Using Science Journals
to engage student learning

Teacher presented with the Award

Ms CHEUNG Tung-ping
(Years of teaching : 33 years)

School

Munsang College

Subject taught

Science (S1-2)

Teaching Philosophy

"In addition to learning science, students can also develop interpersonal and problem-solving skills through science investigation. Through writing science learning journals, students develop an interest in science and become active participants in their own learning."

Interview with the Teacher

Writing journals can help us keep record of what we have done or learnt. In order to keep track of her students' learning progress, Ms CHEUNG Tung-ping from Munsang College has used journal writing to engage students in inquiry-based science learning.


▲Students are very involved in Ms CHEUNG's Science lessons.

"The current S6 students are the best living proof of how writing Science learning journal help them achieve outstanding results in class," says Ms CHEUNG, now happily seeing the fruits where seeds were sown some years ago.

Learning from others

In her 30 odd years' teaching career, Ms CHEUNG has built up her own style of teaching in Science. However, it was not until the late 90s when she participated in an educational activity in which she was strongly stimulated by what another school was doing.

In a sharing session, a teacher from a school using Chinese as the medium of instruction shared his experience of encouraging students to get involved in Science class by asking them to write learning journals.

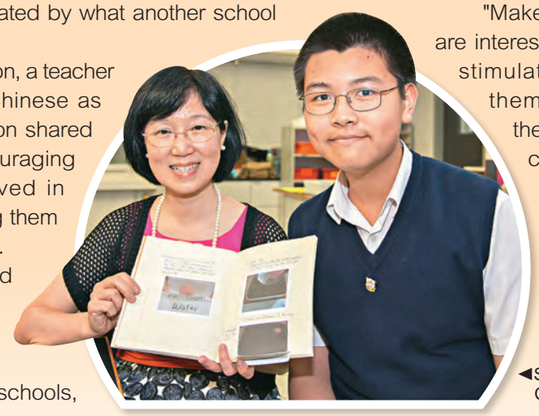
"I was truly amazed by what his students could do," she says. "Although the school wasn't one of the best schools, students did extremely well in Science subjects."

Ms CHEUNG adapted the method and infused her own ideas to make it work in her school, and since then journal writing has become an important part for students in learning Science. She explains, "Science journal writing is basically recording the processes of experimentation, analysing each step and the results. However, asking students to write down every step and observation makes it easy to assess whether they really understand what they have learnt in the process. Putting ideas into words is just as important as performing the experiment correctly — students can only express their ideas well when they fully understand the process."

Jumping out of the box

Ms CHEUNG has worked hard to develop students to be self-motivated learners. She introduces scientific investigations of varying difficulties to students. These investigations are all related to students' everyday life, as she believes that guiding students in investigating everyday phenomena is more important than teaching textbook knowledge. "We started from simple experiments such as observing tea leaves and candles."

"Make sure the issues discussed are interesting to students. This would stimulate their curiosity and lead them to ask questions. When the problem to be investigated came from students, from their need to know or to find a solution, students would feel the autonomy of learning and will be fully involved in the process," she says.


◀Students enjoy writing journals and Ms CHEUNG is amazed by their work.


▲Standard weights are available in the laboratory. What if we do the experiment at home?


▲Students' science learning journals

"I was reading the journals written by the students in response to my question of what will happen to an egg if it is put into some acids," Ms CHEUNG recalls.

While reading the works of students, Ms CHEUNG was slightly upset to see that one of her students did not follow her instructions. But she carried on reading and found that this student in fact did something out of her expectation.

"I asked students to put the whole egg into vinegar, but this student only put half of it into vinegar. She actually wanted to put the egg under two different conditions to compare the results," she says. The result was that the half immersed in vinegar expanded, while the other half remained the same in size.

Ms CHEUNG was very pleased that this student could explore her own ideas further in the experiment, "I've learnt a lesson from this student too — never be too quick to judge."

