



An investigation into excellent tertiary teaching: Emphasising reflective practice

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Abstract. This study is an attempt to understand better the complex nature of tertiary teaching by identifying and investigating the attributes of a group of excellent teachers in science departments of the University. In working with this group of teachers we examined what they *say* about their teaching and what they *do* in their teaching practice. Our findings, as well as confirming much of the existing literature at primary, secondary and tertiary levels, emphasise the strong link between the teaching practice and research commitment of our excellent science teachers; as well as the key roles played by interpersonal relationships and the 'person' of the teacher. We propose that purposeful reflective practice integrates the many dimensions of teaching for this group of excellent science teachers. We present a theoretical model that can be used to assist novice or less experienced university academics in their development and understanding of teaching excellence at the tertiary level.

Keywords: academic staff development, reflective practice, research/teaching nexus, teacher attributes, teacher characteristics, university teaching

Introduction

The authors' research project was conceived to enhance the practice of novice lecturers by making use of the expertise already present in the University. The project began with a discussion between the Assistant-Vice-Chancellor, Division of Sciences and one of the authors on how best to support new science lecturers who typically have had little or no teaching experience, or professional development with respect to teaching. The research team, comprising two teacher educators and an academic staff developer, embarked upon this research confident in the belief that *good teaching is not innate, it can be learned*. With this in mind, the project sought to theorise the attributes of excellent tertiary teachers and the relationships among those attributes, with the long-term goal of assisting novice academics in their development as teachers.

This paper describes five dimensions of tertiary teaching that arose from our analysis of the three data sources used in the investigation. The multiple-

method design allowed us to listen to what our participants had to say about their teaching and good teaching in general, and to observe their teaching practice directly. We found evidence of different types of reflective practice used by the participants. We propose that purposeful reflection on their teaching plays a key role in assisting our participants to integrate the dimensions of subject knowledge, skill, interpersonal relations, research/teaching nexus and personality into recognised teaching excellence. We conclude with a discussion of the implications of our model for staff development efforts.

Characteristics of excellent tertiary teachers

Researchers have tried to pinpoint the components of good tertiary teaching since the 1930s (Weimer 1990). A number of researchers have acknowledged that a widely accepted definition of excellent teaching has yet to appear (e.g., McLean 2001; Trigwell 2001). A variety of methods have been employed to investigate teaching excellence including teaching observations, and student and teacher surveys and interviews. In 1973 Hildebrand sought to “identify and describe effective teaching so that instructors could be helped to improve” (p. 43). Hildebrand described five components of effective performance: command of the subject, clarity, instructor-group interaction, instructor-individual student interaction and enthusiasm (1973, p. 46). He explained that “teachers regarded as strong in all five of the components of effective performance are considered to be fine instructors by virtually everyone” (p. 48). He also described a number of traits present in both ineffective and effective teachers.

Sherman et al. (1987) noted that whether students rated teachers on a pre-prepared list of characteristics using a Likert scale, generated their own list of characteristics of teaching excellence or teachers were interviewed, the same five characteristics appeared. These characteristics were enthusiasm, clarity, attention to preparation/organisation, ability to stimulate interest and thinking about the subject matter, and love of knowledge (p. 67).

Feldman (1988, 1996, 1997) investigated evaluation instruments “to see how student evaluations can be used to help identify exemplary teachers and instruction” (1997, p. 369). He explained that “evaluation instruments try to capture the multidimensionality of teaching” (1996, p. 42). Feldman (1997) found that students placed high importance on the characteristics: clarity, stimulation of interest in the course, preparation/organization of the course, and motivation of students, in identifying good teaching. Students placed moderate importance on sensitivity to, and concern with class level and progress, knowledge of the subject, enthusiasm for the subject, and avail-

ability. Students rated the personality of the teacher as having moderate to low importance.

Horan (1991) reviewed research on effective community college teachers who had been identified as exemplary based on student achievement data and then interviewed to determine any common characteristics. Horan found that effective community college teachers had an in-depth knowledge of their subject area, demonstrated knowledge of and use of a variety of teaching techniques, showed interest in teaching, were organised, were respectful and interested in students, encouraged student participation, and regularly monitored student learning to provide feedback (p. 23). Horan explained that “these characteristics are behaviors and techniques rather than dispositions or personality traits” (p. 9).

Elton (1998) explained that “teaching Excellence . . . as a concept, lacks precision” due to “the multidimensionality of the concept” (p. 3). Elton proposed a list of competencies for teachers and claimed that excellent teachers would demonstrate a high level of competence in “a number of these, but not necessarily all” (p. 6). These competencies include organization, presentation, relationships, assessment and evaluation (p. 6). He added that other dimensions of teaching excellence include reflective practice, innovation, curriculum design, teaching service to the community, research into discipline specific teaching, and pedagogical research (p. 6).

Hativa et al. (2001) studied a group of exemplary tertiary teachers in order to “identify the[ir] beliefs and pedagogical knowledge” (p. 703). In their review of research on the characteristics of excellent university teachers Hativa et al. found that:

Exemplary university teachers are well prepared and organized, present the material clearly, stimulate students’ interest, engagement, and motivation in studying the material through their enthusiasm/expressiveness, have positive rapport with students, show high expectations of them, encourage them, and generally maintain a positive classroom environment (pp. 701–702).

While these, and other studies, contribute to understanding the perceived attributes of excellent teachers, they have had limited influence on improving the practice of less experienced university teachers. Identifying the elements of “good” university teaching has not shed light on *how* university teachers develop these attributes. Our study sought to investigate the characteristics of tertiary teaching excellence in the sciences at the University and use these findings to address teaching development needs of less experience staff. This project was conducted in two phases: Phase I consisted of the identification and subsequent study of excellent teachers from University science depart-

ments. Phase II involved the development and evaluation of an intervention with novice lecturers using the findings from Phase I (Sandretto et al. 2002). This paper reports findings from Phase I.

