

# Beliefs, Behaviours, and Professional Development of Tutors in Problem-Based Learning

Judith C. Williams



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**Beliefs, Behaviours, and Professional Development of Tutors in  
Problem-Based Learning**

Opvattingen, Gedrag en Professionele Ontwikkeling van Tutoren in  
Probleemgestuurd Onderwijs

**Thesis**

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Erasmus University Rotterdam  
by command of the  
rector magnificus**

**Prof.dr. H.G. Schmidt**

**and in accordance with the decision of the Doctorate Board**

**The public defense shall be held on**

**Friday January 20th, 2012 at 11.30 hours**

**by**

**Judith Caroline Williams-Duffield  
Born in Harlow, United Kingdom**



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*For Jeremy, Siân and Jemma*



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Jude

13 November, 2011, Singapore

## Chapter 1: Introduction

The theme of this thesis is the tutor in problem-based learning (PBL). Specifically, the objective of the five studies presented is to gain an understanding of what shapes tutors as facilitators of student learning; their beliefs about teaching, their educational intentions and goals as well as the actions they display and the strategies they adopt when in the PBL classroom. It also traces their development over time to determine whether they change or remain the same and whether they become more or less aligned to the philosophy and methodology of PBL. The role of the tutor is examined from the perspective of their students, their peers and the tutors themselves.

Although PBL can be implemented into the curriculum in a variety of ways there are a number of commonalities that cut across all models (Savin-Baden & Howell Major, 2004). For example, learning always begins with a problem scenario; whereby students actively construct mental models of the problem and its solution; PBL encourages self-direction, with students determining their learning goals, identifying and dealing with obstacles and undertaking research; parts of the learning process require students to work in small groups; finally, solutions to the problem are presented to peers and a tutor for discussion, feedback and reflection (Barrett, 2005; Hmelo-Silver, 2004; Schmidt, 1993; Barrows, 1988). Such an approach is based on a constructivist theory of learning and requires a model of teaching that is different to the conventional classroom. In traditional classrooms, the teacher is the distributor of knowledge and the students the passive recipients of this wisdom (Bennett, 1976). In contrast, PBL is based on a philosophy that views learning as a process of knowledge construction with students playing an active role in knowledge acquisition. It requires teachers to facilitate student learning as opposed to providing direct instruction, and for students to be active in their learning; hence in PBL the teacher is generally called a tutor or a facilitator (Barrows & Tamblyn, 1980; Boud & Feletti, 1991; Schmidt & Moust, 1995). This work is curious to know what tutors of PBL believe about this pedagogy, how they behave and how they develop over time, to determine whether a profile exists of tutors whose transition to PBL is a smooth one. This first chapter provides an overview of the tutor in PBL through an examination of the most pertinent literature; it also includes a summary of the research questions and an introduction to the thesis.

### ***The tutor in PBL***

One way of making sense of the mass of literature on the tutor in PBL is to organize it in terms of i) those studies that are focused primarily on identifying and categorizing the behaviours of PBL tutors and ii) those that are more concerned with the relationship between tutors' behaviours and student outcomes (academic and broader learning outcomes). Both types of studies use a variety of research methods including data collected via self-reports, surveys of students, third-party observations and interviews.

Studies that have looked at tutors' behaviours in PBL have offered a number of classifications in which the tutor can be placed. For example, Wilkie (2004) talks about the tutor who is either a, i) liberating supporter, ii) directive conventionalist, iii) nurturing socializer or iv) pragmatic enabler, whereas Mayo, Donnelly & Schwartz (1995) state that an ideal tutor should be an activator rather than a facilitator; their thinking being that an activator will provoke students into engaging with learning as their approach is more motivational and dynamic than a facilitator. Basing her work in phenomenology Silén (2006) provides two labels for tutoring styles; 'present' tutors and 'dys-appearing' tutors. In essence 'present' tutors base what they do on the students, their needs, and how they are functioning in groups to the point that students perceive these types of tutors to be present and supportive in the group rather than focusing on their own teaching. In contrast, 'dys-appearing' tutors are less sure of what to do and hence they are more consciously thinking of themselves and their role as a tutor so that students view them as being distant or non-existent in the student learning groups.

