

**CONDUCTING SCHOOL-BASED  
ACTION RESEARCH ON  
MAINSTREAMING GENDER  
IN STM EDUCATION**

**BY**

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## **INTRODUCTION**

One of the clearest indices of a society's intellectual health is the strength of its science and mathematics education. These are proven catalysts for developments in scientific research and industrial technology, and ultimately lead to a more diverse and robust economy.

On this premise, the Commonwealth Secretary General, Don McKinnon once remarked in one of the international discourses, "If you exclude women, you diminish democracy and reduce development. If you want more development, include women in decision making". Obviously, involving women and men in Science, Technology and Mathematics (STM) education will bring about a holistic national development. Available research has indicated that girls' attitudes toward science, their achievement and experiences in science, decline considerably during high school (Mishra et al, 2007). Notable factors like inappropriate pedagogy, inhibiting learning environment, unapproachable faculty, fast pace of curricula, excessive work load and insufficient faculty help, lack of critical mass of women in science, dearth of role models etc are some of the structural or cultural inhibitions exerting on girls with poor attitudes to STM (Ekpo, 2003, Welde Laursesn and Heather, 2001).

Female are thus more likely to experience mathematics and science anxiety than the males. The males would exhibit greater confidence in their mathematics and science abilities because stereotypical images of males as scientists have given them an air of mastery and confidence.

Evidence of a science gender gap has been established by research evaluating the population of professionals in the academic fields of science and engineering (De Wander, 2002). Available research has generally supported the conclusion that there are no biological, neurological, or genetic factors at work in the creation of scientific gender disparity. Rather, a combination of elements have combined to make it

more difficult for girls to train for and maintain high-achieving scientific career. These factors include social stigma of the sciences as “masculine”, institutional bias in the scientific community and pressures related to starting a family.

Two concepts in this paper require thorough explanation and these are:

- Action Research
- Mainstreaming Gender

### **Action Research**

Action Research (AR) is a dynamic process in which research, action, participation and evaluation interact. Breakwell et al (2006) regards it as a process that marries thinking, research and action in changing things. AR is said to have emerged specifically from attempts to “bridge the gap between theory, research and practice” (Holter and Schwartz – Barcott, 1993). Unlike what is obtained in participant observation, the researcher involvement in Action research is quite high because the researcher participant is integral. Such that theory can emerge from their practice and the researchers are empowered. Thus, the hall mark of this research design is the level of participation of the stakeholders in the research experience. Reason (1988) observed a new paradigm research in this type of research design where distinction between teacher and participant can blur to the point of disappearance; such that all who participate in the research become both co-researchers and co-subjects.

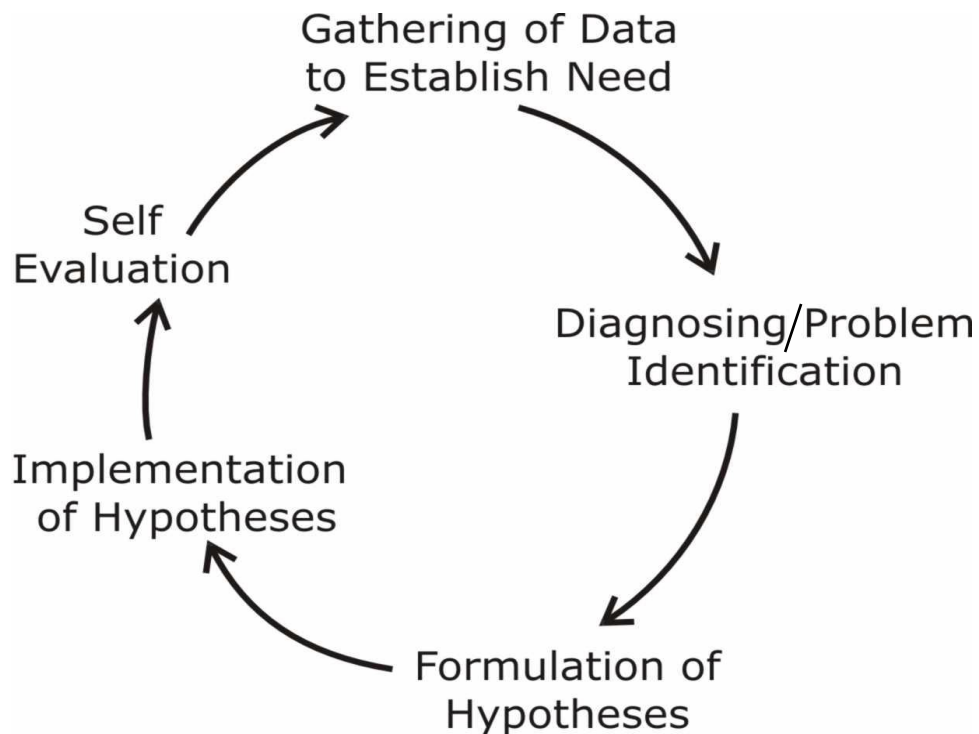
- From the literature, AR has been classified severally. Four models have been identified thus:
  - Diagnostic
  - Participant
  - Empirical
  - Experimental

