A strategy for promoting bilingual teaching in *Physical Geology* at Jilin University

Peng Xiangdong
College of Earth Sciences
Jilin University
Changchun
Jilin
People's Republic of China

pengxiangdong601@jlu.edu.cn

Abstract

Higher education teaching has changed a lot in methodology and strategy since the 1970s. A series of authentic pedagogical theories have appeared to dominate the view of learning articulated in the educational literature. How to use these theories and strategies in my lectures is becoming the biggest issue. Firstly, I should try to arrange the syllabus of physical geology systematically. Secondly, I will select a suitable textbook and some teaching references, and then collect more information online to enrich my teaching. Finally, I will prepare a *PowerPoint* presentation incorporating problem based learning in an attempt to motivate and raise students interest in studying geology and to develop lifelong learning skills.

Introduction

China is a rapidly developing country that is expected to be a major economic, scientific and technological power within a decade or two. In order to adopt advanced technologies, research methods and teaching methods in efficient way we need to cooperate with developed nations and learn from them rather than reinvent ideas and practices for ourselves. To broaden our curricula and our knowledge of our discipline in the wider context we need to equip our students with the vocabulary and vernacular of their discipline. Therefore we should teach our students the basic theory of the discipline in English so that they can engage with its literature, their contemporaries and international colleagues.

It is expected that the 21st century will be a time of rapid technological change and that by the end of this century there will be developments in communication, computing, information technologies and space sciences that will astonish and amaze people born at the beginning of the century in the same way that people born at the beginning of the twentieth century were astounded by the development of television and landing a man on the moon in 1969. Scientists, technologists and engineers will deliver these developments and their research efforts will be facilitated by communication in a common language. This common language is English and all scientists need to be fluent because this enables their collaboration with other scientists and international cooperation on major projects. Science has globalised and English is sciences medium of communication. We all use English for our presentations at international conferences and the top-ranked journals such as *Science*, *Nature*, and *Geology* are all published in English. It is obvious that we need to study and communicate routinely in English if we are to become effective science researchers and teachers.

Teaching methodologies and strategies—a rational for change

There has been an enormous amount of change in teaching methodology and strategy over the past few decades and a number of pedagogical theories have come to dominate learning theory as articulated in the educational literature. The prominent theories or models of how students learn are: Constructivism (Piaget 1972; von Glaserfeld 1989); Schema Construction (Anderson 1977); students' alternative frameworks (Driver and Easley 1978); Self-regulation in Learning (Schunk and Zimmerman 1994); Situated Learning (Lave and Wenger 1991) and the integrated practice of learning (Wilson 1996). A common characteristic of these pedagogical models is that the learners are the main 'actors' in the act learning. These views contrast strongly with the traditional or behaviorist model of the teacher being the central 'actor' or focus of learning activities. Teaching at our university is definitely more aligned with behaviourist teaching models—so we have to think deeply about changing our teaching styles and implementing student-focused teaching strategies. We should adopt the best of western teaching

practices because this will enable our students to engage with their discipline at deeper levels.

I have been lucky because I have had the opportunity to participate in the *Teaching Science in English* program, and to have been sponsored by Chinese Scholarship Council. During this four months period, I have attended as a wide variety of lectures in a diverse range of areas. They included 'Contemporary authentic pedagogical theories and teaching strategies', and discipline specific courses 'Fossils and Time' and 'Earth Processes and Resources'. What I have learnt from the lectures is that the emphasis of teaching should be learning. Even though I have already employed some student-centred teaching strategies in the past I have used them without a theoretical context and in a non-systematic fashion. I now have a theoretical context for student-centred learning and a justification for the systematic use of student-centred teaching approaches.

Current teaching practice in earth sciences at Jilin University

Curriculum English is not a new term in our university. We have developed curricula based on those expounded in popular and successful textbooks and used this approach in many courses for more than decade. But the teaching generally translate content of a course from English into Chinese. The delivery of the content and the concepts, typically, has been via a teacher-centred, behaviorist model. This is partly a consequence of a lack of enough teachers with sufficient confidence to teach totally in English. Consequently we teach in a bilingual mode where content and concepts are delivered in a similar fashion in both Chinese and English.