What is common in all of these studies on types of tutors is the consensus that a spectrum of teaching behaviours exists (Leung, Lue & Lee, 2003; Bibace, Catlin, Quirk, Beattie & Slabaugh, 1981). However the effective PBL tutor sits at the end of the spectrum that is represented by a view of teaching that is based on constructivist theory of learning, which is student-centred, concerned with developing students as self-directed, independent learners and where the tutor takes a facilitative role in the classroom – all factors considered essential for PBL (Barrows & Tamblyn, 1980; Barrows, 1988; Savin-Baden & Howell Major, 2004).

A couple of studies have highlighted behaviours that should be in the repertoire of an effective tutor but which can be problematic. Maudsley (2002) has examined how tutors try to facilitate rather than teach in PBL classes and found that a key issue in facilitation was a lack of knowing when and how to intervene in student learning. This finding was also raised by Haith-Cooper (2003). In both studies, tutors when they decided there was a need to intervene found that they slipped back into the familiar teaching role and started to provide unsolicited

information, and direct students' learning. In an earlier study by Maudsley (1999) she found that some tutors were interpreting the role of a tutor as being 'tutor inactive' whereby they played virtually no role in the classroom or as Neville describes they felt like "wallflowers" (Neville, 1999, p 393), they made little contribution because they thought they could not use their subject expertise to help students. It seems that knowing when, why and how to intervene in PBL classes is an elusive skill. Indeed, in a review of numerous studies of the PBL tutor, Neville (1999) claims the key problem facing teaching staff using this approach is deciding how directive or facilitative they need to be to achieve the balance between students acquiring an understanding of their subject and students being self-directed in their learning. What is unclear from these studies is whether the difficulty related to intervention is based on tutors' lack of knowledge about how to facilitate PBL or a lack of conviction about the appropriateness of this method.

There is a second body of work in the literature on the tutor in PBL that expands upon the research that identifies the behaviours of tutors by looking at how actions and attributes impact on student outcomes. This literature can be divided into two subsections, those studies that look at outcomes in terms of students' academic achievement and those that take a broader view of outcomes to include for example, students' role in groups and their satisfaction with PBL.

Examining first the impact of the tutor on students' academic achievement, a plethora of studies have focused on the subject matter expertise of the tutor. Burrows inflamed the debate into expertise in PBL when he asserted that a good tutor would be able to successfully facilitate in any area (Barrows & Tamblyn, 1980). Much work on the topic followed his claim, with several studies concluding that tutor expertise in a subject is important in students' academic achievement (Davis, Nairn, Paine, Anderson & Oh, 1992; Hay & Katsikitis, 2001). Yet the review by Dolmans et al. (2002) cited numerous studies where the evidence was inconclusive. Schmidt (1994) provides some useful insights as to why there may be inconsistencies in the tutor expertise debate suggesting definitional differences and methodological issues may play a part in the confusion. In addition, he went on to conduct an investigation into the conditions in which subject matter expertise influenced student achievement. His findings showed that subject-matter expertise was important when students' prior knowledge of a subject was lacking and when a curriculum unit was poorly structured. In such cases students performed better when tutored by subject-matter experts.

The work on the impact of the tutor on students' outcomes has been expanded to incorporate other definitions of outcomes such as students' performance in small groups and

their perceptions of, and satisfaction with PBL. An example of this wider interest can be found in a study by Budé, Imbos, van der Wiel, Broers, & Berger (2009). They examined the impact directive guiding had on students' perceptions of the course, the quality of group discussions and the quality of problems. They also looked at students' achievements in the end of course exam. Their study showed that students who received directive guidance via a pre-arranged intervention (in the form of a detailed list of specific questions to ask students) performed better on the end of course exam and regarded the course, the group discussions and the quality of the problems more highly than those students who did not experience directive guidance. An implication of their study is the suggestion that individual differences in tutor behaviours can be manipulated and modified through professional training and the use of curriculum support materials.

