*Glean pointers on teaching and learning as winners of the **NUS Outstanding Educator Award** share their teaching experiences and views in this issue of* CDTL Brief.

My **Secret** *of*
Winning Students to **My Side**

Professor Y.K. Ip
Department of Biological Sciences/
Associate Director, CDTL

As a teacher, I spend much effort finding out what my students have learnt in the past, how they had learnt these things, and how to facilitate their learning now. This is because I consider that knowledge is not simply statements or facts that students acquire. The word 'knowledge' actually means 'to sport with ideas'. A knowledgeable person is someone who can play with ideas, not simply someone who can win a quiz game or score highly in a retention test. Hence, 'to know' something is never as important as 'to understand' something. To understand means that students have to select, organise, integrate the information obtained, and generalise through a process of reflection in the mind.

Consequently, the most important task I often have to do is to change the way students learn, because many of them take learning as the acquisition of knowledge from the teacher or from books. They do not understand the importance of connecting and integrating the information within the mind to construct knowledge. In fact, most students are so obedient and respectful to their teachers that they do not question what is being taught, preventing them from developing critical and creative thinking skills and strategies. This is especially true for the first year students in my BL1103 class.

In contrast, I believe students should always doubt the information that they receive, question what they thought they have understood, as well as try hard to unlearn and relearn. When they unlearn and relearn, they should think deeply about the matter and undergo a critical thinking process.

So in my lectures, I expose students to 'academic controversy' and present certain facts that seem to demonstrate or contradict certain principles. For instance, I pose certain queries like the following:

- Objects fall spontaneously; but why does the column of water in a traditional osmometer apparently rise spontaneously?
- Fever means an increase in body temperature; but why do you feel cold during the onset of a fever?
- Diffusion is the movement of a substance from a region of high concentration to a region of low concentration. So, when no concentration gradient exists, does the diffusion of molecules stop? Will there be any more movement of molecules?

The answer to the last set of questions is 'No', which would then prompt students to realise that the definition they have learnt about diffusion must either be wrong or inadequate.

When posed such queries, the students may at first be confused. But it is precisely through this confusion that their minds get the necessary exercise to construct their knowledge. By raising their curiosity, students will naturally start to question the validity of their existing knowledge (i.e. what they think they have understood before) or even perhaps existing theories or dogma. By questioning, students will then unlearn and relearn, understand and thereby develop new insights to either construct new explanations or to invent new ways to apply what they have understood about the 'real world'. It is through the process of searching for answers that they become independent thinkers—truly knowledgeable persons who are able to critique what they hear and what they read.

By comparison, the laboratory is a more suitable occasion than the lecture period to challenge students to develop creative thinking skills. Most of the time, experiments do not really work out as they should. It is only when students obtain results that deviate from others and those

available in the literature that they have to come up with their own analysis and interpretation. Hence, when I design the practicals, I try to build in the elements of variability and uncertainty that are necessary to stimulate students to look out for new answers.

To be an effective teacher, one must take into account the students' different cultural and educational backgrounds and be interested in finding out how they learn. Even if I teach the same subject every year, I treat it as a new challenge for each new term as the students' doubts and the questions they come up with vary from year to year. I maintain 'a spirit of enquiry' to find out new, if not novel, ways to raise the students' curiosity in the subject matter, to question what they have learnt, and to integrate new ideas with existing information in their minds. To be able to exert my influence on their attitudes towards learning, I believe in my own sense of competency in handling the students. Once I feel that the students have picked up the necessary learning and thinking skills to learn on their own, I make myself redundant, for ultimately they must develop as independent learners and practise life-long learning since I will not be with them forever.■

Professor Y.K. Ip is a winner of the 2000/2001 Outstanding Educator Award.

Learning Communities

Associate Professor Philip Holden
Department of English Language & Literature

When you read this article, we will be starting a new semester in a variety of teaching situations. Personally, I will be grappling with new challenges in three new modules. In my first module, I will be trying to preserve seminar-style teaching in an introductory class that potentially may exceed 40 students. In my second, I will be working with two teaching assistants on a more advanced course which, since it has been designated as a Singapore Studies module, will attract students who will not be majoring in my area of teaching specialisation: this is both an opportunity and a challenge. Finally, I will be sharing teaching on a graduate module; it will be taught in the evening, and the majority of students will be taking a part-time degree, balancing work, family responsibilities and study. The problem I anticipate here will be to maintain academic standards while at the same time acknowledging the real difficulties such students face.