Theoretical framework

Many researchers have acknowledged the complexity involved in teaching and learning to teach (e.g., Ballantyne et al. 1997; Calderhead 1996; Common 1989). In an effort to better capture the complex nature of teaching we use Theories of Action as the theoretical framework to inform our research. This framework developed by Argyris and Schön (1974) “include[s] the values, strategies, and underlying assumptions that inform individuals’ patterns of interpersonal behavior” (Schön 1987, p. 255). When applied to the practice of teaching the theories of action differentiate between teachers’ espoused theories of action and theories-in-use. Briefly, espoused theories of action are those theories “that we use to explain or justify our behavior” (Schön 1987, p. 255). These theories are easy to articulate and could be interpreted as what teachers *say* about their own teaching. Theories-in-use, however, are the tacit theories that underpin practice. Schön (1987) explained:

often we are unable to describe [our theories-in-use], and we are surprised to discover, when we do construct them by reflecting on the directly observable data of our actual interpersonal practice, that they are incongruent with the theories of action we espouse (p. 256).

Theories-in-use exist predominantly as *tacit knowledge*, that is knowledge we hold but cannot articulate easily (Argyris and Schön 1974; Polanyi 1966). Polanyi (1966) described tacit knowledge as “a certain knowledge that [one] cannot tell” (p. 8). Espoused theories of action and theories-in-use distinguish between what people *say* they do and what they *do*. We believe that in order to better capture the complexity of an activity such as teaching, it is important to utilise a number of methods that allow researchers to access both what teachers *say* about their teaching and what they *do* in practice. The Theories of Action framework assists us in achieving this goal.

Participant selection

Given the initial interest from the Division of Sciences and our desire to work with a manageable sized group, we restricted the research to lecturers in sciences. Participants were identified by soliciting Heads of Departments (HODs) in the University’s Division of Sciences. Procedures for performance

appraisal used in our university place significant responsibility on each staff member's HOD. The HOD is the person best placed to provide an overview of staff and student perceptions of teaching performance. The HODs were asked to provide a short written statement of support in order to nominate academic staff who were recognized as excellent teachers within their departments and who had demonstrated interest in exploring their teaching practice. When soliciting nominations we did not place any limits on the potential participants, such as a minimum number of years of teaching experience. We asked the HODs to specify the courses that the lecturer taught and the modes of teaching in which they excelled, i.e., large class lectures, practical classes, distance teaching, etc. We received 13 written and four telephoned statements in support of the 17 nominees. These written statements ranged from the briefest possible: "I am pleased to nominate x . . . [who] excels in large class lecture situations as well as . . . [a] practical context" to extended statements accompanied by relevant course outlines, descriptions of courses and supporting statements from promotion reviews. Many of the HODs referred to student evaluations of teaching, such as "x has received remarkable student evaluation reports . . . considering the size of this class, the overall student appreciation of his lecturing style and presentation is truly exceptional, and to my knowledge unequalled at the first year Science level".

We recognize that a fundamental tension exists whenever anyone tries to identify excellent teachers. Lowman (1996) wrote "the notion of the exemplary . . . teacher shares much with any idealized concept, such as truth or beauty: it is difficult to achieve consensus on a general definition, but most people think they know a specific example when they see it" (p. 33). We are using the term *excellence* to signal an on-going process of self improvement, rather than a measurable end-point. We do not see excellence in teaching as something that once obtained, absolves teachers from seeking further improvement in their teaching.

While it could be argued that the HOD nominations were insufficiently rigorous, the HODs were invaluable in helping us to identify potential participants who were both willing to give of their time to explore their teaching and perceived as excellent teachers. Another possible limitation of the selection process is that students were not consulted directly during the nominations phase. It was clear from nomination statements, however, that many of the HODs drew upon student evaluations of teaching to inform their nominations.

All 17 nominated lecturers agreed to participate in the study. The 10 men and seven women were teachers from departments of anatomy and structural biology, chemistry, computer science, family and community studies, geology, marine science, mathematics and statistics, microbiology, human

nutrition, physical education, psychology, surveying, and zoology. The participants' teaching experience ranged from six to 34 years with an average of 18 years. Participants were not selected on the basis of the duration of their university teaching experience. Three of the participants had been trained as secondary teachers before beginning their university careers. All of the participants were also active researchers.

Research design and methods

The research design was developed in order to capture both what teachers say about their teaching and to observe their teaching practice directly (Kane et al. 2002). To do so we implemented a multi-method research design. Kagan (1990) stated "the use of multimethod approaches appears to be superior, not simply because they allow triangulation of data but because they are more likely to capture the complex, multifaceted aspects of teaching and learning" (p. 459). Initial individual interviews and the elicitation of repertory grids provided our participants with two separate opportunities to 'talk' about their teaching and describe good university teaching and teachers in general (espoused theories). The videotaped teaching episodes and subsequent stimulated recall interviews allowed us to observe their teaching practice first hand, and gave the participants an opportunity to make explicit the thinking underpinning their teaching practice (theories-in-use). Through these multiple methods we sought to capture the complexity inherent in university teaching.

Initial interviews

Shortly after the participants were nominated, they were interviewed individually by one of the authors. The semi-structured interviews lasted from 30 to 90 minutes. The participants were sent the interview questions in advance, although some additional questions arose during the course of the interview for purposes of clarification. The interview questions sought to elicit the participants' beliefs about good university teaching in general and their aims and intentions for their own teaching practice. The questions ranged from general queries about the participants' educational background and teaching experience, to more specific questions such as: What are your particular strengths in teaching at a tertiary level? The interview schedule was influenced by the work of Dunkin and Precians (1992), Dunkin (1995), and Barrington (1999). The initial interview transcripts were returned to the participants for clarification and validation. Although some participants took the opportunity to make small editing changes, none made any substantive changes to text or meaning.

Repertory grid interviews

The use of the repertory grid technique in this study complemented the initial interview data as they provided another means for the participants to articulate their personal constructions of good teaching and good teachers based on their experience as university students and teachers. Repertory grids are based on Kelly's (1955) Personal Construct Theory, which emerged from his work in clinical psychology and in particular his notion of people as "personal scientists". According to Kelly, people construct their own frameworks based on personal experiences and interactions with their world. These personal frames are then used to interpret new experiences and predict future interactions, experiences, or behaviours.