Our understanding of the tutor in PBL has been enhanced by work that has categorised and measured tutor actions. For example Leung, et al. (2003) used four types of teaching behaviours, i) assertive, ii) suggestive, iii) collaborative and iv) facilitative, while De Grave, Dolmans & van der Vleuten, (1999) have shown that effective tutors are those who score highly on four dimensions: 1) elaboration, 2) directing the learning process, 3) integration of knowledge, and 4) stimulating interaction and accountability, and are perceived by students as the most effective tutors. Interestingly the De Grave et al. (1999) study suggested that students perceived tutors who stressed content as being less effective than those who focus on the learning process, although the difference was not statistically significant.

Overall the studies mentioned above have led to an understanding that an effective tutor is a facilitator of learning; someone who allows time and space for students to explore problems, who can make appropriate decisions about when to step-in and help students without taking over their thinking and learning process, who encourages knowledge acquisition and the development of sound learning skills and who is reflective of their own practice and encourages students to also reflect on what and how they learnt. Someone who demonstrates these qualities will have an impact on how individuals and groups perform in the PBL learning process and the outcomes they achieve.

Although the studies reviewed have provided a wealth of information about what it is that tutors do and the strategies they adopt, there are two areas where a lack of research remains. We know little about the beliefs and philosophies that underpin and shape tutors' approaches, strategies and styles and we are also equally unclear about the development of tutors; whether

their behaviours change and adapt over time. Knowledge of both these aspects of tutoring in PBL is important.

Studies in conventional classrooms have shown that the behaviour and practices adopted by teachers are very largely determined by the perceptions they have of teaching and learning, and the contextual factors that either support or modify these perceptions (Trigwell, Prosser, & Taylor, 1994; Fang, 1996). If this is the case, then tutors' whose views are not aligned to the constructive theory that underpins PBL may find it hard to conform to teaching practices that provide opportunities for students to co-construct ideas with peers in a collaborative fashion, to be self-directed and to engage in self-reflection. If tutors are not aligned in their beliefs to PBL then it is difficult to be confident that they are actually practicing PBL as intended, and consequently it makes the measuring of the effectiveness of this method of teaching complex. Similarly it is important to know whether staff can adapt and change to PBL, as there are important human resource issues to be considered. For example, if change is not possible there may be implications for the recruitment process, with the appointment of suitable staff being critical. If however, tutors can be developed so that their beliefs and behaviours gradually show a good fit with the philosophy and practices of PBL then more focus can be placed on staff development than recruitment. Knowing how the development of effective tutors occurs will also be important in ensuring that staff development resources are targeted efficiently.

There has been one study that has looked at both the development of PBL tutors and the beliefs they hold. Wilkie (2004), in a qualitative study, followed 18 new PBL tutors over the course of three years to examine whether they experienced a shift in their espoused and actual conceptions of facilitation in PBL. She found that in the beginning tutors tended to be quite directive in their practices despite having espoused beliefs about the importance of student-centred approaches to learning. After one to three years there was a shift in the tutors' approaches, as they became less directive and more willing to step back and allow the students time and space to explore the problem scenarios. Whilst the study makes available some rich descriptions of the experiences of PBL tutors over a period of time, it is a small study and Wilkie provides little explanation to account for the shift in approaches suggesting only that it may be a result of a sense of dissonance between beliefs and behaviours. The studies described in this thesis investigate the teaching perspectives and beliefs of tutors as well as their professional development on a much larger scale and draw on a range of data gathering instruments



including tutor self-reports, semi-structured interviews, peer observations and surveys of students.