At NUS, each of us faces a unique teaching situation: in a recent discussion with colleagues from other faculties, I learned that one considered a class of over fifteen students as large, while another wished for 'small' classes of under 50. As a recipient of the 2001/2002 Outstanding Educator Award, it would be easy for me to adopt a one-size-fits-all approach, and offer a number of teaching tips, some of which will be relevant to each of us. However, there are websites and library resources that could do this better than I can (for instance, the excellent *Berkeley Compendium of Suggestions for Teaching with Excellence*, the URL of which is given at the end of the article). Thinking back, the one factor that has made the difference in my own teaching in the past, and which I think we need to give greater attention to at NUS, is the presence of community. Practices such as talking to colleagues about teaching strategies in informal settings, of having non-academic staff sitting in on modules, and of getting feedback from and discussing pedagogy with students outside of formal structures seem to me vital in developing a vibrant learning community.

In teaching, and indeed in university life in general, it is often difficult to realise the distinction between structures and communities. Structures are put in place for specific reasons, and the best structures will be flexible enough to allow communities to grow within and around them. An example of such a structure is the new peer review process for teaching evaluation. The process has clearly been exhaustively thought through, and in my experience can in itself enable ongoing discussions regarding pedagogy between different faculty members. It cannot, and should not, however, replace the value of semi-formal interaction in a non-evaluative setting. Structures can be easily changed by fiat, but communities need time to form, and need nurturing in order to grow: in times of rapid structural change communities may become fragmented, damaged or disappear.

In my teaching in the coming semester, I have thought out some strategies through which I would hope to foster the growth of learning communities. First, I hope to meet with my students informally outside of class time, over lunch or through other activities. Within the bounds of normal standards of academic confidentiality, I think it is important to discuss matters to do with choices in syllabus design and administrative practice with students. Students in my experience are often reassured if they discover the rationale for deadlines, grading conventions, and so on, which may seem to them initially inexplicable. If we are open to criticism, presenting decisions made personally, or at the departmental or faculty level as solutions to real dilemmas, we encourage students to become part of the solution. Indeed, students will often

make useful suggestions—at times blindingly obvious—that we have not thought of.

Secondly, I would hope to build relationships with administrative professionals and non-academic staff with whom I work, which involve us gaining knowledge of each other's roles. Faculty are often quick to forget the important part such staff play in teaching, and I've often been surprised in NUS at the gap between faculty and other staff in terms of knowledge of each other's work: for me, indeed, this is one of the biggest differences between university life in Singapore versus other universities I have taught at. Again, informal contacts and discussion of dilemmas as dilemmas, not as demands, can help here: many non-teaching staff have qualifications and experience that are not tapped on, and, with encouragement, can become much more active and autonomous members of a learning community

Thirdly, I've resolved to try to increase the semi-formal space of interaction regarding teaching, hopefully by offering a departmental seminar not on research, but on a teaching issue. Most departments and units hold regular seminars, but they tend to be largely on research topics, providing opportunities for the testing out of a conference paper. Yet teaching is just as vital a topic, and can be the subject of equally intense intellectual debate.

When part of a team giving input into a new building design at NUS, I requested space for informal 'interaction spaces' in the building where students and faculty members could meet informally and chat. A Singaporean colleague noted that such spaces existed at Cambridge, but that they were called pubs. Students who return from the Student Exchange Programme regularly tell me that the classroom environment at their host institution—frequently an Ivy League school, a top Asian university, or a Russell Group university in the UK—is often similar to NUS, but that the host institution possesses something extra: a campus atmosphere of learning, fostered through informal and autonomous community ties. Education is enabled not just in the interaction between student and faculty member, but by a host of other factors, of which community is surely a valuable and neglected one.

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Associate Professor Philip Holden is a winner of the 2001/2002 Outstanding Educator Award.

Teaching Insights

Associate Professor Robert Beckman
Vice-Dean (Academic Affairs), Faculty of Law

My teaching philosophy is the result of more than 20 years of teaching experience in the Faculty of Law at NUS. I have taught both substantive law and 'skills' courses, and I have constantly experimented with various teaching techniques and methods.