Although designed initially for use in clinical psychology, repertory grids have been utilised increasingly in recent decades in a range of research studies in the field of education. Researchers have used repertory grids in their investigations of the ways in which teachers construe the curriculum of their classrooms (Ben-Peretz 1984; Munby 1984) and to identify the influences teachers' personal constructions have on their classroom practice as teachers (Oberg 1986). Exemplary secondary mathematics and science teachers participated in a study conducted by Meade et al. (1991) which used repertory grids to elucidate the participants' personal theories of effective teaching within their area of expertise.

Participants in this study were invited to complete repertory grids as a means of making explicit and examining the ways in which they construe university teachers and teaching. Fourteen of the 17 participants completed repertory grid interviews during four small group sessions led by the researchers. Completion of the repertory grids was presented as an optional component of the study. Three participants declined to participate, but did so due to the restrictions of other commitments rather than in objection to the procedure.

Following the convention of Diamond (1985) and Zuber-Skerritt (1988), the approach chosen for this study required participants to generate personal descriptions of excellent and poor university teachers through comparisons of random triads of university teachers known to them. To elicit descriptions of these university teachers, participants were asked to compare the attributes of random triads of teachers as follows: "With their attributes as teachers in mind, in what way are two of the teachers alike, and in what way is the third teacher different from the other two?" This process resulted in two contrasting, but not necessarily opposite, sets of statements for each construct. The *emergent construct* which emerged from the similarity between two teachers; and, the *implicit construct* which represented the difference between one teacher and the other two. Since the constructs were elicited from the

participants in their own terms the repertory grids served to maintain the integrity of the participants' perspectives free from corruption by researchers' influences and/or interpretations (Solas 1992).

Teaching observations and stimulated recall interviews

Making explicit the thinking behind the teaching practice of participants in terms of their own language was made possible in this study through the use of observations of the participants' teaching and associated stimulated recall interviews. Stimulated recall has served as an umbrella term covering a range of interview techniques that aim to gain access to the thoughts of teachers (and/or students) during classroom interaction. The stimulated recall method has its origin in studies by Bloom (1953) of students' thought processes during a range of instruction modes, in particular, lecturing and group discussion. Bloom made audio recordings of class sessions which were played back to the students who were required to recall what thoughts they had experienced at significant points of the class. Bloom reported that the underlying premise guiding the stimulated recall method "is that a subject may be enabled to relive an original situation with vividness and accuracy if he [sic] is presented with a large number of the cues or stimuli which occurred during the original situation" (Bloom 1953, p. 161).

Stimulated recall has not been employed frequently in published studies involving university teachers, although it has been demonstrated to be a useful tool for accessing the beliefs that underpin primary and secondary teachers' practice (Calderhead 1981; Ethell 1997; Meade and McMeniman 1992). Meade and McMeniman (1992), in their study of effective secondary teachers' implicit theories found it "particularly salient for examining the relationships between teachers' beliefs and actions" (p. 7).

Stimulated recall interviews were used in this study to allow participants to make explicit and articulate the thinking, knowledge, theories and beliefs that guided their teaching practice. All but one of the 17 participants agreed to have a class observed and videotaped. Each chose a large group lecture of about an hour in length, although all of them also taught in small group or other instructional modes. The stimulated recall interviews in this study were semi-structured, allowing both the participant and the interviewer to stop the videotape at any time to question or comment on the thinking and decisions underlying the recorded teaching practice. The stimulated recall interviews were conducted as soon as possible after the class, 14 within 48 hours and the remainder within one week. Before viewing the videotape of themselves teaching, participants were invited to comment on their objectives and intentions for the lecture, and to comment on any ideas, beliefs or theories which they could identify as having influenced their planning and teaching

approach. The viewing of the video commenced with the following directions by the interviewer:

Now you're going to walk me through the lecture and tell me what was going on in your mind at the time. Try to distinguish between any thoughts you had at the time and thoughts you're having now as you watch the tape and make me aware of those differences. You can stop the tape as often as you like and for as long as you need to explain your thinking (based on Marland 1984).

The stimulated recall interview was videotaped and then transcribed verbatim for subsequent analysis.

Data analysis

Our data analysis followed an inductive approach grounded in critical readings and re-readings of the transcripts from the initial interviews, the repertory grids and the stimulated recall interviews. The data analysis was facilitated by using Non-numerical Unstructured Data Indexing Searching and Theorizing (NUD*IST) software from Qualitative Solutions and Research (QSR). The NUD*IST software lends itself to inductive analysis by allowing the researchers to work with the transcripts in a manageable way, search for patterns, and identify and organise themes.

Data analysis commenced with the first set of transcribed initial interviews and continued throughout the duration of the research. Analysis of repertory grids was restricted to content analysis of the participants' elicited constructs. Typically, use of a rating scale allows cluster and/or principal component analysis. In this study, however, we did not pursue the rating scale for two reasons: First, we were concerned primarily with eliciting the ways in which the participants construed university teachers and teaching, rather than how they located themselves and others against such constructions; and second, it became evident that instructions given with respect to the rating scale were ambiguous and had been interpreted differently across the participants.

Two passes of coding were made through each data set by the interviewer and the themes and trends that arose were discussed among all three researchers. As each set of data was added to the analysis, the coding categories were refined and expanded. The model of the dimensions of tertiary teaching was drafted to represent the five major categories of coding that had arisen from the on-going analysis of all three sets of data (see Figure 1). All original transcripts were then re-read to check for coding consistency against the model. As is evidenced by the supporting quotes for each dimension in the following discussion, each of the data sources contributed to the development of the model.