In summary, the five studies presented in this thesis attempt to bridge the gaps in the research on the teaching beliefs of PBL tutors and their professional development in the role of a facilitator of student learning. In addition to the perceived gaps in the literature, the unique educational context of the studies acted as a driving force for the investigations. All five studies reported in this thesis were conducted at Republic Polytechnic in Singapore. This institution is distinct in the island-state, as it has implemented PBL as its single pedagogy since its inception in 2003. PBL tutorials at Republic Polytechnic follow a similar pattern regardless of the course, the tutor, or the grade of students. A PBL tutorial usually lasts a whole day with students working on one problem for approximately seven hours. Each teaching day the tutor meets with a class of 25 students on three occasions interspersed with two student self-study periods. The structure of each of the three class meetings is similar across courses and typically involve a meeting to define the problem, a meeting to share what has been learnt thus far and to discuss learning obstacles, and a meeting to present, elaborate and defend solutions to the problem. During each meeting the tutor is expected to take the role of a facilitator of student learning rather than an instructor or transmitter of information. At the end of the day, the students are asked to reflect on what occurred over the previous seven hours in terms of what they learnt and how they learnt. The tutor is then required to give feedback to the students on the quality of their learning and also to provide a summative grade for the day's work. This method of PBL is known at the polytechnic as 'one day, one problem'.

Given that at the time of the research no other institution was taking this particular approach to PBL it was considered important to investigate all factors involved in the 'one day, one problem' approach. The body of work represented by this thesis is an attempt to examine one key factor - the tutor. It was anticipated that findings from the studies would serve a practical purpose in that they would inform the institution about how well tutors were adapting to its brand of PBL and also provide advice on future steps for the recruitment and development of the polytechnic's teaching staff.

***Research questions:***

Hence a review of the literature, and a curiosity to investigate the facilitation of PBL at Republic Polytechnic led to the identification of the following six questions:

1. Are tutor and leadership perspectives on PBL aligned?

2. Do tutors' perspectives of teaching and learning change as they become more familiar with PBL?
3. Do students' observations of their tutors concur with tutor self-reports?
4. Do student and third-party observations of tutors agree on the characteristics of an effective tutor?
5. Are the performances of PBL tutors stable across time and context?
6. What are the antecedents of tutor behaviours in PBL?

### **The studies**

What follows is a brief outline of the studies in this thesis and how they attempt to answer the six research questions listed above.

The aim of the first study presented in Chapter 2, was to see whether tutors at Republic Polytechnic are aligned with the philosophy of PBL and the practices that constitute the institution's particular PBL approach. It also sought to trace how tutors developed in their teaching perspectives over a period of 18 months. The results were somewhat surprising as they indicated that there is little alignment between what the tutors believe and do, and the views of those who designed and implemented the approach to PBL taken by the institution. What was disappointing was the finding that tutors change so little that even after 18 months there are differences between what the institution considers to be an effective tutor and what the tutors believe and do.

One of the factors that may have impacted this finding was the use of tutor self-reports. Much has been made of the accuracy of such measures (this issue is discussed in detail in various chapters) and so it was decided that a further study would be conducted to determine whether student ratings could validate tutor's self-reports. However, the findings as reported in Chapter 3, suggest that there are discrepancies between what tutors say they believe and do, and what students encounter in the classroom and that there are indeed tutors at the polytechnic that hold beliefs about teaching that are at odds with the philosophy that underpins PBL.

When reflecting upon the findings of the first two studies the instrument used in the research was once again raised as having a possible impact on the findings. Data for both studies were collected using the Teaching Perspectives Inventory (TPI) developed by Collins and Pratt (2008). It was originally selected because it provides an overview of a tutor's perspective on teaching and also differentiates between beliefs, intentions and actions and hence had the potential to garner information on the beliefs that underpin the actions of a PBL

tutor. However, it was not developed as a diagnostic tool and was not written specifically for PBL. Hence it may have been that the TPI was too general in its measurement to provide details about tutors who are adopting a very specific and complex pedagogy. Hence, in Chapter 4 there is a shift away from the use of the TPI to the Tutor Evaluation Survey - an instrument that was designed specifically for the PBL environment. Because of unease with the use of self-reports, but the continued need to find a way of accurately measuring the performance of tutors in the institution, this study described in Chapter 4, sought to determine whether students or a tutor's peer could identify the qualities of effective tutors and whether these qualities are predictive of student learning outcomes. The findings show that neither students nor peers are able to unequivocally identify effective tutors of the institutions' approach to PBL; tutors who are judged highly by students and/or peers do not necessarily facilitate students with high academic achievement and vice versa.

