


GOOD PRACTICE ENCOURAGES CONTACTS BETWEEN STUDENTS AND FACULTY  
GOOD PRACTICE DEVELOPS EFFECTIVE LONG STUDENTS  
GOOD PRACTICE USES ACTIVE LEARNING TECHNIQUES  
GOOD PRACTICE EMPHASIZES TIME ON TASK  
GOOD PRACTICE USES INQUIRY METHODS  
GOOD PRACTICE RESPECTS DIVERSE TALENTS AND WAYS OF LEARNING

# TEACHING INNOVATION AWARDS

## 2001

**Teaching Innovations:  
Fostering a Creative &  
Collaborative Learning  
Environment**



**T**oday's fast moving world demands that teachers and students are open-minded in their approaches to higher education and that graduates enter professional life with a wide range of critical thinking skills and technological knowledge and are able to demonstrate a self-reliant approach to acquiring new knowledge and skills.

In order to recognize and encourage faculty and instructors who have made a sustained effort to improve the quality of their students' learning by the introduction of innovative practices or technologies, the University has instituted the biennial Teaching Innovation Awards.

*Senate Committee on Teaching and Learning Quality  
Hong Kong University of Science and Technology*

## ***Innovative Best Practices in Higher Education***

In 1987, Chickering and Gamson synthesized the research on teaching and learning at the tertiary level and from this produced seven principles for good practice in higher education:

- ★ Good Practice Encourages Contacts Between Students and Faculty
- ★ Good Practice Develops Reciprocity and Cooperation Among Students
- ★ Good Practice Uses Active Learning Techniques
- ★ Good Practice Gives Prompt Feedback
- ★ Good Practice Emphasizes Time on Task
- ★ Good Practice Communicates High Expectations
- ★ Good Practice Respects Diverse Talents and Ways of Learning

Chickering, A W and Z. E. Gamson (1987) Seven principles for good practice in undergraduate education. *American Association for Higher Education Bulletin*, 39, 3-7.

More recently, Silverman and Casazza (2000) have updated this synthesis coming up with thirty-seven principles for learning and development which they have grouped into six areas: *self & identity*, *motivation*, *interaction with the environment*, *ways of knowing*, *learning styles & preferences*, and *self regulation & goal setting*. Some of the key principles from this synthesis are:

- Student achievement is facilitated when self-efficacy beliefs are most closely connected with realistic self-assessments of ability.
- Opportunities for involvement in activities promote positive self-concept development.
- Support from teachers and mentors promotes identity achievement, self-confidence, and maturity.
- Consistent feedback regarding goal attainment increases motivation.
- Individual choice and control over learning activities increases motivation.
- Observing peer models promotes self-efficacy and achievement.
- Teachers who use concrete examples and suggest practical applications help learners connect prior knowledge to new information.
- Social integration and a sense of community are linked to persistence in college.
- Peer teaching promotes active learning, academic achievement and retention in college.

- Students learn better when their cultural backgrounds are incorporated into their academic lives.
- An effective learning environment provides challenges within a climate of support.
- In an effective learning environment, the teacher-student relationship is a collaborative one.
- Learning will be most successful when there is recognition of and respect for different cultural styles of communication in the learning environment.
- Sensitivity to cultural differences is just as important as the recognition that all learners from particular cultures are individuals and do not necessarily share similar patterns of expectations or behaviour.
- A range of instructional styles is necessary to facilitate learning for the wide range of student learning styles.
- Approaches to learning can be modified through strategy instruction in order to increase the learners' repertoires and consequently their opportunities to success across a range of environments.
- Effective instruction to develop self-regulated learning includes practice with authentic materials.
- Effective instruction to develop self-regulated learning allows learners to build an internal commitment to the process.

Silverman, S. L. and M. E. Casazza (2000) *Learning and Development: making connections to enhance teaching*. Jossey-Bass, San Francisco.

As you read through the citations for each of the Award nominees, you will see elements of both sets of principles being displayed. These innovations fall into two broad categories: those that are a single innovation embodying a number of areas of best practice in higher education and those that involve a cluster of innovative best practices whose combination produces a synergy in terms of gains in student learning. All nominees are recognized by HKUST as educational innovators through their effort in implementing these best practices and through the acknowledgment of this effort by the students and colleagues who nominated them.

