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Experiential learning in Physics

WHEN **KAVITA SANGHVI** INTRODUCED EXPERIENTIAL LEARNING WITH HER GRADE 9 PHYSICS CLASS SHE UNDERTOOK SOME EXPERIENTIAL LEARNING OF HER OWN.

In teaching Physics for the past 13 years, I've observed that students can competently answer questions from the textbook, but ask them questions that involve the application of skills and concepts to real-life situations and they falter.

To address that I've used a variety of methods to engage students – using Power Point presentations, experiments and lecture demonstrations – and have not been very successful. What was missing, I came to realise, is a concrete, measurable and application-based approach that enables students to experience effective steps in problem solving, and reflect on these steps. The approach I'm describing is called experiential learning. The model lays stress on learning achieved through reflection upon experience. Learners begin with concrete experiences, reflect on their experiences to make sense of what has happened, interpret the events and consider how they will put what they have learnt into practice.

An experiential learning model, I realised, would ensure that Physics does not remain a dry subject to score marks but a subject which enhances critical and lateral thinking.

Not incidentally, I realised, my path to recognising an experiential learning model was itself a demonstration of the model: I began with concrete experiences of my teacher-led presentations, experiments and lecture demonstrations and, having reflected on those experiences, began to understand that my students were not experiencing learning since I was still not enabling them to apply the skills and concepts they were learning as they were learning.

Following the principles of an experiential learning model for myself, I decided to implement and investigate an experiential learning model with my Physics students in Grade 9, over the period from June to August, 2014.

One of the critical moments in my own experiential learning journey up to this point was the realisation that if I wanted to put the textbooks aside and actually teach the various students in my class I needed to know them better. To help me do that, I used Kolb's Learning Styles inventory, simplified by Peter Honey and Alan Mumford, to classify my students as activists, reflectors, theorists and pragmatists.

Kolb's activists involve themselves fully and without bias in new experiences. They enjoy the here and now and are happy to be dominated by immediate experiences.

Reflectors like to stand back and ponder experiences and observe them from many different perspectives. They collect data, both firsthand and from others, and prefer to think about data thoroughly before coming to any conclusion.

Theorists adapt and integrate observations into complex but logically sound theories. They think problems through in a vertical, step-by-step, logical way. They assimilate disparate facts into coherent theories.

My analyses and observations indicated that the classroom had indeed become a 'learning space', with students questioning, discussing, experimenting, presenting and collaborating.

Pragmatists are keen on trying out ideas, theories and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications.

Understanding my students thus, I was able to establish heterogeneous learning groups, comprising students who demonstrated all learning styles so that they could contribute to each other's thinking process.

We investigated 'Static electricity' and 'Electrical quantities' using the experiential learning model, both topics that students find very abstract. Concepts of charging, discharging, electric fields, current, voltage, resistance and electro motive force were investigated through various strategies of teaching, including lecture demonstrations, experiments, presentations and project-based teaching.

Students were encouraged to experiment with circuits on their own and through group work, and with more of a 'doing and thinking' dimension, a change in the mindset of learning and a sense of interdependence was created. Students were motivated to design simple circuits using a combination of various electrical components. Reflection sheets were given after every activity. This was followed by application of concepts learned to new situations.

To evaluate whether experiential learning helped develop thinking skills in my students I undertook:

- quantitative evaluation by testing students to identify progress in attempting and solving critical thinking questions
- qualitative evaluation of students' presentations that essentially taught concepts to the class, with evaluation addressing their ability to identify and implement an original approach, their content, their analyses of the results of their investigations, their ICT skills and their teamwork
- experiential learning processing questions answered by students after experiential activities to understand their ability to share, process, generalise and apply knowledge and skills
- parent interviews through a parent questionnaire
- staff interviews to identify whether students had shown improvement or increased motivation to investigate and solve problems in other subjects, and
- a record of comments and thoughts generated by students through posts.

My analyses and observations indicated that the classroom had indeed become a 'learning space', with students questioning, discussing, experimenting, presenting and collaborating. Students were excited to know what new teaching and learning methodologies I would use in the class.

As my pedagogy changed, the students' attitude towards the subject changed. They showed a keenness to experiment on their own. The depth of learning increased as they made connections between the abstract and the concrete through their personal experience.

The experiential activities helped to develop skills like time management, leadership, communication and emotional intelligence. Students relished what they saw as well-justified group work as they could share their experiences and work together constructively to analyse and problem solve.

In terms of students' academic growth, the quantitative evaluations indicated clear increases in outcomes from June to August, particularly in applying skills and concepts to real-life situations.

As a teacher I felt my horizons had broadened. I donned the caps of a coach, mentor and facilitator. I had to build trust, set targets, establish the appropriate climate and conditions, give feedback, review my own practice and establish ethical rules. These experiences helped me grow into a better teacher – and learner. I'm a much better educator for the experience. T

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Pictured: Grade 9 MET Rishikul Vidyalaya students with Kavita Sanghvi. Photo © MET Rishikul Vidyalaya.