Chapter 5 returns to the topic of the development of PBL tutors by investigating the stability of three distinct tutor behaviours (1) use of subject-matter expertise, (2) social congruence, and (3) cognitive congruence. Knowing whether tutors' behave consistently is important information when considering professional development programmes. If behaviour fluctuates, being able to identify whether certain facets of the performance are responsible for the oscillation will help to target assistance. For example, a tutor whose expertise may vary from course to course can be provided with extra resources to fill the knowledge gap prior to facilitating a class. However, if a tutor is found to perform consistently low in the area of social congruence then more profound remedial action may be required to help develop affective skills such as empathy. The findings of the study show that tutor performance is reasonably stable and that generalisations about performance can be made after only three semesters of facilitating PBL.

The findings of Chapter 5 led to speculation as to whether there are innate qualities or experiences that can predetermine whether some tutors will perform better than others. Hence the purpose of the last study, reported in Chapter 6, was to select and test antecedents that may affect the three tutor qualities (1) subject-matter expertise, (2) social congruence, and (3) cognitive congruence. Gender, age, teaching experience, level of qualification, possession of an educational qualifications, and study overseas, were examined to measure their relationship to the three behaviours. The study shows that few of the antecedents have an impact on performance. In some ways this finding is reassuring as it means that although in the previous

study we found that tutors' behaviours are stable, it seems that they are not coming to PBL with a predisposition and therefore they have the potential to develop as tutors.

The last chapter summarizes and discusses the overall findings of this research as well as describing its implications and identifying possible directions for future research.

## Chapter 2: The educational change process: Aligning tutor and leadership perspectives

### Abstract

The goal of this study was to determine the teaching perspectives of 73 new tutors in a problem-based learning setting, to map their development through their first 18 months, and to measure the alignment between their perspectives and those of an effective tutor as determined by senior administrators at a higher education institution. Data were collected through the administration of the Teaching Perspectives Inventory (TPI). The inventory separates perspectives into actions, intentions, and beliefs. A brief interview was also conducted to elaborate on the data collected through the TPI. The findings show that there was a shift in tutors' overall perspectives and that this shift was towards an alignment with the leadership's perspective. A more fine-grained analysis suggests that there has been a greater change in tutors' actions than in their beliefs.

### Introduction

When implementing educational change, two questions that need to be addressed are whether tutors' perspectives regarding change are aligned with those of the leaders, designers, and initiators of educational reform; and if not, can they become aligned over time? Despite the importance of these questions, empirical studies that analyse the alignment between the two parties responsible for reform are in short supply. The literature tends to focus on one or other of the two players in the process, and rarely on the link between the two.

Wholesale change at an organization level, including in the education sector, is rare and complex (Burke, 2002). What is clear is that to bring a belief or a theory about education into practice on a grand scale requires a mix of conditions to be present (Ely, 1999; Fullan, 1991) and especially the conviction and commitment of all those involved in the reform process. The role of teachers is well documented with a consistent theme being the extent to which their stance on educational change can affect its outcome (Bailey, 2000; Czerniak & Lumpe, 1995; Fullan, 1991). Educational policy, if judged by teachers to lead to outcomes that are relevant, will be viewed positively. However, the opposite is also true; if teachers view policy changes as not meaningful, they are unlikely to be implemented (Pittman, 1998; Prosnier, Striken, Hewson, & Gertzog, 1982).

In addition, there exists a number of studies examining teachers' perspectives on teaching but these studies tend to focus on describing or explaining their current perspectives, on how their views about teaching were formed, and on comparisons across faculties, gender, and years of experience (e.g., Norton, Richardson, Hartley Newstead & Mayers, 2005; Saban, 2003). Changes in teachers' perspectives are also well documented, with much of the research examining factors that impact on change such as staff development (Murray & MacDonald, 1997; Penuel, Fishman, Yamaguchi & Gallagher, 2007), availability of resources (Tobin, McRobbie & Campbell, 1997) and the influence of colleagues (Kilgore, Ross & Zbikowski, 1990). This body of work does not include, however, any systematic examination of whether teachers follow their leaders when it comes to educational reform, nor does it look at the *degree* of alignment between the two.