There are a few universities, such as Peking University, Tsinghua University and Nanking University, in bilingual teaching has been well-delivered and well-received for many years. Generally this style of teaching occurs in the second year or third year. After graduation, these students are able to engage with the international community in their discipline competently and effectively. It is time that we should apply this model of bilingual teaching in our courses at the University of Jilin. As a geologist, I think that we should initiate this program with our foundation courses course, rather than in specialist courses. Consequently, I think that we should implement bilingual teaching in our introductory physical geology courses in geosciences.

An outline for teaching *Physical Geology* in English using contemporary education strategies

Geology is the science of studying the Earth. Geology deals with Earth materials, processes, and the history of the Earth and life. There are two major branches of geology. These are Physical Geology and Historical Geology. Physical Geology deals with Earth materials and processes. Courses in this field provide an overview of plate tectonics, volcanism, earthquakes, mountain building, weathering, erosion, soil, origin of minerals and rocks, and water and energy resources; and Historical Geology deals with origin and changes of Earth and life through time and space. There are many versions of a foundation course in this area. I have modelled mine on one published by Pamela J. W. Gore of Perimeter College, Georgia, USA. We generally teach this material during the second term of the students' first year. By this time the students have acquired knowledge, and practical skills in courses delivered in Chinese. There is no need to repeat the practical material again. The course will consist of lectures and will last for 64 hours. It covers most of the important issues and content areas of physical geology. Students taking this course, will learn the basic content of geology in English culture, and will be able to read English references and engage productively with the international community of geologists.

In order to teach the discipline of geology well, we need to arrange the syllabus in a more effective way. A model of how this could be achieved outlined below in Table 1. Similarly, we need suitable textbooks and teaching references. there are many textbook relating to physical geology published for use in the United States of America, such as:

- Lindeberg, P. and Kiger, M. (1996) *Dynamic of the Earth.* U.S.Government Printing Office;
- Press, F. and Siever, R. (2001) *Understanding Earth*
- Levin, H.L. (2003) *The Earth Through Time*.
- Tarbuck, E.J. and Lutgens, F.K. (1999) *Earth: An Introduction to Physical Geology*.

These are examples of some of the best geology textbooks currently on offer. Their photographs, diagrams are powerful, well-constructed, colorful and vivid. The content is well-presented logical and well-written. Unfortunately these textbooks are generally based on specific examples that relate specifically to a North American setting, not Asian or Chinese. So there is a definite need to provide a resource that focuses on the geology of China, Asia and the western Pacific. There is therefore a need for a text which presents Chinese examples and provides a context for the geological development of the Asian region in its entirety.

Using the World Wide Web

The Internet is a fantastic innovation which has provided undreamt of opportunities and has changed the way people communicate a great deal. It has enabled the development of a variety of online teaching platforms (e.g., *WebCT*) that enable interaction between teachers and students. There is unprecedented, instant access to library collections and reference materials online. High quality animations of physical processes, digital images (moving and static) can be downloaded at will and much of this material is available for free. I have accessed this information many times, collected a wealth of information and intend to use it to enrich my teaching. Examples of such web sites are listed below.

1. Physical Geology Lecture at Georgia Perimeter College, Pamela J.W. Gore. http://www.gpc.edu/~pgore/online/physical2.php;

2. Physical Geology Lecture Online: University of Houston, Dr. John C. Butler, http://www.uh.edu/~jbutler/physical/onlinefall2001.html;
3. Planet Diary: Earth's Journey, Pearson Education, http://www.phschool.com/science/planetdiary/;
4. GeologyLink®, Houghton Mifflin Company, http://www.geologylink.com/; and
5. Houghton Mifflin Company, http://college.hmco.com/.

New strategies for teaching

***PowerPoint* in the classroom**

The computer has become a mainstay facility for teaching in universities throughout China. There are many among us who feel that the traditional blackboard (the so-called chalk and talk and chalk) should be simply 'thrown away'. But the question of sound pedagogical use of technology remains. What is the proper use of these facilities? How should we use these techniques effectively? These are serious questions that need to be addressed. Many feel that it is enough to just 'cut and paste' text into a *PowerPoint* presentation and then just read them out. This will bore the students and is simply traditional teaching dressed up in modern technology - an approach that is certain to alienate students and provide minimal improvement in teaching quality.

Problem based learning (PBL)

This one of the most exciting and powerful educational options available to tertiary educators, along with group work and research, case studies, guided design, and engineering design projects (Woods 1994). PBL is a learning environment that embodies most of the principles that we know capable of improving learning. PBL is active, can be set up in such a way that it requires cooperative effort and provides prompt feedback—it can also be tailored to suit individual student needs. I have been able to observe all of these strategies applied in a student-focused environment. My enlightenment has been profound and I will endeavor to use these techniques in my own classrooms. They work and I want to use them.

