Inclusion in the School Laboratory

By S. Debono

Many a research has been done on inclusion in the classroom for a spectrum of children with special needs. However, with the increasing demand for a holistic and practical approach to science, inclusion has not been fully realised when it comes to the dangers and pitfalls faced in the average school laboratory. In an attempt to bridge this gap I decided to investigate what potential problems lurk in the laboratory for students with physical disability and come up with some possible solutions. So, how inclusive are our school laboratories?

Rationale

The first question one might ask is: do we take inclusion as a starting point and see how laboratories meet the varied criteria or do we take laboratories and assess them on a certain area of inclusion? Inclusion is a vast subject for it incorporates both the cognitive and physical domains. If a child has cognitive challenges then these challenges will be equal in both the normal classroom and laboratory environments. However, if a child has a physical disability then the challenge is greater in the laboratory than in the classroom. So, this research took existing laboratories to see how well they measure up to inclusion through safety and accessibility.

Physical disability itself is not exhaustive for there is a continuum on which every person can place themselves. Even for persons who consider themselves without disability there comes a time when handling complex laboratory equipment can present a slight, but inconvenient, challenge (ever broken a test tube because the cork was too tight!); let alone somebody on the extreme side of the spectrum where this ‘challenge’ could result in dire consequences. Imagine a student in a wheelchair performing an experiment involving boiling water. If the apparatus were to suddenly get knocked over, the natural thing would be to jump back. How can he do this? The injuries do not bare thinking about.

Practicality, Safety and Attitude

A three pronged approach can be applied throughout when tackling inclusion in the laboratory: Practicality, safety and attitude.

Practicality: Practical accommodation and manipulation of apparatus or resources. Safety: Safe use of the above and general safety issues.

Attitude: Attitudinal barriers from staff and pupils.

Citing the above example a practical solution would be to design an experiment that can investigate the same principle without the need to endanger the student – if latent heat was being investigated, why not use melting ice instead of naphthalene? Another practical approach would be to bring the apparatus down to the student’s level so that manipulation is easier. If hot liquids must be used then safety would involve considering what would happen if the arrangement were to topple over? Where would the hot liquid go? A simple solution would be to modify the student’s workbench by putting raised edges to contain the liquid and having a safety plan in case of difficulties, like a ‘walk’ in shower unit situated close by. However, none of this is possible without the right attitude from pupils and teachers. A peer buddy system is com-
mon, where the student with disability has a friend close to hand to aid, not take over, in experiments. This relies on a good helpful and patient attitude from the peer buddy. Good attitude is also required from the teacher in spending that extra time on preparing differentiated work. School management have to ensure a ‘reasonable implementation’ of any modifications which means a balance between meeting the needs of a student with limited mobility and financial restraints. Sometimes, economical solutions can give the same outcome as more elaborate and costly ones.

Mobility

More often than not students with limited mobility tend to have the use of a wheelchair to become mobile, but how mobile are they in the laboratory? Mobility is about the space required for successful manipulation and negotiation by the student in it. Isles must be at least 122 cm wide to allow for the wheelchair’s turning circle. Doorways should be at least 82 cm wide. Mobility is paramount in view of emergency evacuation procedures in the event of a fire or hazardous chemical spill. In fact, worldwide, this seemed to be the most common concern for students with limited mobility.

The Wheelchair perspective

A person in a wheelchair sees the world from a different perspective – from a lower level. Doors can present a major problem. Many doors have a window through which one can see any potential hazards behind the door, so it is important that the window starts from the lower height of 109 cm. Door handles can also present a problem and must be placed between 87 cm and 122 cm. For people with limited dexterity door handles should be of the lever type with a maximum operation force of 22 N. Utilities, such as gas taps, should also be operated using a lever with minimum force and slightly spring loaded to prevent accidental activation. A wheelchair student must have at least 2 m² of floor space at his workstation and ample room underneath to allow clearance for the wheelchair. The student will be at his workstation for many hours and it is important that he doesn’t have to stretch too much or sit side on resulting in neck strain. Bearing this in mind it is recommended that the working surface be 76 cm from the floor with an underneath clearance of height 74 cm, at least a width of 91 cm and a depth of 51 cm. Practically, the end of a peninsula bench proves to be the best place for the wheelchair student. Similarly, sinks and fume cupboards should have three accessible sides to the student with limited mobility.