# Teaching Innovation Awards 2001

## ***School of Science***

Prof Nelson Cue

Prof Peiyuan Qian, Dr Ice Ko, Prof Madeline Wu,  
Prof Reinhard Renneberg, Prof Jianzhen Yu and  
Prof Dennis Hsieh

## ***School of Engineering***

Prof Rudolf Fleischer

Prof Ting Chuen Pong and Mr Chow To

Prof David Rossiter

## ***School of Business and Management***

Prof Jong Hag Choi

Prof Gary Katzenstein

Prof Surendra Mansinghka, Ms Tsui Fen Kao,  
Ms Chen-Chen Lien and Ms Gloria Wong

## ***School of Humanities & Social Sciences***

Prof Lydia Ayers

Prof Greg Felker

Prof Robert Ferguson

Prof Min Zhang

## Prof Nelson Cue



This learning and teaching innovation is the development of a wireless class feedback system, called the Personal Response System (PRS), which enables active learning in lectures. While other class feedback systems do exist, none have the reliability, flexibility, portability and scalability of Prof Cue's PRS system. In developing this system, Prof Cue has made active learning available to the masses.

Prof Cue's recommended way of using the system in class involves two stages. First, students choose answers to concept questions and assign confidence levels to their choices. This is followed by immediate feedback to the class on the distribution of the class responses. Second, students are asked to confer for a few minutes with one or two peers sitting next to them in order to persuade them of the correctness of their answer. Students can then change their choice and/or their confidence level and again class feedback can be provided immediately. The teacher can then go on to investigate the various reasons for any misconceptions. In this way, the PRS system uses technology to lever a number of important areas of effective learning: prompt feedback, active learning, cooperation among students and peer learning. The power of this system is its simplicity of use, coupled with its impact on these multiple branches of effective learning.



This patented system is not only being used extensively at HKUST and at other tertiary and secondary institutions in Hong Kong, but is also being used at overseas institutions in North America and Europe.



Teaching Team Co-leaders:  
**Prof Peiyuan Qian and Dr Ice Ko**

Team members:  
**Prof Madeline Wu, Prof Reinhard Renneberg,  
Prof Jianzhen Yu and Prof Dennis Hsieh**



This innovation is the development of a core interdisciplinary course, ESCE 500 Introductory Environmental Chemistry and Microbiology, which is part of the MSc. in Environmental Science & Engineering program.

This self-paced course was developed to ensure that students entering this program are not missing the required

background knowledge. The teaching team has made innovative use of online media to enrich the course content in meeting different levels of prior knowledge and also to increase student-student and faculty-student interaction.

The development of this course epitomises the notion of collaboration: collaboration between faculty from different departments, collaboration between faculty departments and CELT, and collaboration between faculty and students and students themselves during the course.



The teaching team has also developed a course using technology as a lever for best practices in learning and teaching in higher education. By using technology to break down time and place barriers, the team has provided busy, part-time students with a flexible option to cope with their competing demands of work, family

and study. The course team also used web-based technology to collect formative feedback (using HKUST's OSTEI) mid-semester and has made adjustments to the course in the light of this.

## Prof **Rudolf Fleischer**



By introducing a number of small innovations which have complemented and reinforced each other, the result has been to produce an overall innovation that is much larger than the sum of its parts. More specifically, these small innovations involve two areas: ways of making learning active and ‘assessment for learning’ techniques that have a dual function of supporting active

learning and removing barriers to surface learning approaches such as rote memorization.

The active learning techniques that Prof Fleisher has introduced include:

- substituting the ‘tutorial as remedial lecture by TA’ for ‘tutorial as students presenting, defending, justifying and clarifying their solutions to problems’ as a means of making misconceptions explicit and empowering students to provide improved solutions
- creating class representatives as a means of reducing the risk-taking with self-esteem inherent in active learning and thus increasing faculty-student interaction
- using small-scale problem setting or concept checking questions to be resolved through small group discussion during the lecture
- using hands-on application tasks that students can relate to but which provide opportunities to think in the algorithmic and creative way that is a must for professionals within their discipline

The ‘assessment for learning’ techniques that he has introduced include:

- marking for effort and thinking processes
- marking for knowledge and understanding only in the final exam
- using both self- and anonymous peer-assessment to deepen students’ learning and improve critical thinking skills

The combination of active learning and assessment-for-learning is powerful and dispels the myth that “Hong Kong students are dumb” and replaces it with the challenge of “What type of learning environment brings out the effective learner within every HKUST student?”





Teaching Team Leader:  
**Prof Ting Chuen Pong**

Team member:  
**Mr Chow To**



Using a Quality Education Fund grant, Prof Pong and his colleagues have developed a virtual learning environment for 'connected education' that enhances the transition from secondary to tertiary education. This innovation provides us with an exemplar of collaboration and a model for delivering distributed learning that crosses educational contexts.