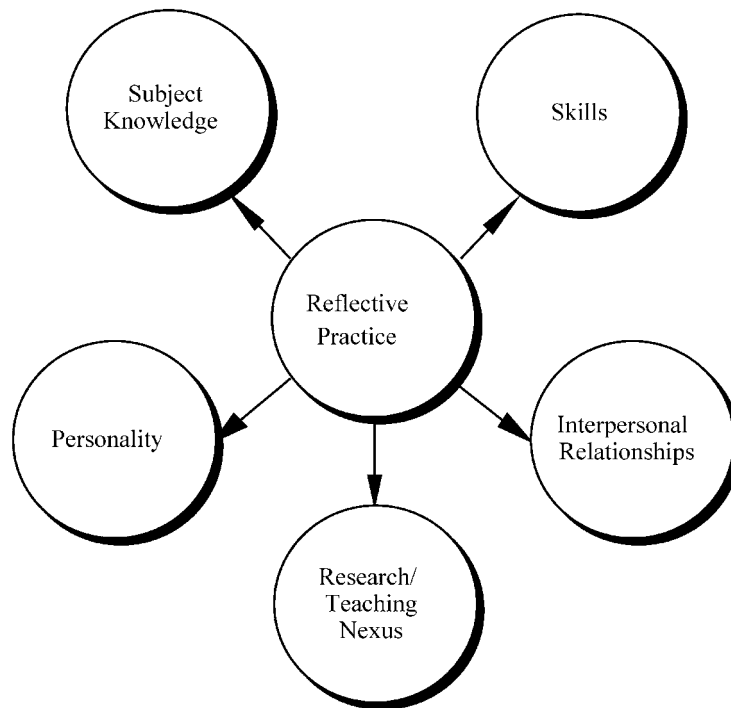


Figure 1. Model – dimensions of tertiary teaching.

Common attributes of excellent university lecturers in sciences

The five-dimensional model of the attributes of excellent science teachers in the University was developed from the participants' descriptions of themselves from the initial interviews and stimulated recall interviews and the important attributes of excellent tertiary teachers that were elicited in the participants' repertory grids. The wheel-like model consists of five inter-related dimensions as spokes; subject knowledge, skill, interpersonal relationships, teaching/research nexus and personality, with reflective practice as the hub. While these dimensions may not be unexpected as they resonate with previous studies, the ways in which the dimensions are related emerged as critical. Based on our evidence, we propose that the participants engaged in purposeful reflective practice as a means to integrate the different dimensions of themselves as teachers and to better understand and improve their own teaching practice. The following presentation of the dimensions of the model is supported with verbatim quotations from the participants' initial interviews (II), repertory grids (RG) and stimulated recall interviews (SRI). The quotes are representative in regards to the gender balance of the participant group.

Subject knowledge

The first dimension in our model is subject knowledge (Figure 1). The view that well developed subject knowledge is a key attribute of a tertiary science teacher came through clearly in the initial interviews for most (15) participants and was also apparent in stimulated recall interviews and repertory grids. For example: “the key probably would be knowledge of the subject” (II); and, “it’s to know your field really, so that I am not just reliant on what I have read” (SRI).

The need to keep up-to-date in the subject was identified by 11 participants as an important characteristic of excellent tertiary science teachers: “being totally up-to-date with the literature and able to articulate new and different ideas very lucidly and clearly” (RG). This characteristic could be considered a corollary to the dimension of subject knowledge; i.e., that an excellent tertiary teacher continues to acquire subject knowledge expertise long after the doctorate is completed.

Subject matter knowledge has long been identified as a prerequisite of effective teaching in both primary and secondary teaching and is a given at the tertiary level where lecturers typically hold doctoral qualifications. By virtue of these higher qualifications, tertiary teachers are expected to be knowledgeable in their subject area. This has been acknowledged by many researchers seeking to describe excellence in university teaching (Feldman 1988, 1996, 1997; Hildebrand 1973; Lowman 1995, 1996; Sherman et al. 1987). Our study has confirmed the key role of subject knowledge in tertiary teaching excellence.

Skill

The second dimension in our model is pedagogical skill (see Figure 1). A number of skills were identified by the participants as important characteristics of excellent tertiary science teachers. We defined skills as techniques that teachers can learn and add to their teaching repertoire, or traits that could be learned and developed with assistance (e.g., Horan 1991). Generally, these skills are observable behaviours.

It is significant that clarity was mentioned by all 17 participants. The term clarity was used by the participants to signal two different concepts. It was used to emphasise the need to “have very good communication skills” (II), and the need to “be heard and understood” (II). Clarity in terms of communication skills was mentioned frequently in the repertory grid interviews, for example: “a commitment to clarity of presentation” (RG); “ability to explain things clearly” (RG); and, “clear verbal presentation ... good diction ... ability to communicate at various knowledge levels” (RG).

Sixteen of the 17 participants noted the importance of making real world connections between the subject and student experience to encourage student learning, for example: “But the challenge is to put examples in it that relate what you know to what they know” (II); and,

I think the material has to be relevant to their lives before they’re going to engage. Try to use topical issues that they’re reading about so that they can bring a sense of scholarship and enquiry and mature thought to things that are raging around them at the moment so they can see the way the science is connected to their lives (II).

Fifteen participants identified the necessity of organisation and clarity of expectations in the tertiary science classroom. “I think students like somebody at the front who is organised” (II); and, “The expectations are clear. I can’t have a hidden agenda . . . I like to be upfront with what the expectations are, and so they know where they’re headed and they don’t have to muck around and waste time trying to work it out for themselves” (II).

Fourteen participants used several different terms to describe teachers who used strategies to inspire, or motivate, or stimulate the interest of students in learning and in the subject area: “I would think I can motivate the student so they would like to go further” (II); and,

the word ‘inspirational’ describes the characteristic that is needed in a university teacher. You need to be able to make bright students not only understand your area, but be enthused and want to work in your area . . . unless the lecturer can inspire the students, they don’t have much of a role in the actual learning process (II).

Ten participants described the excellent tertiary science teacher as a facilitator of learning: “basically [I’m] a facilitator, a resource person, a sounding board for new ideas . . . all those things – generating discussion, providing feedback, all relate back to being a facilitator of learning, and that’s how I see my role, essentially” (II).

An excellent tertiary science teacher is adaptable according to nine of the participants. A tertiary teacher needs to have “versatile approaches” (II) and be able “to work in a variety of situations” (II) including lectures, laboratory classes, tutorials, field work, seminars and postgraduate student supervision. Repertory grid interviews elicited this characteristic in both its positive “ability to teach in a range of contexts and situations” (RG) and negative forms “never thinks of new ways of presenting – just copy it all on the blackboard” (RG).

Nine participants identified preparation as a key attribute of excellent tertiary science teachers:

when I start to prepare for the lectures it's actually the act of pulling this whole shambolic mixed up set of overheads together and getting them into order and touching them up a bit according to their adjustments from last time and that's actually a process of somehow me climbing in and getting this information together (SRI).