(Rapoport, 1972)

- Action Research is similarly classified into three groups:
  - Technical
  - Practical
  - Emancipatory
 (Carr and Kemmis, 1972)
  
- Breakwell et al (2006) classified AR into four broad based groups as follows:
  - The experimental approach which is also referred to as the Rational social management by the founder, Lewin kurt;
  - The organizational approach which is associated with the Tavistock Institute of Human Relations and drawing heavily on psychoanalytic rather than on experimental models;
  - The empowering approach. This model is associated with community development projects because it emerged as part of United Kingdom (UK) government's programme to explore causes of poverty and other social problems; and
  - The professionalizing approach is associated with research in education and Nursing because it emerged as a means of closing gaps between theory and practice. With these modes, theory is emerging from practice and empowering teachers and nurses as researchers.

However, Reason and Bradbury (2001) noted that "this simple classification system cannot remotely do justice to the many and complex ways in which Action Research has evolved." In Action Research, a teacher would definitely start by collecting data; then analyze his/her classroom practice and aim, if possible, to compare his/her perceptions with those of pupils or other observers. The aim of such analysis is to establish need by identifying issues for intervention and possible

development. Once analysis has been done, then a problem or issue would be selected and a strategy identified for improving practice. With this, hypothesis would then be introduced by the teacher into his/her teaching. Fresh data is collected and analyzed. What is evolved eventually is a cycle of research, action, participation and evaluation.



### **ACTION RESEARCH CYCLE**

#### **Distinguishing Criteria Of Action Research: Implication For School Based Research**

- Action Research is educative. Lately the educative focus has moved to “awareness raising” and empowering professional groups or oppressed groups. Reason and Bradbury (2001) say at its best, AR is a process that explicitly aims to educate those involved to develop their capacity for inquiry both individually and collectively.

- It deals with individuals as members of social groups. They may be selected by the researcher or may be self selecting; they may be closed groups or open to admit participants after the research process has begun.
- Action Research is problem focused, content specific and future oriented. The researcher is directly and immediately involved in a real life problem situation. By problem here it may not mean that there is anything really wrong. Rather it could mean there is need for change. It raises the issue of who identifies the need. Need could come from job market, societal needs or self evaluation.
- AR involves a change intervention. Intervention may be identifiable real world actions as in the change experiment of health initiatives.
- It aims at improvement. Again, one may ask who defines what constitutes improvement? It could be assessed by the participants.
- AR involves a cyclical process in which research, action and evaluation are interlinked. Lewin Kurt articulates a cycle of activities that continues to be the crux of AR – A cycle of planning, action and fact finding about the result of the action.
- AR is founded on a research relationship in which those involved are participants in the change process.

Individuals involved in Action Research may be viewed in the same light as Tempered Radicals (Meyerson, 2005). Tempered radicals are not just a group or category of people or a state quality, but as a way of being, a stance toward a dominant culture, organisation or profession. A tempered radical has to be both an “insider and outsider”, working to fit into what is currently acceptable as well as working to change norms of acceptability for progress. It is about rocking the boat, but not so hard that one falls out of it. Often Action Researchers like tempered radicals lead change

more deliberately by initiating small wins that result in new relationships, understandings, and patterns of behaviour. These purposeful small acts that fuel the learning system are necessary to create knowledge reservoir for sustainable change.

### **Mainstreaming Gender**

Mainstreaming on the other hand has been defined as the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes in any area and at all levels (UN, 1997). It is a globally accepted strategy for promoting gender equality. Through this strategy, both men and women's issues, concerns and experiences are made an integral dimension in the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres of human life.

