MEETING REPORT

Science education for the visually impaired*

For visually impaired students (VIS), exposure to STEM subjects is fairly limited from the school-level itself. For teachers as well, science education for VIS can be challenging. Hence an awareness camp to promote higher education in science for visually impaired students was organized recently at the Banaras Hindu University (BHU), Varanasi. This was the result of an active partnership among diverse communities of scientists and science educators to ensure equal opportunity to science education aiming to contribute to human dignity and social justice.

The guiding principle for the camp was 'education for all', as articulated by Mahamana Madan Mohan Malviya. The total number of participants was about 100, which included 40 students and an equal number of teachers. In addition, there were college and school principals as well as BHU faculty. Of the students, majority were VIS.

The first of its kind in the country, this camp aimed to raise awareness of the ambitions and views of VIS in higher education, especially in STEM disciplines. In his brief opening remarks (via video link) Ram Ramaswamy (IIT, Delhi) who has spent a major part of his career in higher education in the university sector stated that 'some doors that should not be closed to any child are never opened for the differently abled, and these decisions are made for them by others, their guardians and their teachers. All doors to knowledge need to be opened and made accessible to all'.

B. P. Mandal (BHU) started the proceedings, explaining that the purpose of the camp was to provide a democratic, inclusive and polyphonic space to recognize possible modes of handling challenges of science education for VIS. Muskan, a visually impaired student of BHU, had to give up her B Sc in physics in the fifth semester, largely because of lack of awareness. As she shared her experience at BHU, Muskan's feedback clearly showed the conflict between the fundamental rights of VIS and the participatory process that is followed in the university. Similarly, Satyaprakash, a VIS pursuing B Ed and teaching in his free time felt that there is a definite need for awareness so that students can get the necessary support to complete their learning. D. S. Pande, reinforced the idea and said that the educators and the students need to work together to achieve the goal.

In his inaugural lecture titled 'Why we need science education for the visually impaired?', S. C. Lakhotia (BHU) noted that the key point was to focus on fostering scientific temper, which is essential for development of the society. J. Roy (BHU) emphasized the importance of ensuring equal opportunity for all. Rajiva Raman spoke on 'Science education for the visually impaired children: challenges and the motivating factors'. The veteran science educator said we cannot deny that there are challenges, yet we can see the advancement of technology is opening up new doors and we all need to work together. Yogendra Pandey (BHU) shared details of the new methodology he is adopting to ensure inclusive education for VIS. There is a need for change in the mindset of teachers: as a teacher-trainer, one has to accept differences and admission to learners with disabilities should not be denied in educational institutions. He further emphasized that a 'handicap' is a social construct, and educators need to deconstruct handicap by making provisions – not restrictions. Pandey said his focus is to convince that inclusion is not confined to the disabled; it also means nonexclusion.

Beula Christy (L.V. Prasad Eye Institute (LVPEI), Hyderabad) gave an insightful talk about the different learning aids, technologies and other resources for the newer generation to guarantee equal rights and equal access to science education. Her talk began with the definition of visual impairement. In the case of total blindness, a student cannot receive useful information through the sense of vision. Such a student fully depends on tactile and auditory senses for learning. Students with limited vision learn primarily through the auditory and tactile senses, though they may be able to use the limited vision for certain day-to-day tasks.

Christy requested the teacher participants to set the main priority to ensure that all students get equal opportunity to learn and access study materials. She explained that this can be easily done by making slight modifications in the teaching strategy; for example, using assistive technology, explaining all visuals, dictating what is written on the board, and giving clear oral instructions. Simple but clear oral instructions help VIS to understand the room arrangement better and to create a safe learning environment. In this context, Christy added that the classroom and laboratory arrangements should be such that VIS would be able to move with ease. In order to have satisfactory STEM education, VIS must become familiar with the laboratory environment, but identifying the necessary equipment and materials to ensure safety as well as a good learning situation is not easy.

Some effective and easily accessible learning aids for VIS include recorders and smartphone apps. Recording helps the students revisit the content multiple times to aid their learning. Christy further described the other audio, tactile and Braille resources available (these include the Raised Line Foundation, Saksham Trust, Daisy Forum India and Book Share India). She pointed out that LVPEI helps students get access to study materials to support their learning and they can be approached, if needed. One fact that is not always stressed is that students with special needs have entitlements and rights, and all educators must be fully aware of the rights of VIS in their demand for inclusion in education. The session was chaired by the eminent environmentalist, S. B. Agrawal (BHU) who also noted the importance of access for all.