Universal design

Designing or ensuring laboratories meet special needs’ specifications can be an advantage to all it meets a universal design. Doors with lever handles instead of rotating knobs can also aid a person with his hands full. When it comes to safety, e.g. protective aprons, everybody stands to benefit from their use. Gas taps fitted with a lever stand to benefit both left and right handed people.

The Schools and students

A total of four schools were investigated: a girls’ Junior Lyceum, a girls’ church school and two boys’ church schools. Three of the students have Spina Bifida and the other spinal muscular atrophy.

In one of the schools the student was not available to observe in situ because the parents were not keen to have their child labelled. However, on speaking with the facilitator it came to light that all the class do not have any practical sessions in the laboratory (incidentally, the workbenches were 97 cm high with
cupboards)! Likewise, in another school the students do enter the lab but sit through teacher demonstrations at the end of the lab. In both cases, only the labs were measured up according to the guidelines discussed earlier. In one school there was a good example of ‘reasonable implementation’ – the table height was modified with four blocks of wood placed under the legs which gave the extra clearance needed for the student’s slightly larger than average wheelchair. In another school the entrance door was narrow and part of the door had to be opened especially for the student. Also, the door had a ‘lip’ protruding from the floor which was evidently a problem for the student, taking a good five seconds to negotiate. This problem was found in another school which had a sliding door whose track was on the ground. Viewing perspective was another problem for one student in that the work bench got in the line of sight of the board. However, special arrangements were made when peering through a microscope; the microscope was placed lower down on a stool which allowed for easier viewing.

Generally, good safety practice was observed by all schools, with all of them having fire extinguishers, albeit some too heavy for students with dexterity problems. It was noted that one school lacked an emergency eyewash, opting for a shower in another classroom and another had a first aid kit inaccessible to a wheelchair student.

In all cases a peer buddy was evident and attitudes seemed honourable from students, teachers and facilitators. One facilitator was keen to learn more about health and safety and would have liked some kind of course – another example of universal design benefiting everyone.

Out of the three wheelchair students, all were happy with their treatment at school and the necessary arrangements made for them. One may ask the question; were they just saying this for fear of any backlash were they to show their real feelings? Bearing this in mind an extra student was interviewed – an ex-student – and his views were slightly different. He felt that he was being patronised when at first the school tried to dissuade him from taking Chemistry at ‘A’ level, feeling that they thought they knew better, but by sticking to his guns they accepted him and made modifications where necessary. However, the London examination board didn’t expect him to sit the practical paper.

**Conclusion**

It’s a shame that two of the schools decided to exclude all students from science practicals. Surely, a case of universal design where every student stands to lose! Out of the two schools where the student was observed both could go a long way in improving access to safety equipment like fire extinguishers and something to douse themselves in case of chemical spillages. Evacuation would be a problem in all cases because of student bags lying around.

The storage of stationary or a place to do an experiment can become more accessible by using a table with adjustable height. Bed trays also provide a convenient solution and can be hooked over the student’s legs. Most bed trays have raised edges to allow for spillages. Another design of tray incorporates a bean bag that can mould round the legs. All these solutions are available at little cost.

On the whole, practicality was observed and reasonable implementations engaged. Safety was a cause for concern, not just for the student with mobility problems, but for all the students. Attitudes in school were good and helpful with all involved doing their best to accommodate the student. Maybe, things have improved from the times of that ex-student where attitudinal barriers almost prevented him from pursuing a career in science had he not stuck to his guns or, perhaps, true feelings were not displayed at the schools observed.

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