### **Significance of Mainstreaming Gender**

Despite all global efforts to keep STM gender neutral, all curricular and teaching / learning materials on science and technology are still loaded with stereotypical images of males and females. These stereotypes, including media images, that show only men as users of science, do influence parents' expectations for their children, and the students' expectations of themselves when faced with such pressure. Girls, more than boys, often avoid science courses because they lack confidence in their ability to pursue science based careers, and they do not wish to go against the expectations of teachers, peers, and parents.

Beside the decreasing interest of girls in science as they move from primary through secondary schools, there is that perception of the irrelevance of science to their lives. Since science is perceived as a masculine realm, males tend to be more inclined to offer assistance to less able peers, and in the process, they learn more science themselves

thereby widening the existing gap. A careful planned action research could address such issues.

Gender inequality in education has been noted to exert a variety of negative consequences for the women who are so affected and for the scientific community at large. Basically, the created gap threatens to turn science research into a “closed club”, where consensus thinking and the absence of new perspectives may hinder meaningful advances. Moreover, women who lack the opportunity to discover their scientific aptitudes may end up in careers that they are less suited and thereby frustrated. Above all, excluding women from science in the classroom sets the stage for a massive decline in scientific literacy for the entire society. Giving all girls a fair chance to learn science at their pace is practicably, affordable and scientific. Thus, mainstreaming gender in Science, Technology and Mathematics Education is one best practice to achieve gender equity in the classroom.

### **School-Based Research Initiative**

School-based research is a developmental initiative conducted within a school for the purpose of effecting change. In the United Kingdom, the idea of Action Research in the field of education emerged in the context of school-based curriculum development (Elliott, 1993). Presently, groups of people from various educational settings globally conduct school-based research together in order to implement reforms from ‘bottom up’ instead of waiting for ‘top down’ policy change. It is believed that reforms initiatives that emanate from the implementers of policy are better accepted and any innovation therefrom are smoothly assimilated.

Macnab et al (2008) presented a 3 – year result of a collaborative school-based oral health programme in a Remote First Nation’s community in Canada. The programme tagged, “Brighter Smiles of School Aged Children”, grew out of a partnership between the pediatric Residency



programme at the University of British Columbia. In order to ascertain whether active participation actually led to measurable results, evaluators undertook a cross – sectional study of all school aged children in the study area. The pre and post intervention evaluation of oral health was conducted. Interim assessments showed that at the end of first year, 41% of the children had no new cavities. Among the 13 children assessed both pre and post intervention showed significant improvement in dental health. Two years into the programme, the government dental hygienist reported that the majority of the children had visibly better oral hygiene and that the time required to treat for restoration had decreased significantly.

Another school-based research initiative was carried out in England from 1998 to 2001. The initiative was sponsored via a Teacher Training Agency (TTA) a United Kingdom government agency and the focus was teachers development and effective learning outcome. The initiative spawned a considerably range and volume of research activities, including peer observation of teaching, peer review of video of teaching, interview-based study, surveys measuring such things as rewards and sanctions in the classroom. In addition to well developed teacher-university collaborations and some other joint work with local education authorities, there were many cases of teacher-teacher collaboration, teacher and pupils working together to devise, carry out or interpret research activity. In practice, it is said that the initiative created an environment in which it was possible to develop new research relationships across a range of partners rather than merely transferring the locus of research to schools (Kushner et al, 2001).

In a school-based research, the effect robs on both teachers and pupils. There was overwhelming testimony by teachers of the value of the initiative on them. Significant report was the rediscovery of their professional confidence in a climate of low trust accountability,

characterized by constant monitoring and target setting. There was also acknowledgement of the growth of familiarity with research practices that teachers gained through working collaboratively with their peers, with pupils and with colleagues from the University.

The third area of success story was how the process of research itself was necessarily situated in teachers' own practice.

### **Impact Of A School-Based Research**

Whether or not, it is reasonable to expect some impact of a particular development activity on a school as well as on the individual students concerned will depend on the purpose of that project or activity. There are various strategies that can be used to maximize the effect of a school based research.