This innovative learning environment delivers pre-recorded video-on-demand lectures in small segments, interspersed with virtual synchronous meetings using a mix of



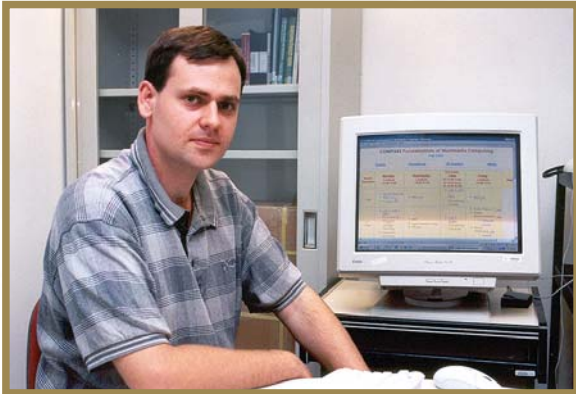
live-video, text-based chat and shared virtual whiteboards. The live-on-line meeting is solely for the purpose of Q&A and takes place with students co-located in a number of regional remote classrooms in selected secondary schools and with teachers located at HKUST. The outcome of this innovation has been a significant rise

in students' active participation as evidenced by a substantial increase in the number of questions posed by students over the traditional lecture mode of delivery.

The system also makes content available in multiple languages and uses animations and other interactive means such as online simulations to increase the depth of learning of key concepts, while simultaneously catering to different learning styles. In addition, the system allows increased student-teacher and student-student interaction through the use of asynchronous conferencing.



## Prof David Rossiter



The core of this innovation is the use of creative inquiry-based projects to enhance student learning. Specifically, students are asked to produce original algorithms to manipulate personalized audio, image and video files in creating an original piece of work.

Student dissatisfaction with the original textbook-driven curriculum led to the development of a demanding task-driven one that communicated high expectations of students. Alongside this, Prof Rossiter made the learners the context of their inquiry by using student-produced digital artifacts of themselves as the raw materials for the course. The combination of these two elements has resulted in increased learner motivation and self-confidence, which has led to an overall gain in subject understanding and an attitudinal change towards multimedia as a career from one of 'boring repetitive work' to 'interesting, creative work'.



A striking feature of the comments made by students from these courses is the passion that has been ignited through experientially emphasizing the creativity inherent in producing these new forms of digital communication.



## Prof Jong Hag Choi



Prof Choi has combined a number of small-scale innovations in terms of both learning tasks and assessment to produce a large learning gain. On the learning task side, he uses group projects with differing group compositions, authentic readings that deal with the real-life application of theory and web-based conferencing so as to increase student-student and student-teacher

interaction and to deepen discussion of critical issues.

In terms of assessment, he has allocated nearly half the marks (45%) to out-of-class work and in-class participation, with the balance being for regular in-class quizzes, the mid-term exam and the final exam. The assessments have been carefully crafted so that their purposes are aligned with the course learning objectives:

- To promote participation
- To promote frequent study and practice
- To provide authentic examples
- To develop students' ability to cooperate
- To develop their ability to research independently
- To promote hard work and minimize free riding
- To promote peer learning
- To foster connection building between textbook (theory) and cases (real-life practice)



The large learning gain that has resulted from this cluster of innovations is evidenced by the summative course evaluations being over 10% above the fifteen-section course average.

## Prof Gary Katzenstein



Prof Katzenstein's innovation cluster reconstitutes a course curriculum so that students learn to apply three transferable cognitive skills: *reasoning, analysis and application* and *generalization and abstraction*. He aligns assessments with these key cognitive skills. His course design does not eliminate the sequencing of content but adds an additional organizing layer around cognition.

Prof Katzenstein's innovations are:

- The Paramedic Method – an editing technique which helps to improve reasoning ability, communication clarity and thus the presentation of self;
- Reasoning Diagrams – visual organizers that make explicit the perceived relationships between concepts (e.g. cause & effect, positive & negative, superordinate & subordinate, etc) both within and across disciplines;
- Writing Awareness Sessions - providing one-to-one feedback on the cognitive structure embedded in students' written assignments;
- An Open Course Structure - which increases ambiguity and student responsibility as exams are absent, textbooks are optional and readings are limited to short articles from the popular press.

In his course, the teacher's role is to change the way students think and how they see the world. He believes that this can only be achieved if teachers:

- have concern for each student's welfare;
- can see things from the student's perspective; and
- have sufficient patience to listen beneath their surface words and actions.