Another experiment involved testing the elastic limit of an elastic band, measuring how much an elastic band will extend when force is applied. "At school, we use weights or a spring balance to apply the force; so what could students use at home? Here, our goal is to see how creative students are in improvising," says Ms CHEUNG. "Some of them used clothespins, oranges or bottles of water. It's very interesting to see how creative they are."

Students are always very involved in class enjoying their experiences of investigating and sharing their findings with their peers. Through exchanging ideas, students could learn faster and also learn how to appreciate others' success.

Expected learning outcome

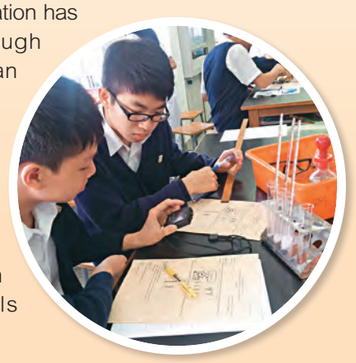
Indeed, creativity, critical thinking and problem solving are all important in scientific investigation. To help students learn better, Ms CHEUNG sets Expected Learning Outcomes for her students and she expects them to make progress through conducting experiments and writing journals.

Ms CHEUNG also uses current affairs to stimulate students' thinking. "For example, discussing the recent Lamma Island boat collision incident, I asked students why the boat sunk so quickly," says Ms CHEUNG.

Practical assessment

Ms CHEUNG recalls that before it took a lot of time and manpower to assess students' performance; now it has become much easier.

"40 students in the class are divided into 20 groups, each pair of students has to design the experiment together and each writes his own report. Since the foundation has been built solidly through journal writing, they can analyse the data they gathered, make the analysis during the lesson and complete the report. They can easily manage each step as they have been practicing these skills since S1," she says.


▲Students show their talents in designing and carrying out experiments in practical assessment.

Rewarding results

Now, the brilliant results achieved by the students have proved the significance of journal writing in Science learning. "We evaluate and refine teaching methods annually to ensure both teachers and students benefit through the process. Our greatest wish is to inspire passion and nurture inquisitive habits and process skills in Science."

Teacher's Sharing

I always remind myself that I am a Science teacher. I keep asking myself, "What is science? How is Science different from other subjects? Why do students need to learn science? How would students learn science best?" If I am not clear about my role and the purpose of learning science, I would not be able to help my students learn better.

Tailor-making the Junior Science curriculum

When I reviewed the Junior Science curriculum in our school in 2004, I came to realise that "science process skills" and "scientific investigation" were the foundations of science learning, and were set as important learning objectives in the Science (S1-3) curriculum guide. I tried to incorporate these learning objectives into our school-based Science curriculum. In the lessons, students learned how to make hypotheses, design experiments and select appropriate apparatus to be used; lessons became more interactive and interesting. In addition, I set Expected Learning Outcomes for each level and shared them with students at the beginning of the school-year, so that they could keep track of their own progress from time to time. This practice, I believed, would help students realise the importance of goal setting in their learning as well as in pursuing their own dreams later in life.

▲Comparing the experimental results of the different groups

Creating an effective and independent learning environment

It is also important for students to make use of resources wisely for independent learning. Each group of students has their own tray of apparatus (test tubes, beakers, funnel, evaporating dish, etc.) in a side bench drawer in the laboratory. They can select from the common apparatus for use in the experiments they designed and clean and return it afterwards. We trust our students and allow them to use the more delicate measuring instruments, such as the electronic balance. They become more serious and cautious in handling the equipment. The autonomy it entails enhances students' ownership of learning and develops their sense of responsibility.

Journal writing

I emphasise learning by doing, so hands-on experiences are important in students' learning, both inside and outside the classroom. Hence, I ask students to keep a personal Science Learning Journal in which they record science-related issues of interest, their observations and their process of investigations.