The tertiary teacher as a life-long learner was described by seven participants. "I think of myself also being a teachable person – in other words you are always willing to learn. You can show that to your learners so that they can see that you're willing to learn from them as well" (II). This commitment to self-improvement was evident: "I belong to . . . an organisation set up for health professionals in education . . . I get a lot of abstracts on the different teaching journals" (II). Another participant was keen to partake in the project "because it was a chance to see my own teaching and think about it and critique it. And I thought that was just a wonderful professional development opportunity" (II).

Of the many skills identified by our participants, other researchers have supported the role that clarity (Feldman 1988, 1996, 1997; Hildebrand 1973; Lowman 1996; Murray 1997; Sherman et al. 1987), organisation (Feldman 1988, 1996, 1997; Hildebrand 1973; Lowman 1996; Murray 1997; Sherman et al. 1987); motivation/inspiration/stimulating interest (Feldman 1996, 1997; Lowman 1996; Sherman et al. 1987); and preparation (Feldman 1988, 1996, 1997; Lowman 1996; Murray 1997; Sherman et al. 1987) play in successful tertiary level teaching. Each of these skills assist a university teacher to communicate his or her subject knowledge in clear and meaningful ways that support and enhance student learning.

What all of the skills listed above have in common is that a newly appointed tertiary teacher, should he or she choose, could seek to learn and implement them in the course of his/her teaching. "Indeed, most of the skills of teaching, could, I believe, be learned by any teacher who really put his [sic] mind to it and cared enough to invest the necessary time and effort" (Hildebrand 1973, p. 49). Academic staff development often focuses on the development of pedagogical skills as a key way of supporting newly appointed academics in their university teaching. We would argue, however, that while perhaps the most readily recognised dimension of our model, skills are far from being the most important determinant of teaching excellence.

Interpersonal relationships

Tertiary teaching does not take place in a vacuum but occurs within a relationship between the teacher and the students. In our model, these relationships form the third dimension of tertiary teaching (see Figure 1). All 17 parti-

cipants spoke of the role that interpersonal relationships play in teaching at the tertiary level: “but when I think back to last year, the most pleasurable [sessions] were these long runs of lectures where I could establish a relationship” (II); “I do think teaching relies on one-to-one interpersonal relationships, even if you’re standing there with 200 unknown names, it’s critical” (II); “a deep respect and even fondness for students” (RG); “there’s a level of humanity and empathy that I think is critical to being a good teacher” (II); and, “I think it’s really important to not set yourself above them but to actually convey to them in some way that you’re really interested in them and their point of view and what they bring to the situation” (II). Another participant described the thinking behind her teaching style:

which I suppose again it’s just that I’m revealing quite a lot about myself in my lectures, so I was making myself human to them . . . So they get to know me probably almost as much as I get to know them (SRI).

Some of the participants noted the need for tertiary science teachers to act as mentors for young people: “I think empathy, trust, ability to understand students’ issues, students’ problems, any difficulties. And I guess it’s manifest in the fact that they will come and talk to you openly about any problems or difficulties they have” (II). And lastly, interpersonal relationships were seen by some participants as critical to effective tertiary teaching: “I would say that knowing where they’re at and being able to communicate with them as people is probably the top priority” (II).

We suggest that teaching at all levels is primarily about building relevant interpersonal relationships with students. Relationships that are concerned with caring about the students’ needs, and what and how they think emerged as important to our participants. Teaching within universities often involves lecturing to large numbers of students which is often assumed to preclude opportunities for building relationships that encourage interactive engagement between the teacher and students, and between students and students. It is interesting to note that 16 participants in this study chose to videotape their teaching in a large group lecture, and each of them identified establishing interpersonal relationships as central to successful teaching at a tertiary level regardless of class size.

Research/teaching nexus

Although there were not any questions in any of the interviews specifically asking the participants about connections between research and teaching, most participants (13) discussed the effect their research had on their teaching and vice versa (see Figure 1). For our participants from the sciences, research is an essential part of their job as a university academic;

my role is different from that of a high school teacher, I'm a researcher and my research is important to me. And I'm trying to show them how my research skills . . . can be communicated to them . . . by telling them a little about the research that I do and using that as a way of linking the lectures together (SRI).

The participants also emphasised the link between research and teaching when describing characteristics of excellent tertiary science teachers. For example: "pursuit of excellence and detail in research and teaching" (RG); "integration of research into teaching" (RG); and,

The other thing that I do at year one, which most of my colleagues don't do, is to actually use primary research material in the context of my teaching . . . I love research, I love talking about experiments, so it's a way of capturing for me the process of science, which again I think is the best I can leave them with. The facts, a lot of times, are irrelevant, and they're going to be out of date by the time they graduate. The thing that won't be out of date, however, is the way in which scientists go about solving problems . . . So starting at year one, I use this research based practice . . . But a lot of times I try to make the points by walking the students very carefully through the research that was conducted in order to come up with those particular conclusions . . . And they're starting to think critically about the whole process of science. And so that's really the underlying motivation of going through research . . . trying to teach them those important skills which I think transcend the content (SRI).

And in addition "some of my best research ideas have come out in the course of teaching in an area that is not necessarily something I do a lot in, but I'm reading up on it for my teaching and I think 'oh, that would be really interesting, why don't we do that?' " (II).

The participants did not separate their roles as researchers and teachers. In New Zealand the Education Act states that teaching and research in universities are "closely interdependent, and most of their teaching is done by people who are active in advancing knowledge" (New Zealand Government 1995, p. 162). Indeed there is an understanding that it is research informed teaching that sets apart universities in New Zealand from other tertiary education institutions. John Henry Newman (1801–1889) wrote: "If its object were scientific and philosophical discovery, I do not see why a university should have students" (as cited in Pelikan 1992, p. 80). The majority of the participants (13 of the 17) related how research plays an integral role in what and how they teach and who they are as university teachers. This appears to contradict much of the research that has sought to isolate and quantify the relationship between research and teaching in universities. What is clear

from our participants is that they are confident that teaching excellence is enhanced by the ways in which their research informs their teaching, which in turn informs their research.