My experience in preparing students for international mooting competitions has had a considerable influence on my teaching philosophy. I observed over the years that students participating in international mooting competitions not only learned more than students doing regular courses, but they also enjoyed the learning process much more. This forced me to consider how some of the techniques I used in coaching moot teams might be employed in the teaching of regular subjects. As a result, I have placed an increasing emphasis on problem-oriented methods of teaching and exercises that require students to work in teams.

My teaching philosophy can be summarised as follows:

1. Most subjects in law school should be designed to produce students who are creative problem-solvers, not students who have learned large amounts of legal doctrine. In order to develop problem-solving skills, there should be less emphasis placed on substantive content and more emphasis placed on the application of general principles. Greater emphasis should be placed on making certain that students have a thorough understanding of the basic principles and a framework for analysing that area of law.

2. From my experience the best method of teaching law students to be problem solvers is to use the 'problem-oriented' method of teaching in which the students analyse complex hypothetical problems. The problem method of teaching forces students to analyse facts, identify the legal issues, research the law, and prepare arguments or propose solutions. This process requires students to think critically about the law they have studied and to go into greater depth than is required in regular classes. It develops their analytical and research skills, and forces them to come up with practical legal arguments for one side or the other in the problem. In addition, students usually find complex hypothetical problems challenging and interesting. Finally, complex

hypothetical problems are the best vehicle for encouraging students to come up with innovative and creative arguments.

3. Teaching should reflect the fact that law is best understood in its broader context and as part of a dynamic process. Law should not be taught as a static body of principles and rules. Legal rules and principles are constantly being adapted and changed to respond to technological advances, economics, social, political and ethical values and other forces. As teachers we must provide our students with an analytical framework for understanding this dynamic process, as this will enable them to be key players in the process.

4. Teachers should understand that there are serious limitations to the traditional lecture method of teaching. Lectures provide a useful forum for teachers to generate interest in a subject. Lectures can also be used to explain the basic principles governing a subject area and the context in which those principles developed. Lectures can also be used to provide the student with a framework for analysing a problem or issue in that subject area. However, when it comes to the higher skills of analysing complex problems and issues, I have found that lectures are of very limited value.

5. Higher levels of learning occur when students are forced to articulate their ideas and solutions in writing. Learning is enhanced further if the written analysis is critiqued by their peers or by the teacher, and the students are required to re-write their analysis in light of the comments and criticisms. A still higher level of learning is achieved if the students must verbally articulate their analysis and respond to questions that test their level of understanding. The highest levels of learning are reached if the students must repeat this process until they can demonstrate that they have reached the desired level of understanding and excellence.

6. Students can learn as much from each other as from their teachers, especially if they are given greater responsibility for defining the learning process. When possible, the teaching methods employed in a course should provide students with the opportunity of working together in groups to analyse problems, conduct research and propose solutions. This is also important in preparing students for legal practice, where they will usually be working as a member of a team on a case. This requires that teachers must be more than good lecturers or communicators. They must also be good facilitators and coaches.

7. It is critically important that the methods of evaluation and assessment in a subject reflect the objectives of the course and the teaching methods that have been employed. If creative problem-solving is one of the major goals of a subject, there should be more use of methods of continuous assessment such as writing exercises and moots, and less emphasis on final examinations.

8. Finally, and perhaps most important, always treat your students with respect, and make an effort to get them involved in the learning process. If you seek their views on the teaching methods you plan to employ, they are more likely to cooperate and support your efforts.

I have limited my comments to the teaching of law, as that is the only discipline I am qualified to teach or comment on. However, I would expect that many of my points may also be valid for education in other disciplines.■

Associate Professor Robert Beckman is a winner of the 2000/2001 Outstanding Educator Award.

Teaching Tips:
Developing the Curriculum for a Professional Clinical Course

Associate Professor Lim Lum Peng
Department of Preventive Dentistry

By three methods we may learn wisdom: First by reflection, which is noblest; Second by imitation which is easiest; and Third by experience which is bitterest.

—Analects of Confucius

The explosion of knowledge arising from the recent proliferation of information technology has led educators in tertiary institutions to ask questions such as: How do we design a curriculum that will develop self-directed

independent life-long learners? How successful have we been thus far in so doing? With regard to professional courses like Medicine, Dentistry and Pharmacy, educators not only have to achieve the goals of a broad-based education, but also face the challenge of designing a curriculum to help students attain certain desired and necessary professional skills so as to safeguard the interests of patients at large.

