Science in Brazil

Julia Barral and Vivian M Rumjanek consider the collaborative approach between school and university – teaching science to deaf students in Rio de Janeiro, Brazil

In Brazil, more than 23,000 people with some kind of disability are enrolled in higher education. Many of the deaf people who seek a university place choose a degree in Arts, specifically Languages (Portuguese/Brazilian Sign Language – LIBRAS). They see it as an opportunity to learn more about their own language and to use this knowledge professionally in teaching sign language. In addition, the National Institute for Deaf Education (INES) has created the first course in Bilingual Education (Pedagogy), opening the possibility of jobs for the bilingual deaf in the first segment of elementary school. In 2011, there were 423 deaf people enrolled in languages, 277 in pedagogy, 222 in administration, 14 in fine arts, 12 in biological sciences and a small number in other specialities for a total of 1582 deaf individuals enrolled in universities in Brazil. Although these data do not clearly indicate the degree of deafness of individuals, it is clear that the area of Life Sciences was not much of a choice and the same applies to other scientific areas.

When a Brazilian deaf student reaches university he/she has gone through a number of barriers due to their difficulty in communication. But would they choose a scientific career if they had been presented with the various aspects of science earlier on? It has been repeatedly stressed that science education goes beyond the need to train future research scientists and should focus on the need to train future citizens who are able to understand the implications of science in their lives. The perception of the importance of science in everyday life is still not understood by many segments of society. Whether or not it is taught to hearing or deaf students, Science education faces a number of challenges and different approaches, mostly recognizing the limitations of traditional teaching and information transmission.

At the Biochemistry Institute in the Federal University of Rio de Janeiro, in Brazil, short courses lasting for one week and based on a scientific subject, have been offered to secondary school profoundly deaf students since 2005 (Pinto-Silva, Martins, Rumjanek 2013). Although the courses are organized by a group of the Institute staff and by hearing postgraduate students, the courses do not offer lectures and are always based on answering questions posed by the deaf students and performing experiments. The whole course is in Brazilian Sign Language (LIBRAS). The format is based on questioning, ability to argue, group work, hands-on experimentation and interpretation of the results obtained. Teachers of the deaf students are invited to attend and to participate as a group separated from the students' group (not to intervene). There are usually five times more deaf candidates for the course than the number we can take whereas there are very few teachers wanting to participate. The best deaf students who want to proceed can stay as trainees in our research labs. For some of these trainees, a daily course lasting for one year was developed at the university by Pinto-Silva in 2009. This course seeks to cover most fields of biosciences, experimentally, in a succession of thematic modules.

The success obtained with these approaches led one of the school teachers (Flores and Rumjanek 2015), to suggest that maybe teaching science in a similar way could be offered to younger subjects at a specialized school for the deaf. Since 2010, a number of activities has been offered to 5th-grade primary school deaf pupils. Older deaf students, engaged as trainees at the university, function as tutors. The sequence of activities being offered involves the 5th-grade (9-10 years) pupils with scientific methodology as previously discussed between some of the university staff and Dr. Flores. Although accepted as a method that raises the interest of the pupils and totally immerses them in their activities, the other teachers at school seem reluctant to adopt a similar approach.

An added difficulty in teaching Science to deaf children is the fact that LIBRAS (as many other sign languages) is very poor in scientific and technological signs. Furthermore, there are no specialized interpreters and they face difficulties interpreting science due to lack of knowledge in the area and the paucity of scientific signs.

During the experimental courses, the deaf secondary students began to develop signs, related to what they were discovering because they wanted to communicate with each other. These new signs, describing equipment, phenomena, organs, etc. are then registered. In parallel, a discussion group, containing deaf trainees, biologists, and interpreters, looks into the new signs generated, to verify if they contain the correct concept and start to define them in LIBRAS. A key aspect of this project was to see the acceptance of the new sign, observing whether it was used by another group of deaf people, on a different course, to describe the same idea. Sometimes the "new" sign was rejected or simplified. The importance of the deaf tutors and trainees at the university scientific lab cannot be minimised. They acted as role models and disseminated the new specific scientific signs in a natural way.