The essence of Prof Katzenstein's innovation is the notion of loop input; process is aligned with content. His innovations and his teaching philosophy encourage contact between students and faculty, communicate high expectations and respect diverse talents and ways of learning.

Teaching Team Leader:  
***Prof Surendra Mansinghka***

Team members:  
***Ms Tsui Fen Kao, Ms Chen-Chen Lien and Ms Gloria Wong***



The essence of this innovation is a solution to the problem "How do you retain best practice in teaching and learning in higher education when faced with the economic need for mass education?" Prof Surendra and his team's solution is to structure this course of 730 students so that the learning environment has a high level

of individualized learner support, enhances opportunities for student-teacher interaction and provides prompt feedback on all questions and assignments. Prof Surendra and his team reorganised the course to expand access to teachers, increase student-teacher interaction and to deepen teacher's knowledge of individual students. They also increased collaboration within the teaching team over course delivery and assignment marking. Finally, they aligned assessments with the revised aims of the curriculum and used formative and summative evaluation to monitor the implementation of this innovation.

Keys to the success of the innovation

- Hiring demonstrators specifically for this purpose (selection criteria crucial);
- Lectures (class size ~240) with mandatory attendance of one per week for demonstrators ensuring that they knew what was happening in class and to provide feedback on the lecture to the team leader;
- Making the purpose of tutorials (class size 30) to discuss homework problems and answer questions;
- Requiring attendance of tutorials by making this the only place for submission of assessed homework;
- Providing multiple opportunities for students to ask questions: in lectures and tutorials, though email and web-based fora, during office hours either in person, by phone or by fax, and by making an appointment outside office hours.

## Prof Lydia Ayers



At the heart of Prof Ayers innovation is the problem of how to teach music to large classes when the traditional master-apprentice approach is unfeasible. Her innovative solution is to use various forms of rich multimedia that cater to multiple learning styles, reduce psychological barriers to a potentially unfamiliar subject and increase student interest and motivation in

the subject. Having a teaching foot in both Humanities and Computer Science, Prof Ayers integrated set of innovations merges science and art.

To bring the music alive to students in her lectures she uses a number of active learning techniques including:

- Animations;
- Synthesized sound examples;
- Live demos;
- Listening guides; and
- Annotated videos including field recordings

Through bringing the cultures of world music into the Hong Kong classroom, Prof Ayers expands students' horizons towards global citizenship.

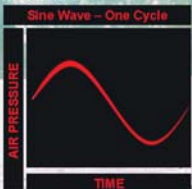
### The Classical Style

- **Major composers:**
  - Joseph Haydn [Austria] (1732-1809)
  - Wolfgang Amadeus Mozart [Austria] (1756-1791)
  - Ludwig van Beethoven [Germany] (1770-1827)




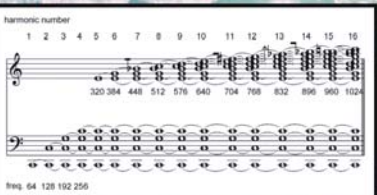
### The Properties of Sound

- **Cycle**
  - the distance from one point of maximum or minimum compression to the next
- **Sine Waves**
  - simplest sound waves

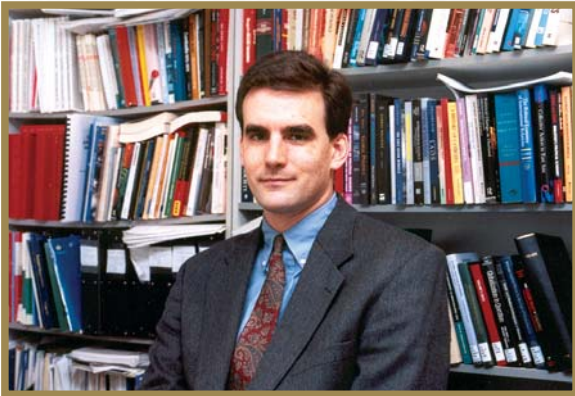


### Harmonic Series

- when sounded at the same time, partials are part of a complex sound, such as a [21] bassoon tone



## Prof Greg Felker



Prof Felker's innovation uses technology as a lever to promote active learning, peer learning, student-student interaction and student-faculty interaction. Specifically, he uses web-based asynchronous forums and synchronous text-based chat rooms within WebCT to conduct online discussions and simulations. The simulation involve students role-playing political groups in an international political crisis and presenting their positions through the online forum.