Thus to be an outstanding educator, one needs more than excellent presentation skills. The ability to design a good curriculum is also an integral component of good teaching. When designing a curriculum, one should consider the following key elements:

1. Learning objectives

As the basis designing curricula for a professional course in the medical and dental sciences (or in fact any other course), the learning objectives should be explicit, realistic and clinically relevant. In the three domains of learning (i.e. cognitive, affective, psychomotor) required for most courses, Bloom's taxonomy of educational objectives could be applied as a useful guideline to establish the learning objectives of each course.

For example, in the cognitive domain, levels of knowledge could range from basic cognitive skills (essential knowledge) to higher order thinking skills (application and evaluation). The affective domain focuses on attitude and behaviour, which are essential in the working environment. In the psychomotor domain, development of psychomotor skills involves several stages from novice to expert. The level of the learner would therefore determine the learning objectives, particularly in the cognitive and psychomotor domains.

2. Sequence of learning

While it could be argued that learning should be open-ended and ill-defined, some sequencing of learning is necessary when developing the curriculum of a professional medical/dental course. Certain core skills need to be established first so as not to endanger the welfare of patients. Although there are increasing attempts to integrate the basic science course with the clinical course in medical education to allow students to appreciate the clinical relevance of learning basic sciences, some care and restraint should be exercised such that it is recognised that the training of a medical professional must proceed in the following stages of evolution:

novice → advanced learner → competent practitioner → proficient practitioner → expert

3. Deployment of appropriate learning strategies

Not only does a curriculum have various objectives, students too have different learning styles.

Consequently, it may be useful to employ a combination of learning approaches such as problem-based learning, discovery learning, role-play, the use of simulation models, case studies/discussions, computer-based learning, multimedia presentations, collaborative learning, peer learning and direct instructional modes. The choice of learning approach is dependent on the discipline itself and to some extent on the individual teacher's preferred teaching styles.

Although problem-based learning (which has proved useful in enhancing students' self-directed learning) is increasingly being used, this does not mean that one should rigidly apply only one particular approach. There are circumstances when traditional modes of teaching may be highly effective and relevant. For example, when teaching a practical/clinical skill such as cardiopulmonary resuscitation or tooth-filling, direct instruction may be required to ensure students acquire the necessary basic skills and patients are ethically protected.

4. Independent learning vs. spoon-feeding

Despite the increasing focus on self-directed learning, students are ironically becoming more dependent on the lecturer's PowerPoint notes and less engaged during lectures. This phenomenon raises the question: are lecturers in fact spoon-feeding students more than previously? Although a certain amount of spoon-feeding is inevitable to develop the students' core knowledge, it is vital that the lecturer challenges the students' thinking processes (instead of mass producing notes) by raising questions during lectures/ seminars and following up the dialogue through emails, tutorials, take–home assignments, individual and small-group discussions.

5. Appropriate assessment strategies

How students are appraised should be an integral component of curriculum design. Not only should the learning outcome be assessed, but the process of learning must also be evaluated (an aspect that is often overlooked). A high achiever in terms of grades may not necessarily be the most successful in professional practice for the evaluation of life skills (e.g. interpersonal relationships, communication skills, ability to work with others and work under pressure) are often not reflected in traditional modes of assessment. Although outcome assessment is apparently easier and more straightforward as opposed to the evaluation of behavioural and attitudinal matters that is more difficult and subjective, it is crucial that we improve and refine our assessment methods to take the latter more into account.

To achieve a truly well-rounded education, it is essential to apply multiple assessment strategies

besides the traditional written exams. This could involve project work, case presentations, open-book examinations, problem-solving tasks, objective-structured clinical examinations, take-home assignments, and competency-based tests (that assess practical and interpersonal skills). Assessment should include authentic tasks, be congruent to the learning objectives, reflect thinking skills, and not expect the mere regurgitation of information. Due credit should also be given to students who have demonstrated marked progress during the course.

6. Reflection

It is commonly accepted that reflection is one of the best avenues for evaluating the effectiveness of a course. Reflection could be carried out via self-reflection, students' evaluation, peer review and employers' feedback. While each mode has its advantages and limitations, a combination of different modes of reflection would help to reduce bias and could be used to evaluate the effectiveness of a programme from different perspectives.