The importance of giving basic science education to all VIS, including girls, for the growth and development of society

*A report on the one day awareness camp on higher education in science for the visually impaired students organized at Banaras Hindu University, Varanasi on 16 November 2019. The effort was sponsored by BHU, NASI (Varanasi Chapter), L V Prasad Eye Institute (Hyderabad), and was also supported by the Gynome Foundation and VIVIDHA (Bengaluru).

was stressed by M. Agrawal (BHU). Success stories of VIS who have gone on to careers in science in different parts of the world were shared by B. P. Mandal. In the next session, the manner in which VIS can participate in hands-on activities as well as serious experimentation was demonstrated, and the importance of scaffolding mechanisms was explained. Shruti Pande shared some simple on-line tools that aid basic science learning. Parimal Das emphasized the need for more such camps. In the concluding session, O. N. Srivastava enlightened the audience on the development of Braille, and highlighted modern technologies that can help science education for VIS.

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MEETING REPORT

Luminescence dating*

Chronology plays an important role in determining the timing of geological and climatic events that shaped the earth's surface processes, particularly during the Quaternary period, as this lays the foundation of understanding our recent past and predicting possible future scenarios. Considering that the major focus in Quaternary research is on the earth's surface processes, climate change and human–cultural interactions, it is thus pertinent to secure the chronology of these events identified using various proxies. Hence improving the numerical ages and techniques for Quaternary sediments and artifacts is crucial for Quaternary research. In the Indian context, over the last few decades, the luminescence dating technique has made a significant contribution towards providing secure chronology on dunes, fluvial deposits, glacial/paraglacial sediments, coastal deposits and to some extent on archaeological materials. Luminescence dating exploits the trapped charges that accumulate from the ionizing radiation delivered by the naturally occurring radioactive elements to the mineral crystals. Similar to other dating methods, age may be estimated if the total number of trapped charges in the crystal is known – which is a function of the ambient radiation dose; and is divided by the dose rate – dictated by the concentration of radioactivity surrounding the datable sample. However, the technique involves various assumptions, preconditions and measurements to arrive at a reasonable estimate of time. For example, the samples should be adequately bleached before burial, linear radiation dose-response of the sample in a natural environment, secular equilibrium in radioactivity, near-reasonable estimation of sample-water content history and lastly, the models used in computing the ages.

If the protocols are not standardized for all laboratories in the country, there may be discordance in the ages. In view of this, a workshop was held to encourage standardized protocols and adoption of a consistent methodology by all the laboratories.

Inaugurating the workshop, the Director, Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow welcomed the participants and touched upon the significance of precise chronology for the Quaternary deposits, including the Anthropocene. The workshop provided a platform for researchers (both experts and end-users) who participated from various laboratories and institutions across the country, to discuss the problems, possible solutions, and latest research innovations in luminescence dating. The themes included sample-specific problems encountered, standardization of the protocols for dose and dose-rate measurement, format for reporting luminescence ages and data repository, formation of a national body (either formal or informal); and inter-laboratory calibration. Session-I was devoted for highlighting and discussing the sample-specific problems encountered in obtaining accurate and precise luminescence chronology. It included extracting quartz from feldspar-dominated samples, separation of mica from the sediments generated from crystalline-dominated Himalayan rocks, poor sensitivity of the Himalayan quartz samples, problems associated with dating young (~200 yrs) tsunami/cyclone sediments, widespread scatter in the equivalent dose (D_e) distribution of Himalayan sediments, and poor growth curves of sediments from regions like the Andaman. Discussion was also held on the current methodology of preheat plateau test, which involves giving laboratory dosage to bleached samples and estimating D_e at different temperatures. Due to the dominance of physical weathering, the Himalayan samples (usually quartz) show feldspar contamination. Hence the use of double single-aliquot regeneration (SAR) (post-IR blue optically stimulated luminescence (OSL), was suggested to avoid the luminescence contribution from feldspar. Another major problem encountered, particularly for the Himalayan and Andaman quartz, is the poor luminescence sensitivity. Therefore, various studies deviate from the conventional threshold values/ratios of 10% recycling ratio and 5% recuperation criteria so as to have reasonable number of aliquots. It was suggested that any such study-specific deviations must be included in text or supplementary materials as mandatory information, so that the results are replicated by various laboratories. Also, for defining minimum (reasonable) number of aliquots, it was proposed that a statistically rigorous procedure should be evolved to obtain reliable age estimate. A template for reporting tables and figures in a manuscript was formulated and users were encouraged to utilize it in all future communications. This includes (a) OSL shine-down curve (inset: infrared stimulated luminescence (IRSL) shine-down curve); (b) preheat plateau test with three values, viz. (i) measured (M)

*A report on the National Symposium on Luminescence Dating, convened in Birbal Sahni Institute of Palaeosciences, Lucknow between 29 and 30 March 2019.