Based on this experience, in 2007 a glossary related to

new signs in life sciences started to be produced by our group, divided into thematic booklets. They are filmed and DVDs are distributed free to school teachers and anyone who asks for them. Currently four DVDs are at the distribution stage: Cells, Blood and the Circulatory System, the Immune System, Fertilization and Embryogenesis. The volumes produced already show signs for 309 scientific terms, of which more than 200 are totally new. But this is a long process that must be developed gradually and is always based on a topic the students had experienced during a course.

At a similar time, in 2007, the Scottish Sensory Centre, in Edinburgh started to develop a Scientific glossary (see article on page 25). Despite being sign languages with very different origins, we noticed that some signs were highly iconic carrying the correct concept. In collaboration with the group of Rachel O'Neill, Gary Quinn and Audrey Cameron, a preliminary study in different parts of Brazil (to consider the possibility of regionalisms) was performed where finger spelling, the sign in BSL and the sign in LIBRAS were presented in different order and the students were asked to mark their preference. Only 17 signs were tested, as our interest was to develop the testing model. To our surprise, independent of students being from the north, south or southeast, at least, four of the signs developed by the SCC were chosen instead of the ones in LIBRAS. We expect to expand this experiment to verify if it is possible to adopt specialized scientific signs from other languages.

But learning science, as learning any other subject, involves a degree of attraction and should not be restricted to the school environment. It is important that science is seen as relevant to day to day life. One way to attract and familiarize the individual with science is by going to science museums and exhibitions. Likewise, we believe that this would be a way to disseminate new scientific vocabulary.

In Brazil spontaneous visiting of museums is not part of the culture, tending to occur only when a famous exhibition is being presented. The frequency of visiting museums was analyzed in 2013, in a well-distributed sample living in the Brazilian capital, and it was found that the majority does not attend museums and the situation only slightly improves when the educational level of the sample reaches higher education (CPIM/DEPMUS/IBRAM, 2012).

However, a group that could particularly benefit from the visual appeal of museums is deaf people, who often have a huge communication barrier and depend so much on vision for understanding the world. Our preliminary survey shows that going to museums is not part of the Brazilian Deaf community's reality either. Furthermore, a meeting in the presence of directors from several museums in the city of Rio de Janeiro in 2014 confirmed what had been assumed; namely, that our museums are not prepared to receive such a public. Long texts, videos without subtitles or translation into LIBRAS - and only occasionally a LIBRAS interpreter who does not know science or scientific signs.

The work of Carletti and Massarani shows that science museums in Brazil do not seem to be prepared for an audience with disabilities. Survey questionnaires were distributed to the directors of the 209 cultural institutions and science museums listed in the Guide Centres and Science Museums in Brazil. Although only a fraction answered the survey, 60% said they did not feel prepared to receive people with some kind of special need. Among those who responded favourably to this group, only a minority felt they could support a visit of people with hearing difficulties. A way to unite the reality of non-adaptation to the lack of attendance to museums would be to train deaf individuals to work as mediators in Science museums and other museums. This is already what happens in the Museum of Modern Art in São Paulo. The opportunity for our group to start a collaborative project to train deaf mediators for Science museums occurred in 2015 in two different museums in Rio de Janeiro and it was highly successful. On a different level, deaf children at the elementary school inside the National Institute for Deaf Education in Rio de Janeiro, engaged in an activity in which 5th grade, children were asked to act as monitors for younger deaf children. They went to a Planetarium, a Geological Museum, a Physics Museum, and an exhibition on the Human Body. Before going into the 5th grade, pupils received classes on the subjects they were going to see and encouragement was given to ask all possible questions they might want to ask. Not to feel inhibited they were told that they must think of all the questions the younger children must want to know. This kind of activity was especially relevant not only in terms of knowledge but also improvement of their self-esteem.

The possibility of employing deaf people asv mediators is important because in many countries, regardless of legislation that supports the opening of jobs to disabled people, the labour market for deaf individuals, is very restricted. It is essential to understand that mediation in museums for Deaf people by Deaf mediators, is much more than "translating" what is being said. That, a good interpreter could do if they had the vocabulary to do so. What the Deaf mediator can add, is their culture.

The main point of our various approaches is to create in the deaf community a critical consciousness that enables them to understand the local and global consequences of certain interventions resulting from scientific advances. For this, the opportunity of being exposed to Science by research scientists at the University makes the students and their teachers understand that more important than obtaining information is to understand the scientific process. In this way, you are always prepared to adapt in a changing world.

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