Ely (1999) in looking at technological innovations in education identified eight conditions that would facilitate moving from theory to practice and recognized that support from top management was critical. Studies that have looked more closely at the role of leadership in educational change describe differences in leadership style and how these differences impact on the outcome of the change. There appears a high degree of agreement regarding the crucial role that leaders play (particularly school principals), in shaping what happens in schools (Hallinger & Heck, 1998). This has led to research activity on the nature of principals' work, and the strategies of effective leaders of educational reform (Hargreaves & Fink, 2002; Leithwood & Reicht, 2003). A number of studies have looked at the views of leaders and found that the culture of the school is largely shaped by the principal's educational beliefs, which in turn have enabled or limited the reform process (Fullan, 1991, 1993; Hargreaves, 1994; Sarason, 1971; Stanovich & Jordan, 1998). For example, Leithwood, Jantzi, Silins & Dart (1993) found that school principals have a strong influence on school culture in terms of norms, beliefs, and values, which, impacted on the programmes and policies adopted by the school and on tutor behaviour. Youngs and King (2002) when looking at change brought about due to the arrival of a new principal cautions against the new leader initiating reform unless and until the norms and values of staff are known and shared, if not, the initiatives are likely to fail. However, none of these studies have focused specifically on the alignment of perspectives between the principals and teachers.

The limited literature that does exist only focuses indirectly on these interrelations, and tells a story of struggle. Duffy and Roehler (1986) and Fullan (1991) found that teachers are more likely to reject reform if educational policy makers and administrators have mandated it.

Teachers are also resistant to change if they believe it threatens their autonomy in the classroom (Datnow and Castellano, 2000). They become defensive and act in a covert way by resorting to their old practices rather than adopting the new. Richardson (1990), when examining the role of staff development, describes how the principal represents a common foe among teachers who use staff development programmes as an opportunity to vent their pent-up frustrations against reform initiated by the principal. However, these studies do not take a longitudinal view to determine whether the leadership's pedagogical beliefs and practices can act as a catalyst in the evolution of teachers' views on teaching. The aim of this study is to attempt to fill this void in the literature.

Besides the issue of alignment between leaders and teachers, it is also important to look at how teachers' perspectives change longitudinally especially if, at the outset of a reform programme there is a misalignment between the perspectives of teachers and those of the leadership. The question to be asked is whether it is possible for teachers to shift their perspectives towards those of the leaders so that, within a short period of time, the changes promoted by leaders will be implemented. A review of the literature on extrinsic efforts to change teachers' perspectives is littered with disappointment (Pajares, 1992, Prossner et al., 1982, Cooney, 1998). The reasons for this apparent inertia in teachers' perspectives may be found in studies of educational psychology, particularly those that focus on the nature and formation of individuals' beliefs. Beliefs appear to form the backbone of the way people view, interpret and act, and therefore underpin the perspectives they have, including their perspectives on teaching (Clarke and Peterson, 1986). Nisbett and Ross (1980) state that a belief incorporated early into a person's belief structure will become a core belief for that person, and will influence how new information is processed thereafter. Richardson (2003), in the tradition of Lortie (1975) and Nespor (1987) concurs that the beliefs new teachers hold are often formed by the teaching that they, themselves, have experienced and help to explain why teachers are often reluctant to challenge or change the profession. The overall conclusion from this body of literature is that teachers' perspectives are formed early, are persistent, and so take time to change. Teachers may not readily adopt a reform advocated by others if it is at odds with their current views.

