

SCIENTIFIC SOCIETAL MEETINGS AS OPPORTUNITIES FOR SCIENCE EDUCATION IN DEVELOPING COUNTRIES

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Resumen

Brazilian Scientific productivity presented a remarkable growth during the last two decades, as inferred by the number of articles published by Brazilian authors. The number of Brazilian secondary students also grew sharply. Together, those factors lead to a scenario in which there is an increase science produced locally, a great demand for information but a paucity of resources to make it available for the youth. We have evaluated by using quantitative and qualitative approaches the potential of societal meetings as opportunities for science education. Students acquire scientific knowledge and also autonomously develop consistent strategies for choosing and attending activities to maximize their learning. Those results suggest that scientific meetings may represent an underestimated potential for science education in developing countries.

Objectives

We evaluated the feasibility of using the Meeting of the Brazilian Society on Experimental Biology as an opportunity to develop science education programs for high school students. The program consisted of lectures presented exclusively for high school students by researchers. Students could also freely participate from the meetings regular activities. We have characterized student's strategies to overcome difficulties

during the meeting as well as their learning of scientific information. The results show that the program was successful and may represent a low cost alternative for science education to be developed in other countries.

Background

Brazilian scientific performance in biomedical research has experienced a remarkable growth in the last decades, resulting in greater proportion of papers published in international journals (Leta et al, 2005). Concomitantly, the proportion of Brazilian students who enter high-school also grew. There is thus a situation where a scientific knowledge is produced locally in association with a large demand for such knowledge by students. Low-cost and effective strategies to disseminate scientific knowledge in Brazil are thus strongly needed. These initiatives could promote the access of socio-economic excluded students to the scientific knowledge and also contribute to the integration of individuals in the society of knowledge.

Societal meetings were considered as specially interesting opportunities for science educational s they gather on a single place most of the researchers and graduates students working on a scientific field. We report here the results obtained in the evaluation of a program of science education (Youth and Science in the Future program - YSF) developed for secondary students during the Annual Meeting of the Brazilian Federation of Experimental Biology Societies (FeSBE).

Methods

Students from two schools (S1 and S2) joined the YSF program. S1 is one of Brazil's best performing high schools located in its second largest city (Rio de Janeiro) while S2 was the only high school located at the small city where the meeting occurred.

The YSF program occurred during the FeSBE meetings and consisted of two types of activities. The specific activity was a course on the topic of "Inflammation" presented exclusively for secondary students by a researcher. Ordinary Activities were those usually presented in the Meeting, as follows: ordinary courses (CO) and poster sessions (PS).

The methods for evaluating the program used in the present work were essentially the same described in detail in a previous study (Oliveira et al. 2001). Students were asked to anonymously fill simple Follow-Up Questionnaires (FQ) to evaluate each activity using multiple-choice questions containing three written options for their comprehension (understandable, difficult but understandable and not understandable) and their interest (very interesting, interesting and not interesting). A transformation of answers to number for allowing statistical analysis was performed by assigning an integer from 1 to 3 to the options available for understanding and interest. Students were also asked to freely summarize in a few lines the most important information that they believed to have acquired during each activity.

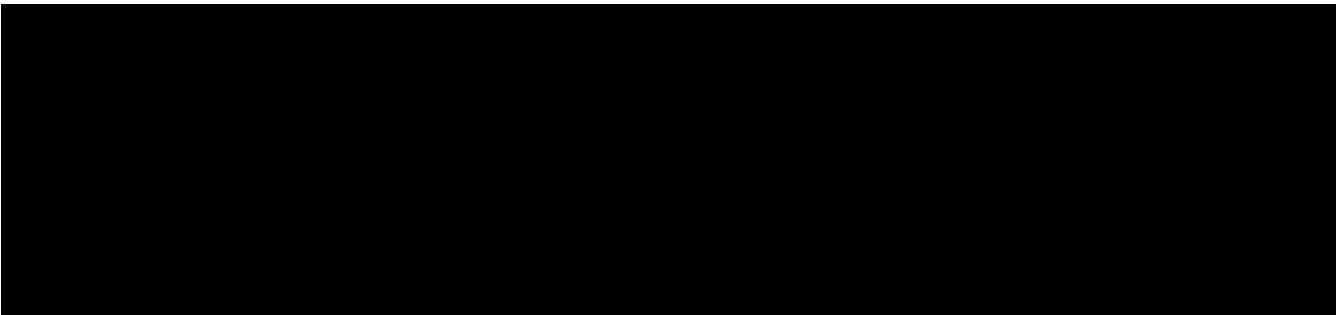
Eight months after the Meeting students filled the After Meeting Questionnaires (AMQ) aimed at evaluating

