts in their contextualization of science knowledge.

H_2: There is no significant difference in the mean score of Malaysian and Nigerian serving science teachers. The t-test result of this analysis is presented in Table 3. From the table, it can be seen that the null hypothesis is not significant (that is the hypothesis shows no significant difference and is upheld since the calculated t-value is lesser than the critical t-value). However, looking at the two means show that the Malaysian sample has a greater mean score, but the score is not statistically significant.

Combining and considering the data on Tables 1 to 3, the mean scores of the pre-service science teachers are greater than those of their serving counterparts in the two locations, although there is no hypothesis formulated and tested to ascertain the significant difference.

DISCUSSION

Whereas science is studied and practiced world wide, there are situations where social, cultural and religious factors influence the way science is learned and used by students. Economic and infrastructural development of a nation also plays an important part in students' conceptualization of science (Alam and Khalifa, 2009; Alam, 2009b; Sjoberg, 2001, 2005). Samples from both nations fall below expectation in their contextualization of science knowledge. Although Malaysia and Nigeria share similar religious and cultural beliefs, the former has a relatively larger and more widely distributed Islamic population than the latter. These common factors might not be largely responsible for the difference in performance on contextualization of science knowledge revealed on Tables 1 to 3, but economic and infrastructural development might be. This is because there is a marked difference observed in the infrastructural development of the two nations, Malaysia being more developed. This in turn has produced remarkable difference in science teaching facilities and quality of students, teachers and teaching between the two nations. Further analysis of a few of the questions on recycling of plastic wastes and environmental variables shows the Malaysian sample to be more environmentally conscious than their Nigerian counterparts. Whereas there is a deliberate effort to control and recycle waste in the former, the same cannot be said of the latter. This might have contributed to the difference in performance between the two samples shown in Tables 1 to 3. Contrastly, students in Malaysia failed to apply science knowledge in their sugar intake. In spite of being very good in nutritional science, the amount of sugar intake and the associated health consequences are greater in the area (American Academy of Child and Adolescent Psychiatry, 2008). This observation might influence the result in a way.

Conclusion

It can be seen from the study that a large proportion of the students of both countries could not contextualize science. However, there was a difference in the scores of both samples. The Malaysia sample showed better application of science knowledge to their daily lives than their Nigerian counterparts. This difference could be attributed more to the disparity in economic and infrastructural development of the two nations than to social, cultural and religious factors. Social, cultural and religious factors might influence the way students learn and use science but economic and infrastructural development will seem to be a more prevailing factor.

ACKNOWLEDGEMENT

We greatly acknowledge the University of Malaya who funded the research from which this article was derived.

REFERENCES

Alam GM, Hoque KE, Siraj S, Ismail L (2011). The Role of ICT in Business Ethics Courses: Evidence from Bangladesh and Malaysia, Afr. J. Bus. Manage., (In press).

Alam GM (2009a). The Role of Science and Technology Education at Network Age Population for Sustainable development of Bangladesh Through Human Resource Advancement. Sci. Res. Essays, 4(11): 1260-1270.

Alam GM, Khalifa MTB (2009). The Impact of Introducing a Business Marketing Approach to Education: A Study on Private HE in Bangladesh. Afr. J. Bus. Manage., 3(9): 463-474.

Alam GM, Hoque KE, Rout GK, Priyadarshani N (2010a). Who gains from EFA–State business of education or private higher education business in developing nations? A study to understand the policy impact in Bangladesh. Afr. J. Bus. Manage., 4(5): 770-789.

Alam GM, Khalifa MTB, Shahjamal MM (2009a). Return from education system in Bangladesh: An investigation on comparative flashback scenario. Afri. J. Bus. Manage., 3(10): 567-575.

Alam GM (2009b). Can governance and regulatory control ensure private higher education as business or public goods in Bangladesh? Afr. J. Bus. Manage., 3(12): 890-906.

Alam GM (2011). A further editorial guideline for writing manuscript in the field of social science: A special perspective for African Journal of Business Management (AJBM). Afr. J. Bus. Manage., 5(1): Editorial.

Alam GM, Haque KE, Khalifa MTB, Siiraj SB, Ghani MFBA (2009b). The role of agriculture education and training on agriculture economics and national development of Bangladesh. Afr. J. Bus. Manage., 4(12): 1334-1350.

Alam GM, Hoque KE (2010b). Who gains from “Brain and Body Drain” Business -Developing/developed world or individuals: A comparative study between skilled and semi/unskilled emigrants, Afr. J. Bus. Manage., 4(4): 534-548.