Researchers have been unable to quantify a significant, correlational relationship between teaching and research at the tertiary level (Hattie and Marsh 1996; Ramsden and Moses 1992; Shore et al. 1990). Shore et al. (1990) found “the evidence we have collected largely contradicts the belief that research and teaching inform directly upon each other” (p. 35). Hattie and Marsh (1996) in a meta-analysis that sought to relate publications (as evidence of research) and quality of university teaching concluded that “the common belief that research and teaching are inextricably entwined is an enduring myth. At best, research and teaching are very loosely coupled” (p. 529). While these quantitative studies appear to contradict our findings, it is important to note that their authors sought to establish and measure a relationship between research and teaching and used narrow parameters of both research and teaching excellence. We suggest that the research approaches adopted were unable to mine the richness of the individual university teacher’s experience and understanding of his or her own work. Kreber (2000) noted that quantitative studies “have been criticised for ignoring the complex nature of research and teaching, and the critical points where the two might meet” (p. 64).

The complex and idiosyncratic nature of the research/teaching nexus is highlighted in qualitative studies by Kreber (2000), Neumann (1992), Robertson and Bond (2001), Rowland (1996), and Smeby (1998). There is increasing support for the notion that university teachers do perceive there to be a definite link between research and teaching. It is apparent from these studies, and supported by our project, that “the nexus is complex, and its subtle, arcane aspects appear to outweigh the more concrete, explicit ones” (Neumann 1996, p. 14), which may account for the inability of quantitative studies to identify explicit relationships of the complexity described in this study.

Personality

The fifth dimension in our model is personality (see Figure 1). We differentiated skills from personality by using our own tongue-in-cheek definition: One can learn new skills with some study and practice, but it would take years of therapy to alter one’s personality. One participant explained that good tertiary teachers “exhibit much of their own personality” (RG).

Significantly, the most commonly cited personality characteristic was enthusiasm, named by 15 participants: “here is someone who is really enjoying the whole academic experience, that whole learning experience.

They're still acquiring knowledge even at their stage in life!" (II); "infectious enthusiasm" (RG); and, "one of the most important characteristics is somebody who is extremely enthusiastic and has a real passion for the subject that they're teaching" (II).

Thirteen participants mentioned the role that a sense of humour can play in the tertiary classroom: "I also think that having a sense of humour is also a really important thing to have at a tertiary level and not to take yourself too seriously because we all make mistakes and to set yourself up as being completely infallible leads to a disaster in the classroom" (II); and, "so I look for . . . the teachable moment where I can safely introduce humour or interest into the session" (SRI).

Tertiary teachers need to be approachable according to 10 of our participants: "accessible in the sense that if there is something they want to talk about, or complain about . . . at least they have some forum where that can happen" (II).

The role that passion plays in excellent tertiary teaching was mentioned by seven participants: "it all comes down to portraying that sense of passion for the work that makes [the students] want to go out and learn more" (II). For seven of the participants, excellent tertiary teachers are relaxed:

If things go wrong, don't worry about it. They'll [students] be relaxed if you're relaxed. If the slide projector breaks down, who cares . . . Don't let it put you off for the rest of the lecture. Try to improvise, try to have a plan B, always. (II).

Excellent tertiary teachers are "humane" according to six of our participants: "I'm revealing quite a lot about myself in my lectures, so I was making myself human to them" (SRI); and, "So there's a level of humanity and empathy that I think is critical to being a good teacher" (II). Four participants felt that fun was an important component of excellent tertiary teaching: "I'm out there having fun" (II); and "I think that as a teacher you're . . . trying really to communicate to them [students] the joy of learning. So it's got to be a fun experience" (II).

What is at the heart of establishing interpersonal relationships with students is the "person" of the teacher. Palmer (1998) reminds us that good teaching goes far beyond technique of delivery of subject matter, "good teaching cannot be reduced to technique; good teaching comes from the identity and integrity of the teacher" (p. 10). The participants in our study each identified personal affective attributes as key influences of who they were as teachers. The participants were determined to integrate their personalities into their role as teacher. "There is no blueprint for being an effective teacher and teachers jeopardise their growth when they try to imitate others and ignore

their self-actualisation. Being who you are is important in the classroom and is essential in forming honest relationships with students” (Fraser 2000, p. 3).

Integration of dimensions of teaching excellence through reflection

A common characteristic that became apparent was that these excellent university teachers engaged in regular, purposeful reflection on their teaching practice. Reflection lies at the hub of our model and we propose that it is the process through which our participants integrate the various dimensions (see Figure 1). One participant explained: “It’s a continuous process of reflection and trying to do what you’re doing as well as you can” (II). It could be argued that we asked the participants to reflect, particularly in the stimulated recall interviews, however, we also found unsolicited evidence in the initial interviews as the participants offered examples of the strategies that they regularly used to engage in ongoing reflection on their teaching.

Reflective practice is becoming an increasingly recognised aspect of teaching in higher education (e.g., Biggs 1999; Brookfield 1995; Clegg et al. 2002; Kreber 1999; McAlpine et al. 1999). Day (1999) wrote “it is generally agreed that reflection in, on and about practice is essential to building, maintaining and further developing the capacities of teachers to think and act professionally over the span of their careers” (p. 222). The origins of the term can be traced back to the work of Dewey (1933). Dewey defined reflection as “an active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds supporting it and future considerations to which it tends” (Dewey (1933) as cited in Yost et al. 2000, p. 39). A resurgence of interest in the role of reflection in the practice of professionals has been attributed to the work of Schön (1983, 1987). Schön (1983, 1987) described “reflection-in-action” as reflection that takes place while the practice is occurring; and “reflection-on-action” as reflection that takes place after the practice has concluded. Osterman (1990) characterised reflective practice as “mindful consideration of one’s actions, specifically, one’s professional actions . . . a challenging, focused and critical assessment of one’s own behaviour as a means towards developing one’s own craftsmanship” (p. 134). Korthagen (2001) explained that “reflection is the mental process of trying to structure or restructure an experience, a problem, or existing knowledge or insights” (p. 58).