In conclusion, it should be acknowledged that it is almost impossible to design a perfect curriculum. One must be prepared for change for what is considered good by today's standards may be outmoded in tomorrow's context. The curriculum must be modified after constant reflection and kept up-to-date in line with new knowledge and technology. One must be prepared to trim the curriculum or abandon certain aspects to make way for more effective learning tasks and not regard impending change as a threat to the success of one's course. ■

Associate Professor Lim Lum Peng is a winner of the 2000/2001 Outstanding Educator Award.

Teaching **Freshman** Chemistry

Professor Andy Hor Tzi Sum
Department of Chemistry

There are many ways to teach and achieve teaching objectives. I favour a multitude of approaches, strategies and methodologies that eventually converge. This convergent process serves as a mechanism to shape a scholar in a way that I believe scholars should be.

I teach CM 1111 (Basic Inorganic Chemistry), a freshman class with a typical enrolment of 350–400 students. The task is: how to reach out to a class whose background, aptitude and abilities cover two extremes of a spectrum?

There are many strategies to approach this challenge. First, I address the fundamental principles with the students. Once this foundation is laid, we have a common starting point in learning.

Second, I emphasise on the knowledge creation, assimilation and integration process, not the knowledge content itself. The processing of knowledge based on fundamentals is like learning how to cook, given a set of basic ingredients. You do not need to learn specifically how to cook Dish XYZ if you really understand the principle of cooking. Once you master the science and art of cooking, you can create your dish and off you go.

Third, the more able students need to be intellectually challenged. My questions therefore are set at different levels. The questions for these students are often those whose answers are not easily found in undergraduate texts or even open literature. Yet, the solutions will emerge naturally after a proper brainstorming session.

Fourth, confidence building is essential. Quite often, I find that the 'weak students' are actually very able, except that they lack confidence—the confidence to try, to experiment, to challenge and to explore. Unless they have confidence, they will not have the courage or commitment to continuously experiment and explore until success is attained. (Achieving success itself is a confidence booster, thereby reinforcing the cycle of increasing self-assurance.) Because such qualities take a while to cultivate, I, as their mentor, often spend much time and effort encouraging these students to help them build their confidence level.

Fifth, it is important to engage students in the 3Ds—Discussion, Dialogue and Debate. When the 3Ds are carried out in the classroom from Day One when the class is assembled and continued throughout the semester, such classroom interaction will have a lasting impact on the development of the students' thinking and communication skills. The Integrated Virtual Learning Environment can also supplement classroom interaction, providing an excellent forum that can take place anywhere, 24 hours a day, 7 days a week. Once incorporated into the students' daily routine (rather than being imposed), learning and thinking become a natural process and appear less difficult.

Last but not least, the students must write. The students cannot write if they do not think. They cannot think if they do not read. By making essay writing part of my course requirement, I compel my students to read

scientific literature and engage in the first step of the learning cycle since scientific writing must be based on facts, evidence and literature reviews. Through the process of writing, students learn how to gather knowledge, judge, dissect and assimilate concepts—skills essential in the learning of science. There is no better time to start the discipline of writing than at Level 1 when the students' minds are fresh and their thoughts are raw.

My first lecture usually starts with a promise and a caution. On one hand, I promise a new learning experience that will yield results over the long term. On the other, I caution those who underestimate the task ahead— learning can be painful at times because it requires mindset changes, sacrifices, and, very importantly, the courage to seek new knowledge. ■

Professor Andy Hor Tzi Sum is a winner of the 2001/2002 Outstanding Educator Award.

Feeding Them for Life

Assistant Professor Sunita Abraham
Department of English Language & Literature

We have all heard the adage, "Give someone a fish, you feed them for a day. Teach them how to fish, and you feed them for life." The knowledge-transmission model of education gives students fish. The knowledge-construction model teaches them how to fish, feeding them for life. And, that is what I hope to do as a teacher— help students acquire the mindset and know-how to construct, critique and communicate knowledge. How? By designing a range of activities which encourage learners to question the very traditions and structures they are being initiated into, thereby promoting productive interaction between self and other, past and future, conformity and originality.