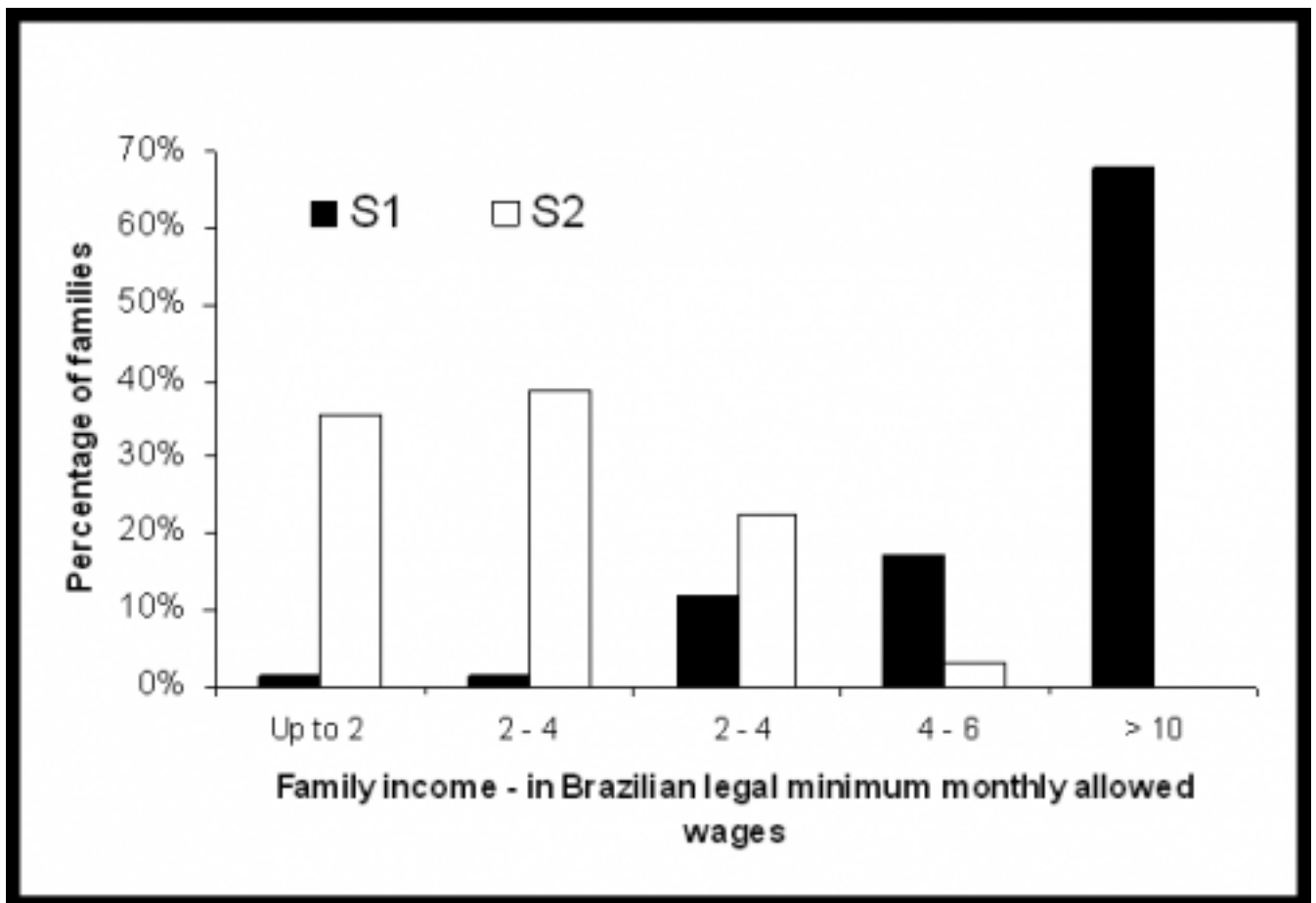
the acquisition of information during the program (Oliveira e cols.,2001). In brief, students were asked to summarize the information that they believed to have learned during each activity attended. Students' answers to AMQ were compared with abstracts available in the Meeting Annals and with their own summaries written on the FQ. Learning was considered to occur when the contents of answers in AMQ and the contents of any of the two other sources were compatible.

The difficulty of the vocabulary of posters titles was evaluated by counting the words considered to be unknown to secondary students by at least two researchers from our group.