A number of different levels or types of reflection have been described in the literature (Day 1999; Hatton and Smith 1995; Schön 1983; Smyth 1992; Wellington and Austin 1996). We used the framework of reflection outlined by Hatton and Smith (1995) to identify four types of reflection in the initial and stimulated recall interviews: technical, descriptive, dialogic and

critical. All 17 participants reflected on their practice in one form or another, and 13 participants demonstrated two or more types of reflective practice. Participants reflected on subject knowledge and skills most frequently, but they also reflected on interpersonal relationships, the research/teaching nexus and personality (see Figure 1).

Sixteen participants made statements that we classified as **technical reflection**. Hatton and Smith (1995) defined technical reflection as “decision-making about immediate behaviours or skills” (p. 45). Typically, technical reflection is focussed on the practical skills of teaching; the methods needed to transfer information and the processes used to improve lectures from one year to the next. Participants used technical reflection to reflect on the subject knowledge of a particular class or the skills they were using in their teaching (see Figure 1). One participant explained “I take at least a third to a quarter of each course each year and revisit it and update it both from a presentation point of view and a content point of view” (II). Another participant noted that he was often “reflecting on those things like clarity and communication” (II). Other participants noted techniques they used to help them reflect:

if there are certain things that have gone well, or more particularly if things haven't gone well, I'll sit down and write out a sheet which I'll put in with my notes for that particular lecture for next year to make sure I don't make the same mistake again next year. Or that if things have gone well that I do adopt that same sort of order, that same sort of logic that has gone down well with the students this year, next year (II).

I will always take notes immediately after a lecture if something's gone wrong. So I used the video in yesterday's one and I spooled it for just too long and I felt the energy change so I make myself notes (SRI).

We found evidence of **descriptive reflection** from 16 participants. Hatton and Smith (1995) characterised descriptive reflection as “analysing one's performance in the professional role . . . giving reasons for actions taken” (p. 45). The participants used descriptive reflection to examine subject knowledge, skills, interpersonal relationships, the research/teaching nexus and personality (see Figure 1). In the initial interview, this participant reflected on experiences as an undergraduate:

I constantly draw on that, I think, “well, how are we going to show them how to get stuff out of this situation? . . . What was the way that somebody dealt with me in a particularly effective way when I was an undergraduate?” . . . I can use those models over and over again to try and solve the same kinds of problems when they come up in my own teaching career (II).

In the stimulated recall interview, a participant explained the thinking behind the visible teaching behaviours and his concern with building and maintaining positive relationships with students:

I think the other thing I am doing there is valuing responses and so no matter what they said, if it was a really silly one I would still try and make the most I could out of it. And so it creates a safe environment for people to speak in a large group . . . because . . . whatever they say they are going to get some good feedback . . . Even if it is a silly one, I will turn it to good effect if I can (SRI).

Thirteen participants demonstrated evidence of **dialogic reflection** in their stimulated recall interviews. Hatton and Smith (1995) described dialogic reflection as “hearing one’s own voice exploring alternative ways to solve problems in a professional situation” (p. 45). Our participants used dialogic reflection to examine the skills, or teaching methods, they were using and to explore ways to improve (see Figure 1). For example:

Ah well, I often ask myself, “would I as a learner gain anything from this? What would I think of it? Would I enjoy it? Would I move on?” So that’s one criteria I use. . . . Gaining a sense of “have I achieved what I set out to?” . . . and look back over it and say, “did I actually cover the material?” And if not, “am I going to send them out an handout/article or something? How am I going to address that?” (II).

The videotaped lectures provided a strong stimulus for reflection, as evidenced by this participant’s statements:

Even when I was doing the delivery on [subject] I was thinking there are some things I really need to hone here, some things I need to organise a bit better. Maybe I need some different graphics, maybe I’ll cut out some of the facts. What I did . . . is I presented two alternative explanations for [topic] but really at first year level we don’t need that. I think I’ll just dispense with the first one. Because it just adds a bit of noise rather than signal. So I was thinking that at the time, “why am I saying this?” (SRI).

The final type of reflection, **critical reflection**, was demonstrated by three of our participants. This type of reflection was the least often demonstrated by the participants. Hatton and Smith (1995) described critical reflection, as “thinking about the effects upon others of one’s actions, taking account of social, political and/or cultural forces” (p. 45). The participants used critical reflection to interrogate their skills, or teaching methods, and subject knowledge, in terms of social, political and historical contexts (see Figure 1). For example:

I have been aware that the usual method of teaching [subject] in the department, and it was what I experienced when I was a student, seemed to reinforce people's prejudices about people who are different . . . [so] I was looking for other models of teaching (II);

I chose to read something out like this to actually try to start heightening the emotional intensity of what was going on, [to] hook them into an emotional argument about an issue . . . I think that in the end people do respond to an emotional argument and it can improve learning to show a human dimension all the way along (SRI); and,

I always try to use men and women, to mix them, to try to find examples where women are in positions of their career placements and making key decisions. I try to bring women into the classroom a lot because science is done differently by women than by men, they communicate differently. But also try to get Māori in. All those sorts of ways of trying to show diversity of approaches (SRI).

Each of the participants revealed that they thought about, or reflected on their teaching practice in different ways. For the purposes of the following discussion, the different types of reflection have been clustered under the umbrella term of reflective practice.

Reflection is the hub of the teaching excellence wheel

The five dimensions of our model (see Figure 1) describing tertiary teaching represent cognitive, affective and relational attributes of teaching that we propose are inter-related through a process of reflective practice. Weimer (1990) highlighted the need for research that extends what is known about excellent tertiary teaching: "we know what the characteristics [of good teaching] are, but we don't know how they relate to each other" (p. 13). We found that our participants used different types of reflection to improve their understanding of dimensions of their teaching. We propose that ongoing and purposeful reflective practice is a means of interrogating and establishing teaching practices where subject knowledge, skills, interpersonal relationships with students, research, and personality can complement each other and work in concert to develop excellence in teaching. McClean and Blackwell (1997) claimed that "teaching excellence resides in a reflective, self critical, theoretically informed approach" (p. 85). We place reflection at the centre of our model because we believe that it is this disposition towards reflective, self-critical practice that enables our participants to understand and to reconcile the various dimensions of teaching and to establish excellence.