The Latin *çducâre*, meaning "to draw out", from which we get the verb "educate", offers another clue to the goal of education, i.e. to draw out the wealth of knowledge that students bring, based on their lived experience and prior learning, and help them make connections between the old and the new. I spend the first class clarifying not just the module's learning outcomes, but also the goals of university education and the type of learning students should be aiming for— understanding how the ideas accepted/rejected by a disciplinary community are interconnected as well as the arguments for their acceptance/rejection (see *http://courses.nus.edu.sg/course/ellkpmoh/educ/NIE.rtf* and *http://nus.edu.sg/gem/about_what_is_ge.htm*).

This discussion allows me to underscore the idea of our being a learning community—that each of us brings different kinds (and levels) of expertise which need to be pooled to get the best out of our joint exploration of a subject. To drive this message home, I identify different students as 'resource person/specialists' for particular areas, based on their expertise and interest. I also spell out what I enjoy most about the teaching/learning situation (the give-and-take of ideas in an environment where everyone understands that knowledge, while empowering, is fallible, and that no one has a monopoly on good ideas), and clarify my own preferred learning style, while inviting students to reflect on their own learning styles.

In terms of the educational triangle (teacher, student, subject for joint exploration), my goal is to foster mutual respect between fellow explorers (teacher and students), and shared passion for the subject of our exploration. In order to create a conducive environment for learning, I underscore the need for discipline and a clear understanding of our mutual roles and responsibilities (e.g. in terms of preparation, participation, absence, meeting deadlines), circulating a written 'code of conduct' on which the class reaches consensus through negotiation.

Turning to module design, my syllabi tend to be question-driven in that the module usually seeks to answer one or two overarching questions, in the process of answering which, students explore other questions and concepts. I have written elsewhere (*http://www.cdtl.nus.edu.sg/publications/CDTLINK/Nov2001.pdf*) about the central role of language, and writing in particular, in knowledge construction, viz. that knowledge of an academic discipline crucially involves the discursive ability to speak, read and write the discourses of that discipline. Consequently, my main assignments typically require students to find a significant problem/question for independent exploration, targeted at an audience and publication site of the student's choosing, in negotiation with me. In this assignment, students experience a complete writing spiral, starting with a proposal indicating their research problem/plan before moving on to draft their papers. The draft receives oral and written feedback from the student's peers and me, based on which it undergoes further revision. Students submit a final draft together with earlier drafts (so I can see how much progress has been made) and a brief cover letter in which each student reflects on the strengths/

weaknesses of his/her paper (meant to promote the extremely difficult skill of auto-critique).

Collaborative learning is further encouraged in a group mini-project, culminating in an oral presentation, evaluated by peers and teacher, and through the formation of affinity groups for practical, moral and intellectual support. The groups comprise five students each, to provide a tie-breaker and to discourage sleeping partners. To help students take ownership of their own learning, I create multiple opportunities for them to interact without me, using a variety of web-based resources.

All my classes tend to be interactive. Since class-time is at a premium, I do not lecture. Instead, students are introduced to key ideas through their required readings. Each workshop begins with an opportunity for students to clarify ideas before we move on to a variety of tasks that call for thoughtful application of the concepts introduced.

Given there is no one best method of teaching/learning, asking for mid-semester module feedback allows me both to probe students' learning processes (e.g. how much time they spend on this module in comparison to others, and why; how much time they spend on specific activities like reading and assignments) and to discover the elements within and outside the module conducive/disruptive to deep learning. Some of the former include providing reading packets to eliminate time wastage at the Recommended Book Room (RBR); specifying the learning goals of each activity; returning assignments quickly, and analysing the class's performance on each assignment so they have a clear sense of their progress as individuals and as a cohort.

Finally, since teaching for me is about relationships, I try to get to know my students as individuals, as quickly as possible. A class poster, with photos culled from the Integrated Virtual Learning Environment (IVLE), distributed to the various affinity groups helps both the students and I put faces and names together of the members of our learning community. I also distribute profile sheets to get a sense of each student's academic profile (e.g. how many modules they are reading that semester, which ones they are majoring in) as well as overall aspirations, interests and concerns. Based on the information shared, I often email students to reassure, encourage or congratulate—a time-intensive activity, but well-worth it, given that it makes students feel valued as individuals and well rewarded by students' genuine appreciation, hearing from their busy professors.

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Assistant Professor Sunita Abraham is a winner of the 2000/2001 Outstanding Educator Award.