Peter Varghese

Generally people associate science with electricity, motors, test tubes, Bunsen burners, acids alkalis and so on. Quite often we hear teachers groaning over lack of equipment and the difficulty they have in teaching science. Although it is desirable to have all the facilities and equipment for science teaching, in reality it may not be possible, particularly in the Samoan context, to have all these in every school. So what are we going to do until we have these facilities and equipment readily available? We have a moral responsibility to provide the best learning experience for the students who have been entrusted to our care.

As science teachers do we really make an effort to make our lessons as enjoyable learning experiences as possible for our students?

I will share a classroom experience I had during one of my school visits. A few years ago I had the opportunity to observe a lesson in a secondary school. The lesson was on plants. The teacher wanted to teach the students plant structure and plant classification. The teacher was very confident and knew the subject well. He drew the pictures of a monocotyledon and dicotyledon plant showing the plant parts on the blackboard. He explained the plant parts and their functions. He told the students that plants are divided into two groups – monocots and dicots and listed the characteristics of both. He had a very attentive class which reacted passively to the teacher's questions.

At the end of the lesson I congratulated the teacher on the wonderful lesson he had presented. Then I volunteered to teach the same lesson in another class in the same level. I briefed the teacher on the objectives of my lesson and what I hoped to achieve through this lesson.

Next day I informed the class that we were going to learn about plants. We had a short chat to find out how much they knew about plants. Then I divided the class into groups of five. Each group was asked to choose a leader and a reporter.

Students were instructed to carry out the following:

- go out and observe different plants around the school compound and note some differences and similarities among the plants they observe;
- collect 5 to 6 different plants without damaging their roots;
- bring the plants into the classroom and spread them on a newspaper;
- observe the plants and discuss some differences and similarities in the appearance of their roots, stems and leaves;
- separate the plants into two groups based on their similarities and differences;
- write down the similarities in each group;
- give a name to each group.

When the class had carried out the activities, each group was asked to report to the whole class. Up to this stage, I had not mentioned anything about plants and plant structure to the class. I took two plants – a monocotyledon plant and a dicotyledon plant and I asked them to tell me any differences in their roots. The class easily identified the main difference as one having a main root and branches coming off from the main root and the other as having several similar roots.

Then I asked the class to look at the stems of the two plants I was holding and give one main difference between the two. The whole class responded positively saying that one plant had a single stem and the other had branches coming off from the main stem.

Then the group was asked to give one main difference between the leaves of the two plants in my hand. This was a bit more difficult and yet a number of students came up with the answer that one plant had long narrow leaves with parallel veins and the other had broader leaves with branched veins.

At this stage I showed the students a monocotyledon and a dicotyledon seed. I pointed out that one seed had only one seed leaf and the other had two seed leaves. The one with one seed leaf is called a monocotyledon seed and the other a dicotyledon seed (**Mono** means one and **di** means two). The plants that grew from monocotyledon seeds were called monocotyledon plants and those that grew from dicotyledon seeds were called dicotyledon plants.

Now I asked the class to group all their plants either as monocotyledon or dicotyledon. They were then asked to write down some keys which they could use to identify a new plant as a monocotyledon or dicotyledon plant.

I wrote down some characteristics of monocotyledon and dicotyledon plants on the blackboard and asked the students to compare the keys they had written with the one I wrote on the board. They were very pleased and happy to find that most of the characteristics they had written were similar to the ones I had on the blackboard.

If you compare the two teaching methods mentioned above, which method do you think is better and why?

The first method is easy for the teacher. But how effective is it? In this method the students are passive objects and have no active role to play. They just sit still and listen to the teacher. It is passive learning and most likely the students will get distracted and miss all or part of the lesson. There is very little thinking involved.

The second method is active learning. The students play a major role in the learning activity. It involves several process skills such as observing, comparing, discussing, making judgements, grouping or classifying and reporting. Every student had the opportunity to be involved in the activity. We did not need any special equipment. The students enjoyed the lesson and it was a good learning experience for them. The teacher was there to set the stage and guide them through the learning process. When plants are available, why should we use abstract diagrams and pictures? The students could actually see, feel and observe plants in their own environment. The learning occurred as a result of their own activity. They observed the plants, talked about them, made comparisons and sorted them. Things students learn using their senses will be an enjoyable learning experience and will be better understood and remembered. Such experiences make sense to them and can become meaningful in real life. Whenever possible, science teachers should use real objects and situations rather than abstract objects and situations.

On another occasion, a teacher was teaching the structure of the human eye. Again it was a chalk and talk approach. At the end of the lesson, the teacher told me that he wished he had a large model of a human eye. I agreed with the teacher fully. But I reminded the teacher that since we did not have the model, we should look for alternative resources to teach the topic as those students would have only one chance to learn about the eye. Next day we arranged for some fresh fish eyes through the students. Many parents in that village were fishermen and so it was not a problem.

Next day we had a plate full of fish eyes. The students were asked to work in groups. They examined the eyes very enthusiastically. They were asked to sketch a diagram of the eye as they saw it. Then they cut open the cornea and examined the inside structures. They took out the lenses from the eyes and examined them. They used the fish eye to focus sunlight. There was a lot of excitement and curiosity among the students. Some of them even felt that they were medical surgeons.

After this activity the students found it very easy to relate the parts of the fish eye to the human eye.

As teachers we should always be thinking about ways of making our lessons more student centred. Our lessons should encourage students to think, ask questions and enable them to relate science concepts to everyday life situations. For example, when you teach convection, the students should be able to see convection in the rising smoke, boiling water, land breeze and sea breeze. In the context of conduction, they should be able to see the reason why we use rags or gloves to lift hot pots, why cooking pots are made of metal and their handles covered with plastic. Then we can say that science is in action. Only when students are able to relate their classroom learning experiences to everyday life situations, does learning science become meaningful and useful. As science teachers, it is our responsibility to ensure that our students are able to make these connections.