It has become increasingly common for primary and secondary teacher preparation programmes to espouse the necessity of reflective practice (e.g., Loughran 2002; Osterman 1990; Sebren 1994; Wildman et al. 1990; Yost et al. 2000). Sternberg and Horvath (1995) explained that “in the minds of many, the disposition toward [sic] reflection is central to expert teaching” (p. 15), and Bell (2001) argued that “reflective practice is regarded as an essential skill of effective teachers” (p. 32). McAlpine and Weston (2000) studied six exemplary university teachers and concluded that reflection functions “as a mechanism for the improvement and development of teaching” (p. 382). Other researchers have made links between the scholarship of teaching (Boyer 1990) and the role of reflective practice (e.g., Kreber 2002; Kreber and Cranton 2000; Trigwell et al. 2000). Lastly, Biggs (1999) described the critical role that reflective practice plays in tertiary teaching: “Learning new techniques for teaching is like the fish that provides a meal today; reflective practice is the net that provides meals for the rest of one’s life” (p. 6).

In proposing the model Dimensions of Tertiary Teaching (see Figure 1) we do not claim to have re-invented the pedagogical wheel. Our participants highlighted characteristics that have been explored previously. We do conclude however, that it is not only the presence of the dimensions but the way in which the participants think about and understand their own practice through purposeful reflection, that has led to their development of excellence. The participants were able to articulate how they understood the dimensions of tertiary teaching to be related and how they sought to continually improve their own practice through reflecting on their teaching in different ways.

The way forward

In offering advice to less experienced university colleagues our participants emphasised the importance of seeking to understand oneself as a teacher:

try and be yourself, not trying to be what somebody else wants you to be. If you’ve got a passion about what you want to teach you’ve got to teach it and you’ve got to teach it your way and there are lots of different ways. Different methods are often just as effective because it’s whoever you are that makes it work (II).

Our participants highlighted also the need for the University, and for those responsible for academic development in particular, to consider a more holistic and supported approach to the development of less experienced university academics. “I suppose you will have gotten the message that I think there needs to be a stronger intervention for novice teachers, more support” (II). They called for a scaffolded approach to the development

of less experienced staff whereby the university would introduce strategies and programmes to help people become better teachers and to encourage collaborative and open examination of teaching:

we should build up a culture amongst our teachers that we will actually watch each other do the process and learn from each other; that there will be enough kindness and gentleness that we can honestly talk about the mistakes in our teaching as well, or at least the less effective things, as well as the things that work very well (SRI).

This study has several limitations that could be addressed in future research. There is a need to conduct a similar study in a different grouping of disciplines, within the Humanities for example. We focussed on how excellent teachers in sciences thought about and practiced teaching. We did not seek student input, nor did we link these excellent teachers to the performance of their students. Future studies could examine excellent teaching in sciences from the perspective of students, and/or examine the connections between teaching excellence and student learning.

On several occasions our participants indicated that they had different teaching practices according to the context, i.e., lecture, laboratories, seminars and so on. However, the 16 participants observed all selected a lecture for us to observe and videotape. With more resources we would have videotaped more than one teaching episode in several different teaching contexts and conducted stimulated recall interviews for each teaching episode to amplify our model. We could then have analysed how the teaching context affects the characteristics described and modelled by our participants.

Conclusion

“Teaching is the heart of the University” (II)

If, as stated by one of our participants, teaching lies at the centre of university work, we need to be constantly seeking ways to assist early career academics with the development of teaching excellence. Our study reveals ways in which university teachers identified as excellent think and go about their teaching. We propose that insights provided by our participants can be used to assist less experienced university teachers in examining their own teaching practice (e.g., Sandretto et al. 2002).

No two of our participants approached their teaching in the same way. They had a wide range of subject expertise, interpersonal relationships with students, teaching practices, research areas, and personalities. They were all passionate about their subjects and spent a great deal of time reflecting

on their teaching in different ways. We propose that it was this reflection which enabled them to interrogate their teaching practice and to find the best fit between their subject, teaching skills, relationships built with students, research and personality. These participants demonstrated that it is possible to integrate the various dimensions of tertiary teaching through reflection.

In addition, this study demonstrates that the methods used – individual interview, observation, stimulated recall interviews and repertory grids – each enabled the participants to articulate and examine their own thinking about teaching and their roles as teachers. For the participants in this project, the opportunity to talk about themselves as teachers, to watch video recordings of their own practice and discuss this with a colleague (researcher) proved to be powerful methods to make explicit the thinking underpinning their own practice as teachers. Through engaging in this project our participants came to understand better their own teaching practice. In many ways the processes employed in this study alongside the model (see Figure 1) derived from the study, together provide a way forward for assisting in the development of less experienced university teachers.

We believe that the strength of our model (see Figure 1) lies not in its prescriptive ability, but rather in its descriptive capability. It not only makes explicit what constitutes an excellent tertiary teacher but also sheds light on how we can support less effective teachers to improve their teaching. In working with tertiary teachers, both experienced and novice, it can initiate a dialogue on the complexities of teaching development: it provides a common starting place and vocabulary for teachers to discuss their current and future practices. Our model has the potential to help teachers understand the significance of the different dimensions that contribute to tertiary teaching and to encourage them to talk about their teaching.

No one who teaches or works with teachers will deny the complexity involved in teaching. In the past, however, many have chosen to focus on only one or two dimensions in an attempt to simplify the picture of tertiary teaching. Some researchers acknowledge that we must be wary of those simplified pictures of teaching: “teaching is more complicated than any list of the qualities or characteristics of good teaching can suggest” (Centra and Bonesteel 1990, p. 11).

With our model, we can develop staff development programmes that assist novice or less experienced tertiary teachers in examining **all** the dimensions of their teaching practice. We can emphasise that “Master teachers are not born; they become. They become primarily by developing a habit of mind, a way of looking critically at the work they do; by developing the courage to recognize faults, and by struggling to improve” (Common 1989, p. 385). The key for new teachers at the tertiary level, just as at primary and secondary, is

to encourage the development of the skills of reflective practice. We can help tertiary teachers develop themselves as teachers in a way that acknowledges all the dimensions that make up the complex act of teaching.

But we'll also have a good time and that's what I think marks the difference between a lecturer and just watching a video or reading a book, that if you can communicate something of your personality, something of your own interest as a scientist or as a researcher then that's something that makes the lecture worth coming to, hopefully (SRI).

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