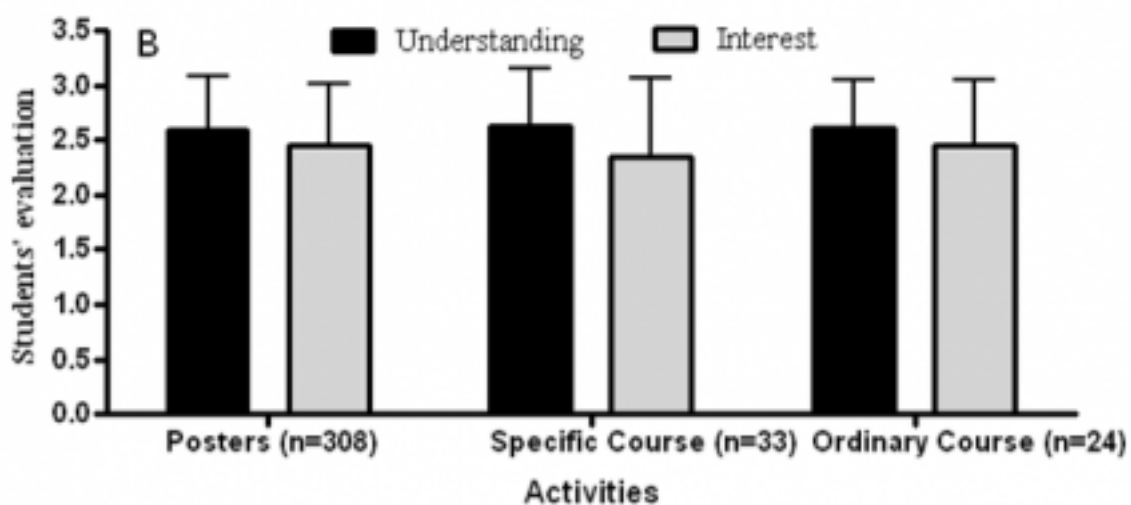
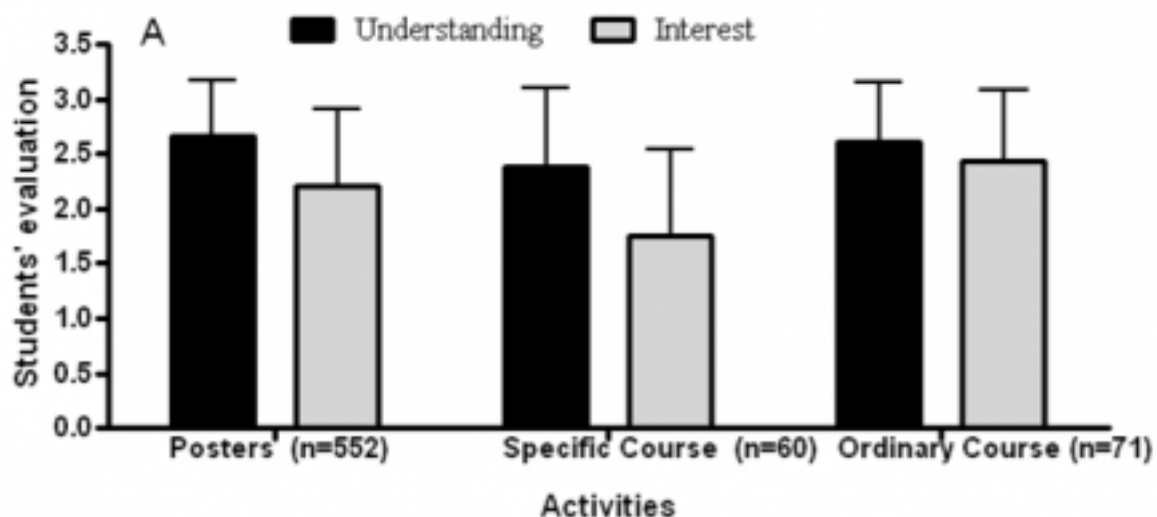
Results and Discussion

Although there were no differences in age or gender distribution between students of S1 and S2, those from S2 belonged to families with lower educational backgrounds (Table 1) and family incomes (Figure 1). That allowed the evaluation of the YSF adequacy for low-income students which are the majority in the Brazilian educational system.





Students' evaluation of their understanding and interest during the activities were mostly positive with average values above mostly higher than two (Figure 2). For S1 students both the understanding and the interest for ordinary courses (four different courses were attended) was greater than for the specific one (Figure 2A). That suggests that freedom to choose subjects of interest seems to counterbalance the adaptation of vocabulary and contents by the presenter to secondary students in the SCO. Such differences were not observed for S2 students (Figure 2B) as their evaluations were homogenously higher, regardless of the activity attended. As they came from very low income families with little access to educational activities besides formal teaching, it is likely that they were somewhat overwhelmed by the opportunity to join the YSF.