Alam GM, Hoque KE, Oloruntegbe KO (2010c). Quest for a better operation system in education: Privatization and teacher educationalization or voucherilization glimpsing from consumer and product perspectives. Afr. J. Bus. Manage., 4(6): 1202-1214.

Alam GM, Ismail KEHL, Mishra PK (2010d). Do developing countries need Education laws to manage its system or are ethics and a market-driven approach sufficient? Afr. J. Bus. Manage., 4(15): 3406-3416.

Allens M (2009). Do Learners Really Need Learning Objectives? Bottom Line Performance Inc. American Academy of Child and Adolescent Psychiatry (2008) Obesity in children and Teens. The Campaign for American Kids.

Bower JM (2005). Scientists and Science Education Reform: Myths, Methods and Madness. A Publication of National Academy of Science, Washington DC, 2001.

Bulte MSA, De Jong O, Pilot A (2006). Empowering teachers for designing context-based chemistry education. In I. Ejlks & B. Ralle (Eds). Towards Research-based Science Teachers Education, Aachen: Shaker Verlag, pp. 159-170.

Connect (2004). Ethics of Science and Technology. UNESCO Int. Sci. Technol. Environ. Educ. Newslett., XXIX: 3–4.

Dewey J (1933). How we think: A restatement of the relation of reflective thin king to the educative process. Lexington, MA:D.C. Health and Company.

Djalo AB (2004). Science Education in Danger. Education for Today: The Newsletter of UNESCO's Education Sector, No. 11.

Hoque KE, Alam GM, Shamsudin F, Akbar SZA, Moktharuddin N, Fong YS (2010). Impact of foreign teachers' recruitment on higher education: An analysis at Malaysian standpoint. Afr. J. Bus. Manage., 4(18): 3937-3946.

Hoque KE, Alam GM, Ariff MRBM, Mishra PK, Rabby TG (2011). Site-based Management: Impact of leader's roles on institutional improvement. Afr. J. Bus. Manage., (In Press).

Kasuko H (1995). Teacher-centered and child-center pedagogical approaches in children's learning. Education, p. 115.

Kroto H (2008). One Comment on Episode 17 – Sir Harold Kroto on Science Education. Frey Scientific.

O'Connor JP (2003). Innovations in Science and Technology Education. UNESCO Publications, Paris, Vol-VIII.

Oloruntegbe KO, Akinsete AM, Ayeni EO, Odutuyiand MO, Alam GM (2010a). Rethinking development and sustainability of African economy: The roles of science education. Afr. J. Bus. Manage., 4(6): 811–819.

Oloruntegbe KO, Zamri SNAS, Saat RM, Alam GM (2010b). Development And Validation Of Measuring Instruments Of

Contextualization Of Science Among Malaysian And Nigerian Serving And Preservice Chemistry Teachers. Int. J. Phys. Sci., 5(13): 2075–2083.
Orlando H (2004). Focus: Science Education in Danger. Newslett. UNESCO's Educ. Sector, October-December, 2004, 11: 4.
Piaget J (1965). The Moral Judgement of the Child. Free Press.
Rabby TG, Alam GM, Mishra PK, Hoque KE, Fredericks IJ, Nair S (2011). Different Economic and Policy Perspectives in Micro Population for Sustainable Development: A Study of the Haor Livelihood in Bangladesh. Afr. J. Bus. Manage., (In press).
Sjoberg S (2005). Young People and Science Attitudes, Values and Priority: Evidence from the Rose Project. A Keynote Presentation at European Union's Science and Society Forum, March 8–11, 2005, Brussels.
Sjoberg S (2001). ROSE: The relevance of science education. A comparative and cooperative international study of the contents and contexts of science education. [Online] http://folk.uio.no/sveinsj/ROSE_files.htm.
Swaim EE, Skinner BF, Carl RR (1974). on Behavior and Education. Oregon ASCD Curriculum Bull., 28(324) August.
Swanson C (2008). Child-Centered Learning: Are We Going Too Far? In Education Practice and Education Theory, 5 Comments. Senechal, D. Eds.
Yeung SYS (2009). Is student-centered pedagogy impossible in Hong Kong? The case of inquiry in classrooms. Asia Pacific Educ. Rev., 10(3): 377–386.
Zaidan AA, Ahmed NN, Karim HA, Alam GM, Zaidan BB (2011). Spam Influence on the Business and Economy: Theoretical and Experimental Study for Textual Anti-spam Filtering Using Mature Document Processing and Naïve Bayesian Classifier Afr. J. Bus. Manage., 5(2): 596-607.