There are few instruments available to quantitatively measure alignment and change in perspectives. One well-established instrument is the Teaching Perspectives Inventory (TPI) (Pratt, Collins & Jarvis-Selinger, 2000). The TPI was developed through an iterative process of interviews, observations, evaluations, and second interviews. It is based on the input of over 250 tutors in a range of countries, including Canada, China, Hong Kong and Singapore and has

been shown to have a high degree of validity and reliability (Collins & Pratt, 2008). It is a self-report instrument that measures teachers' orientation towards their role as a manager of the learning process and consists of five scales, called 'perspectives'. Teachers rarely use a single approach in the classroom; indeed as they gain experience they generally become adept at drawing upon a range of strategies to help students learn. By providing a score for each of the five perspectives, the TPI helps teachers become aware of the range of actions they employ whilst also providing them with information about the predominant lens through which they view teaching. Although not specifically designed to measure shifts in perspectives, the TPI has the capacity to do so by being repeatedly administered. The instrument also differentiates between (and measures) beliefs, intentions and actions, the three indicators of a teacher's perspective.

### **Context of the study**

The institution that forms the subject of this study has embraced a teaching and learning philosophy that is based on the educational literature in the tradition of Marton & Säljö (1997), Ramsden (1992), Kember & Gow (1994), and Trigwell, Prosser & Waterhouse, (1999) who find that students' approaches to learning are influenced by the approaches adopted by their teachers. The literature holds that any meaningful student approach to learning will be discouraged if teachers believe that their role is that of a transmitter of the domain knowledge into the minds of their students. It is in this philosophical context that the institution has implemented educational reform that represents a departure from conventional practice; namely, pedagogy based on problem-based learning (PBL). Using this approach, students work in small collaborative teams to solve a given problem that is designed to stimulate or initiate the learning process (Schmidt, 1983). Teachers at the polytechnic act as facilitators of learning and from this point forward will be referred by their more common name in the PBL literature – tutors.

An alignment between the leadership's views on what constitutes an effective tutor of PBL and the perspectives of those responsible for implementing this pedagogy seems critical if real change is to occur in classrooms. A potential obstacle, however, is that teaching staff are often successful graduates of a conventional education system and that the pedagogy that characterises PBL is alien to them. The educational reform process thus effectively represents a significant paradigm shift for these tutors. At the institution in question – a new polytechnic – PBL has been introduced from the outset across the entire institution, for all students, in all courses, in every year, with an emphasis on developing reasoning skills, logical thinking and argumentation. Tutors do not give lectures but rather facilitate learning for up to 25 students who work in small groups of five to solve or understand a problem, or undertake some task over the



period of one day. The tutor meets the students three times during the day for a total of four to five contact hours. There is little deviation from this structure with each class starting and finishing their meetings at similar times. The activities the students engage in, and the facilitation strategies adopted by the tutors, are also generally the same from class to class. Staff are provided with curriculum resources, tutor guides, exemplar problem solutions, and are encouraged to attend briefings on the problems to be facilitated before they go into class.

Such an approach is not at all familiar to the majority of the staff. It should be noted that the institutional setting of this study is also different in that the pedagogical model is in place *before* tutors take up employment. The issue then becomes the extent to which a tutor has the capacity to develop and adjust to the new pedagogy given their extant beliefs as to what constitutes good teaching and classroom practice (Brown & McIntyre, 1993).

In short, tutors and leaders each have a key role in determining the success of a reform programme, yet there is a gap in the literature with regard to the interrelations of the two groups in terms of their perspectives on teaching. It is unclear whether tutors will conform to practices advocated by leaders if these practices are not consistent with the tutors' perspectives on effective teaching or their beliefs about the need for change. It is equally uncertain whether tutors are able to modify their perspectives over time as they attempt to implement reforms in which they have had little input.

To summarize, this study examines two issues: (1) the alignment between the tutors' perspectives (in terms of their beliefs, intentions and actions) towards teaching and those espoused by the leaders of the pedagogical reform: the senior administrators and policy makers at the polytechnic, and (2) whether tutors change in their perspectives over a period of 18 months.

## **Method**

### ***Participants***

The sample consisted of 73 new tutors, (48% female and 52% male) from an institute of higher education (known as a polytechnic) in Singapore. The average age of the participants was 33.8 ( $SD = 5.77$ ) years. Over 33% of them graduated within five years of joining the polytechnic; 67% had been awarded first degrees from local universities. Not surprisingly for an institution that offers technical and vocational diplomas, 74% of the tutors have degrees in either Engineering, IT, Business/Commerce or Science. Only nine of the 73 tutors had any academic

qualifications in Education. The teaching perspectives of these 73 new staff were measured before and after their first 18 months at the institution.