It is likely that S1 students seem to choose posters by the potential simplicity of their titles prior to each session, as judged by the fact that there are significantly less difficult words and specific vocabulary in the titles of attended posters in relation to unattended ones (table 2). Such differences were not observed among the titles of posters attended by students from S2 (table 2) that probably attended to posters chosen randomly or without criteria based on their potential difficulties.

The results obtained eight months after the Meeting show that students were able to learn during all the activities (Figure 3). The majority of the students recalled updated information on the subjects presented during the two types of courses and no differences in learning were observed between specific and ordinary courses or between students from S1 and S2. The results on learning in poster sessions were more modest, but are also noteworthy if one keep in mind that the presentations are quite short and deal with many different subjects. The apparent random choice of posters by S2 students may have hampered their learning. In further editions it would be important to help develop low-income students' to develop strategies for choosing the activities to attend, perhaps by bringing students from both schools in closer contact.

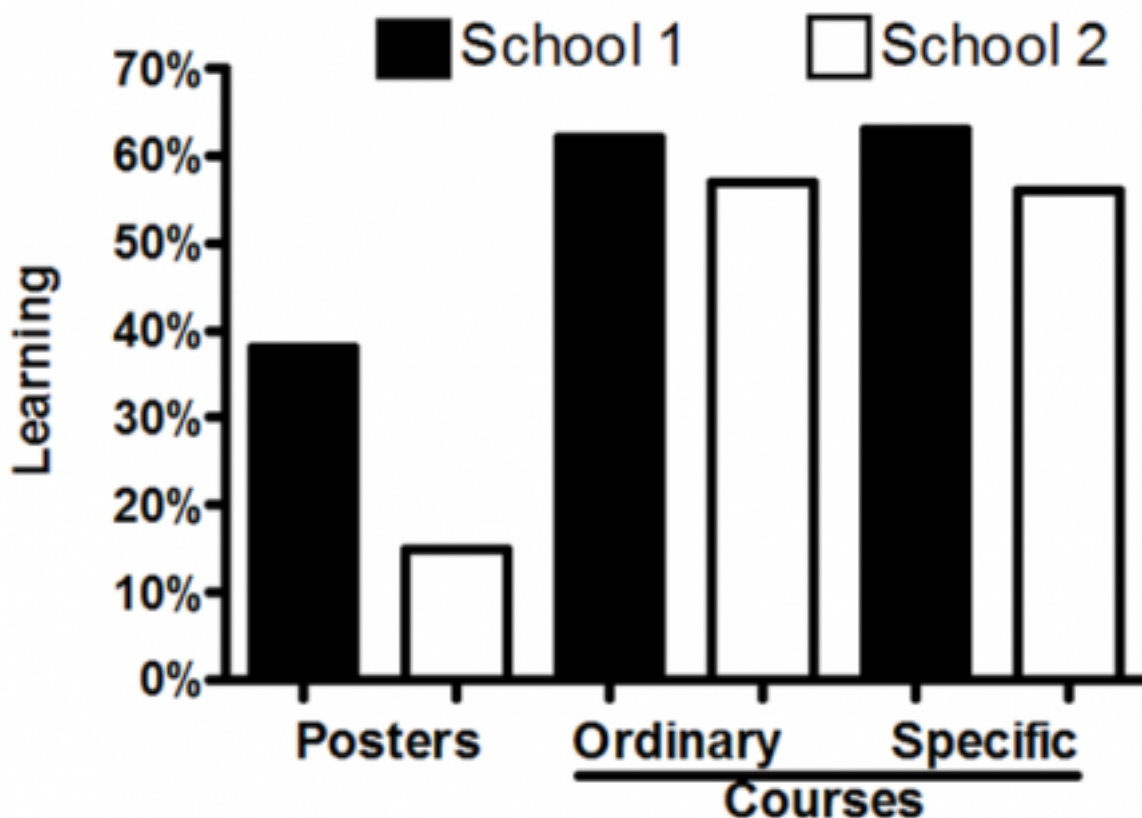


Figure 3: Learning of scientific information eight months after the YSF program

The YSF was an effective way to bring up-to-date biological subjects to students. Further studies are needed to investigate factors that contribute or hamper students learning during the YSF.

Three goals are commonly emphasized on discussions on how to orientate science education: learning science, learning about science and doing science (Hodson 1992, Gil-Pérez, 1996). The YSF brought the students in contact with Science in the making as they learned about research results presented in societal meetings by scientists. It gave them an opportunity to know a usually inaccessible part of the work of “doing science”. They were also free to choose the activities to be attended based on their own criteria. By doing so they sometimes improved their learning (as in the case of posters sessions for S1 students). The YSF and similar programs may thus offer the students opportunities to “enable self directed ownership of learning” allowing “small groups to operate independently” and to provide “access to the process by which scientists have generated new knowledge” (Griffin, 1998).

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