For example, I asked my students to answer this question at home: "Does adding salt make ice melt more quickly?" Students needed to design a fair test investigation to find the answer, write a laboratory report of their study, evaluate the method and suggest some further experiments that they could do. I was thrilled to find their ideas both creative and unique. The students discovered shortcomings in their investigations and came up with creative ideas for improvement. They voluntarily spent time doing their investigation at home and researching additional information online to solve their problems. A simple task had sparked their curiosity in a quest for some simple truths.

▲Helping students in an investigation

Students' reflection showed that they had gone through an independent research process. They started from not knowing how to conduct an investigation to gradually mastering it. They all faced the challenge of not having the necessary apparatus to perform the experiment at home, so they had to solve the problem creatively. This process was similar to what early scientists experienced in their research: the problem of not having appropriate equipment to perform the experiment and the joy of discovery.

In my feedback to students' journals, I acknowledged their creative ideas and encouraged them to think more critically. I showed appreciation for their creative designs and the efforts they had put into their work. I also shared my thoughts with them. I tried using questions to stimulate them to think and looked forward to seeing improvements in their work. By displaying the good works of some students, I encouraged them to learn from each other. This could cultivate a positive and appreciative culture in class. Students took the good exemplars as reference and were eager to do as good, if not better, in the next task.

Investigative practical assessment

The goal of practical assessment is for students to demonstrate their problem-solving skills in a science investigation. To prepare for the assessment, various investigative and process skills are taught in the different Units from Secondary One.

In a double lesson in S2, students are put into pairs to work on an investigation. They need to discuss the task, design the experiment, carry out the investigation and write down the results in the first lesson. They then write their laboratory reports individually in the second lesson. They work seriously with their partners, and complete the report on their own. Although the data is the same, the presentation, evaluation and reflection displayed in the report varies greatly from student to student. Most students are able to complete the tasks in the double lesson. Such assessment reflects students' learning and provides a good opportunity to evaluate our teaching. It also promotes a positive learning attitude towards investigations in science.

Conclusion

My teaching belief is that students learn through practice. Let students take control of their learning; trust them and they will surprise us.

Assessment Summary

Dedicated to developing the "student scientists" - initiated the science learning journal to motivate students to explore on their own, and provided feedback to promote self-directed learning.

Ms CHEUNG is a dedicated, reflective and charismatic teacher who is keen on exploring strategies to motivate and engage her students in learning. She has worked out a holistic and systematic plan to promote students' scientific thinking at the junior secondary level. By linking up science practical activities with students' everyday life, she has successfully stimulated students' curiosity and interest in science.

To engage students in self-directed learning, Ms CHEUNG guides her students to keep science learning journals for recording and reflecting on their science learning experiences both at school and at home. The various investigation ideas and reflections recorded in the journals not only reflect students' creativity but also their ownership of learning. Under Ms CHEUNG's guidance and encouragement, these students become active learners, designing their own experiments to explore a scientific topic. The science journals of these students show their great achievement of learning.

Ms CHEUNG always provides written feedback on every student's learning journals. These feedbacks include what the students have done well and what else they could investigate further. She also shares with her students the good work of their classmates. With the meaningful feedback she provides, students are able to learn from other's exemplary work and thus motivated to strive hard in order to be in Ms CHEUNG's list of good performers next time. Ms CHEUNG has made very good use of assessment for learning and made positive impact on students' self-directed learning. She makes good attempt in motivating her students to fulfill their potential in science.

A range of good teaching practices has been observed in Ms CHEUNG's classes. Students are allowed to choose the most appropriate apparatus and equipment for doing the experiment; they could make decisions on the procedures and the way they record the results. They could carry out the experiments neatly, efficiently and independently. They work collaboratively and effectively in groups and respond quickly to the instructions of the teacher. There is strong learner autonomy in the classroom where students take up responsibility for their own learning.

Ms CHEUNG has participated actively in education-related researches. She helps in developing exemplary teaching materials, and video clips of her lessons have been uploaded on the web for sharing with teachers. She also supports other teachers through sharing of good practices and teaching ideas in seminars and conferences.

►Students design their own experiments which enhance their interests in learning Science.

Way of Obtaining Information of the Teaching Practice

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