The high level of student participation generated through these active learning tasks and the students' positive attitude towards online learning has inspired other faculty to take up this innovation.



Prof Felker sees the success of the online forums as mainly coming from three factors:

- the instructor being online a lot so that students received prompt responses;
- allowing and fostering informal communication which fits the online culture students are used to (e.g. from ICQ); and
- making the online environment (WebCT) the authoritative place for course related information so that students 'feel' the medium to be an essential and integral part of the learning environment along with the classroom.

Prof Felker highlights a couple of tensions in supporting and sustaining online interaction:

- deciding when to intervene and when not to, i.e. which questions students had the knowledge to answer and which they didn't - if you answer too early, this may shut down communication as students will wait for the 'authoritative answer' rather than post;
- deciding whether or not to require participation – requiring communication may guarantee postings but it tends to reduce spontaneity

## Prof Robert Ferguson



The core of Prof Ferguson's innovation is the adaptation of continuous quality improvement (CQI) techniques from industry to the large lecture classroom. In so doing, Prof Ferguson shifts the balance of authority and builds a collaborative learning culture within the class.

This innovation stresses repeated formative course evaluations involving two specific techniques: *Quality Circles (QC)* and *Line-Stops*. This innovation is also rooted in the content of the Science, Technology and Society course delivered by Prof Ferguson and thus is an innovative example of content matching learning process.

These CQI techniques lever students' experiential knowledge of instruction through their apprenticeship of observation of teaching of a wide range of instructional styles. Using this knowledge, students are empowered to stop the 'learning production process' when they identify problems – this is the line-stop technique. Once this 'line-stop' occurs, students form QC teams whose function is to identify and solve the learning production problem. It is important that the instructor promptly implements any practical and beneficial student-generated solutions. When there are contradictory suggestions, these need to be investigated further to see if consensus is possible. Once an innovative solution has been adopted, students are then required to adopt an iterative action research cycle of problem definition/reflection, planning, action and observation/reflection so as to continually develop the quality innovation.

By being small, these innovations require few resources but the incremental nature of the process builds up and produces a large learning gain.

In using these techniques, there is an empowering shift in the authority of knowledge towards students. Other changes in pedagogical design, such as establishing shared learning goals, need to be implemented alongside these techniques so that learning messages are consistent.



# Prof Min Zhang



Prof Zhang's innovation involves a suite of proprietary and Internet software to technologically enable his linguistics courses and to shift the pedagogy from a teacher-centred to a learner-centred paradigm.

This technology enhancement has been implemented in five key areas:

- Digitization of all course related content to increase ease of access
- Annotated Internet resources
- Existing virtual tutorials
- Digitized samples of student-generated content for acoustic analysis
- Proprietary language-related computer software



The proprietary software packages are based on innovative artificial intelligence software which uses natural language processing and allows natural language communication between students and the machine. The software also analyzes metaphorical inference and interpretation.



# Five Benchmarks Of Effective Higher Education Practice

## National Survey of Student Engagement (U.S.)

### Level of Academic Challenge

- Preparing for class (studying, reading, writing, rehearsing)
- Reading and writing
- Using higher-order thinking skills
- Working harder than students thought they could to meet instructors' standards
- An institutional environment that emphasizes studying and academic work

### Active and Collaborative Learning

- Asking questions in class or contributing to class discussions
- Making class presentations
- Working with classmates outside of class to prepare class assignments
- Working with other students on projects during class
- Tutoring or teaching other students
- Participating in community-based projects as part of regular courses
- Discussing ideas from readings or classes with others

### Student Interactions with Faculty Members

- Discussing grades or assignments with an instructor
- Talking about career plans with a faculty member or advisor
- Discussing ideas from readings or classes with faculty members outside of class
- Working with faculty members on activities other than coursework (committees, orientation, student life activities, etc.)
- Getting prompt feedback on academic performance
- Working with a faculty member on a research project

### Enriching Educational Experiences

- Talking with students with different religious beliefs, political opinions, or values
- Talking with students of a different race or ethnicity
- An institutional climate that encourages contact among students from different economic, social, and racial or ethnic backgrounds
- Using electronic technology to discuss or complete assignments
- Participating in:
  - internships or field experiences
  - community service or volunteer work
  - foreign language coursework
  - study abroad
  - independent study or self-designed major
  - co-curricular activities
  - a culminating senior experience

### Supportive Campus Environment

- Helps students succeed academically
- Helps students cope with non-academic responsibilities (work, family, etc.)
- Helps students thrive socially
- Promotes supportive relations between students and their peers, faculty members, and administrative personnel and offices



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