Learning From Regional Differences

S. B. Cavalcanti[1], Luz J. Martínez-Miranda[2], Margaret E. Samiji[3], and Ling-An Wu[4]

[1]*Federal University of Alagoas, Brazil,* [2]*University of Maryland, USA ,* [3]*University of Dar es Salaam, Tanzania*
[4]*Chinese Academy of Sciences, China*

Abstract: We discuss the regional differences between our countries. We find that we need to explore the reasons these differences arise before we can apply them to improving the education of girls in physics.

Keywords: physics education, girls in physics, regional differences
PACS: 01.75.+m, 01.40.Di, 01.40.Ej

INTRODUCTION

Topic 5 attracted close to 30 conference participants. The group maintained a multicultural discussion among physicists—women and men—from all over the globe about regional differences. The group was split into two subgroups with a pair of team leaders each. The conclusions obtained on this topic when it was discussed during the First IUPAP International Conference on Women in Physics (Paris, 2002) were presented and analyzed [1]. One of the conclusions of the Paris discussion was a look into how physics is taught in the schools. The discussion this year was mostly centered on the teaching of physics, but we also looked at the poor reputation of physics among the general public and the need for a thorough revision in teaching systems. Particular emphasis was given to experimental activities, which are absent from middle schools in most of the countries. Another topic was how to teach physics so that it is less "attack physics," which turns off many people, especially girls.

The work in Paris presented numbers that show there are more women studying and working in physics and physics-related fields in countries with strong social support, supportive families, and flexible working hours. Negative factors common to all countries were mentioned, such as age discrimination, particularly for researcher-mothers; lack of transparency in the hiring process; few traveling opportunities; late appointment for permanent positions; and open sexual harassment.

The numbers have been around for many years; however, it was clear during our current round table discussion that all countries, even those where the numbers are relatively good, agreed that the teaching of physics needs to be improved. In addition, we could not correlate the numbers presented in the Paris conference to this common thought or "complaint." It was clear that we needed to know why these numbers are the way they are, and why, in spite of the differences they suggest, we all agreed that the teaching of physics needs to be revised.

SUGGESTIONS

This year's group discussion gave rise to three main recommendations for IUPAP, UNESCO, governments, institutions, and individuals:

1. Introduce physics, with real experiments, at an early age everywhere for both sexes. The best way to do this at each level is an educational problem that should be tackled by education experts working with physicists. To be effective and lasting, any change in early physics education must be carried out by physicists working in conjunction with teachers, who ultimately are responsible for curriculum planning.
2. Go beyond the numbers presented at the 2002 conference on the regional differences in physics performances, in order to include the reasons why some countries do better than others in attracting and graduating more women in physics and having more women working in physics-related fields. Questions such as: What are the local barriers? and What are the local facilities that contribute to attracting as well to repelling women? should be answered by this study. The study should be conducted by social researchers, because we as physicists do not have the training to see the social differences. It should also be conducted independent of the physical

CP795 Women in Physics, 2nd IUPAP International Conference on Women in Physics
edited by Beverly Karplus Hartline and Ariel Michelman-Ribeiro
© 2005 American Institute of Physics 0-7354-0278-7/05/$22.50

societies so that all differences can be distinguished more transparently. The social researchers will work with the individual physical societies, which will provide numbers for the study, and will work with physicists to keep the language in a style that nonsociologists understand.

3. Establish a special fund to be used to translate work of all web-based pedagogical materials available on the Internet, perhaps via Java applets, to the native language of the countries where they are used. Therefore, various countries around the world could use them to improve physics teaching methods.

These were the main recommendations. In addition, the following programs from different countries were cited as good actions to disseminate and promote wherever possible:

- Lab in a Lorry, a UK program in which a moving laboratory takes experiments to reach children and youngsters living in remote areas or areas which are not equipped with many laboratories.
- The provincial Physics Olympiad trials from China, which awards a prize for the best experiment or paper presented by a young girl.
- Science camp for young girls in Tanzania before they enter secondary school, sponsored annually by the Ministry of Education and Culture.
- One-week teaching physics of the 21st century in high schools in Denmark.
- Scientific Initiation Program, a Brazilian program in which an undergraduate begins doing research work under a special scholarship that allows the student to work in the university without the need to also work outside the university to make ends meet.
- A grant program in Israel to enhance physics education in high school by giving a grant to the research laboratory employing a young scientist who is willing to teach in a high school. This program, described during the round table discussion by a Canadian physicist familiar with the Israel's programs, allows a young researcher time to teach in the high school, instead of teaching at the university, while pursuing her/his research interests in the laboratory.

Another suggestion, that experimental ability tests be required for students entering the university to study physics was touched on during the discussion and presented briefly at the concluding session. The idea met strong opposition from a fraction of the audience, mostly physicists from the UK. This idea came up as a result of a proposal for enhancing the teaching of experimental science in schools by requiring governments to spend some money on laboratory kits at all levels. This idea must be further discussed, because it might put students from rural and poorer districts at a disadvantage. These districts may not receive as much money or may be too far from a university such that some of the activities involving physicists may not be easily available to them. There was no time to consider this idea in detail; however, the issue should be further discussed in the future to avoid misunderstandings.

CONCLUSIONS

In spite of the regional differences, both subgroups agreed that the key to getting more girls into physics is to improve the teaching in schools and to educate the general public. We agreed that we must study the reasons behind the regional differences, rather than concentrate on the numbers of women in physics in different geographic regions. Finding out what gives rise to the numbers rather than concentrating on the numbers themselves will tell us what can work in our countries and what may not work, and will enable us to work more effectively in increasing the number of girls and young women who enter and stay in physics.

REFERENCE

1. P. Thorngren Engblom et al., "Learning From Regional Differences," in *Women in Physics, The IUPAP International Conference*, AIP Conference Proceedings 628, New York: American Institute of Physics, 2002, pp 25-27 [http://proceedings.aip.org/proceedings/confproceed/628.jsp].