To actualize this, attention should be given to issues like:

- setting up classroom observation, or, some on-the-spot feedback mechanism specifically to help someone analyze the impact of the exposure as the teachers and students collaborate on the research,
- building review and evaluating curricular plan,
- setting up a network of committed science teachers to build on and implement new learning techniques that have been explored in the course of their research. This might include various options offered by information and communication technology. Teachers' commitment is very important if the intervention must work,
- the school principal should be made to understand the rationale for the project, and he should sell the idea to significant number of staff. In forming working or research teams, teachers should be encouraged to self-select their members according to interest, and

- setting up a systematic mentoring structure for the teacher especially the training of the newly qualified teachers or student teachers. By this arrangement, more experiences and expertise will be shared.

## **CONCLUSION**

The current perspectives on school-based behavioural intervention are underpinned by compelling arguments that they are most effective in promoting children's academic and social competencies. These arguments are firmly based on science.

School-based Action Research design is cost effective and remarkably user participatory. If there is any instructional strategy that enhances learning of science concepts, it is learner participation. Burgess Macey et al (1997) noted that Action Research is known to be quite successful in furthering the professional development of early year's practitioners (EYP) who took parts in their school-based research. They observed specifically that these teachers were empowered or re-empowered to gain a sense of professional respect and take active steps to promote their own self-growth both in emotion and practical terms.

Commenting on the applicability of this research design for teacher development, Craft (2004) observed that Action Research has been viewed by many teachers as a rewarding form of professional development that is directly linked with their practice. It is seen to be grounded in a careful analysis of the situation in which the participants (teacher, pupil, school administrators etc) operate and the various interventions involved. If every participant in this workshop will go back home determined to practice what he/she has learnt, we would have gone a long way to mainstream gender issues in our learning environment.



## REFERENCES

- Breakwell, Glynis, Scan, Hammond, Fife-Schaw, Chris and Smith, Jonathan (2006). *Research methods in Psychology* 3rd edition. London: Sage publications.
- Burgess – Micey, Celia and Rose Janet (1997). Breaking through the Barriers: professional Development, Action Research and the early year's Educational Action Research 5(1), pp 55 – 70.
- Carr, W. and Icemmiis, S. (1986). *Becoming Critical: Education, knowledge and Action research*, London: falmer.
- Craft, Anna (2004). *Continuing Professional Development: A practical guide for teachers and schools*. 2nd ed. London: Routledge Falmer.
- De Wandre, N. (2002). Women in Science: European Strategies for Promoting women in science; 295, 278 – 279.
- Ekpo, C. M.; Orok, Annie, Ekukinam, Thelma, Okon, Uduakobong (2003). Gender Socialisation Practices of the Ibibio and academic Performance of Girls in Science and Technology. A paper for the 11th Gender and Science (GASAT) International conference, Mauritius Reduit, 6 – 11th July.
- Holter, I. M. and Schwartz Barcott, D. (1993). Action Research: What is it, how has it been used and how can it be used in nursing? *Journal of Advanced Nursing* (18), 298 – 304.
- Kushner, S.; Simon, H.; James, D.; jones, K. and Yee, W. C. (2001). TTA School-based research consortium initiative: the evaluation, final report. Southampton: England and University of Southampton.
- Macnab, Andrew; Rozmus, Jacob; Benton, David; Gagnon, Faith (2008). Three-year Results of a collaborative School-based Oral Health Programme in a Remote First Nation's community. [www.comminit.com/en/node/278493/303](http://www.comminit.com/en/node/278493/303). Accessed on April 20, 2010.
- Meyerson, Debra (2005). Tempered Radicals Speak Courageously to inspire change. Interview with Debra Meyerson. <http://www.nsd.org/library/publications/jzd/meyerson>. Accessed on February 9, 2006.
- Mishra, R. C., Promila, S., Harish, B. (2007). *International Encyclopedia of Education*, vol. vii. Women Education. New Delhi: APH publishing cooperation.

Rapoport, R. N. (1972). Three Dilemmas in Action Research. In Glynis M. Breakwell et al (2006) Research Methods in Psychology. London: Sage publication.

Reason, P. and Bradbury, H. (Eds) (2001). Handbook of Action Research: Participative inquiry and practice. London: Sage.

United Nations Economic and Social Council (1997). Mainstreaming in Poverty Eradication and the Millennium Development Goals. File:///C:/:Gender%20mainstreaming%20m%20poverty%20eradication. Accessed on April 6, 2010.

Welde, Kristine, Laursen, Sandra and Thiry, Heather (2001). Women in Science Technology, Engineering and Mathematics (STEM) Fact Sheet: women in STEM. <http://research.cs.vt.edu/advance/index.htm>. Accessed on April 6, 2010.