Conclusion

It is possible to teach physical Geology in my university in English. But I perceive that there is a greater need to teach in a bilingual mode. Teaching is not one day's work, but a life long project, so we need zest, broad minds and broad attitudes to enable progress. In conclusion—'IT'S TIME'. It's time to introduce bilingual teaching into our basic science curriculum. It's time for us to innovate, and it is time that we reflect on our teaching practice so that we can improve it.

Acknowledgements

Firstly, I would like to thank China Scholarship Council and Jilin University for giving me this opportunity and funding this project. Secondly, thank you to the University of the Sydney, especially the Faculty of Education and the Centre of English Training. I would like to give my special

Table 1. Syllabus of Physical Geology

Week	Lecture Notes	Potential Assignments or seminar	Assessment
1	Introduction to Physical geology		
2	Introduction to Minerals		
3	Igneous Rocks		
4	Volcanoes	Using the web site of Georgia Geosciences online, answering questions and doing research assignment http://www.gpc.edu/~pgore/gore.htm	Quiz 1
5	Weathering and Soils		
6	Sedimentary Rocks		
7	Metamorphic Rocks		
8	Crustal Deformation and Folds		Middle term examination
9	Earthquakes	Using the map of tectonic plate plot worldwide distribution of earthquakes and answer questions	
10	The Interior of the Earth		
11	Ocean Floor and Plate Tectonics		
12	Mountain Building and the Evolution of Continents		Quiz 2
13	Hydrology, Running Water, Erosion, and Sediment Transport		
14	Shorelines and Coastal Processes		
15	The Earth Through Time	Mass extinction and global climate change	
16	Resources of Minerals and Energy	Energy crisis and war	Final examination

thanks to Associate Professor Mike King and Mary Peat who have taught me much about contemporary pedagogical theories and teaching strategies, and Professor Peter Davies and Associate Professor Geoff Clarke. They have enlightened me so much in geological teaching. And I also give my thanks to Senior Lecturer Tom Hubble for his help in preparing this article for press.

References

Anderson, R.C. (1977) The notion of schemata and the acquisition of knowledge. In R.C. Anderson, R.J. Spiro and W.E. Montague (Eds), *Schooling and the Acquisition of Knowledge*. New York: John Wiley and Sons. 415-431.

Butler, J. (2001) Physical Geology Lecture Online, [Online] Available: http://www.uh.edu/~jbutler/physical/onlinefall2001.html.

Driver, R. and Easley, J. (1978) Pupils and paradigms: A review of literature related to concept development in adolescent science students. *Studies in Science Education*, **5**, 61-84.

Gore, P.J.W. (2003) *Physical Geology Lecture Online at Georgia Perimeter College*, [Online] Available: http://www.gpc.edu/~pgore/online/physical2.php

Houghton Mifflin (2004) *GeologyLink®*, [Online] Available: http://www.geologylink.com/.

Houghton Mifflin (2004) *Home Page*, http://college.hmco.com/.

Lave, J. and Wenger, E. (1991) *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.

Lindeberg, P. and Kiger, M. (1996) *Dynamic of the Earth.* U.S.Government Printing Office.

Pearson Education (2004) *Planet Diary*. [Online] Available: http://www.phschool.com/science/planetdiary/

Piaget, J. (1972) *Psychology and epistemology; Towards a theory of knowledge*, London: Penguin Press.

Schunk, D.H. and Zimmerman, B.J. (Eds) (1994) *Self regulation of learning and performance. Issues and educational applications*. Hillsdale, NJ: Erlbaum.

von Glasersfeld, E. (1989) Constructivism in education. In T. Husen and T.L. Postlethwaite (Eds), *The international encyclopedia of education*. Oxford, UK: Pergoman.

von Glasersfeld, E. (Ed.) (1991) *Radical Constructivism in Mathematics Education*. Dordrecht, The Netherlands: Kluwer.

Wilson, B.G. (1996) *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Woods, D. (1994) Why PBL? Improving learning and selecting aversion of PBL that is suitable for you. In D. Woods (Ed.) *Problem-Based Learning, How to Gain the Most from PBL*, Ontario