In addition, nine leaders were asked to determine the profile of an effective tutor so that a map of the alignment between the two groups could be established. The characteristics of the nine leaders are somewhat different to those of the new tutors, being older and more experienced in education. The group consisted of four females and five males. The average age of the group was 40.22 (SD = 8.40) years. All of them had graduated more than 10 years ago (including three graduating with a Master's degree in Education) and all of them had over five years experience of teaching in an institute of higher education, indeed three of them had been teaching in such institutions for more than 20 years. Two of the female tutors had been working in secondary schools for over five years prior to joining the polytechnic.

### **Measures**

The Teaching Perspectives Inventory, or TPI, (Pratt, et al., 2000) was used to measure both the leadership's view of an effective PBL tutor, and the conceptual and behavioural changes over time of the new tutors. The TPI is a self-report instrument that measures tutors' orientation towards their role as a manager of the learning process and consists of five scales, called perspectives (Pratt, 1998). Using a scale of 'Never', 'Rarely', 'Sometimes', 'Often', and 'Always', (or 'Strongly Disagree', 'Disagree', 'Neutral', 'Agree', and 'Strongly Agree') and 45 items subdivided into items that measure, 'actions', 'intentions', and 'beliefs' it determines respondents' orientation towards the five perspectives. These perspectives are: (1) Transmission (effective delivery of content), (2) Apprenticeship (modeling ways of being), (3) Developmental (cultivating ways of thinking), (4) Nurturing (facilitating self-efficacy), and (5) Social Reform (seeking a better society). Hence responses to sets of three items will determine a person's beliefs, intentions and actions for each of the five perspectives and sets of nine items will establish each perspective. Those taking the TPI will receive a profile indicating their score across the five perspectives and the beliefs, intentions and actions for each perspective. The profile will also show which of the perspectives are dominant and which are regressive.

The validity and reliability of the instrument has been tested by its authors and was found to demonstrate adequate reliability in terms of the internal consistency of the scales (Collins & Pratt, 2008). Construct validity of the instrument has been established by means of exploratory factor analysis. The results demonstrated that all items made a meaningful contribution to at least one of the perspectives with none of the items having less than .30 factor loadings (Collins & Pratt, 2008). The reliability for the present data set was adequate: Cronbach's Alpha values

were Transmission .70, Apprenticeship .67, Developmental .70, Nurturing .77, and Social Reform .74. Each of the five perspectives is discussed in detail below.

Tutors demonstrating Transmission as a dominant perspective will be subject content experts. They see their task as passing on knowledge of subject matter to students in as accurate a fashion as possible as can be demonstrated through the item "I make it clear to people what they are to learn". They organise and sequence tasks so that students can acquire knowledge efficiently and systematically. In the classroom, a Transmission tutor provides clear learning objectives and appropriate resources, explains misunderstandings, summarises content, corrects mistakes and offers feedback.

The Apprenticeship model of teaching is common in vocational studies. Like those who demonstrate a Transmission orientation, tutors with a dominant Apprenticeship perspective are content experts. However, their methods rely less on telling and more on showing and demonstrating as illustrated through their response to the item "I model the skills and methods of good practice". They are concerned with acculturating students into a subject, and are good at gauging the level of support a student requires, modifying their levels of guidance accordingly.

Perhaps the most succinct description of the Developmental perspective is that it views learning from the student's perspective. The goal of tutors who hold this perspective as dominant is to support students as they move from simplistic to more complex structures when understanding content. To accomplish this goal, Developmental tutors ask lots of probing and challenging questions and require students to demonstrate their reasoning skills, for example "I encourage people to challenge each others' thinking". They often provide students with case studies to explore and problems to solve.

Tutors for whom the Nurturing perspective is dominant believe that the emotional aspect of learning is significant as is the relationship between the tutor and learner. Learning can be helped or hindered by a student's self-esteem and self-efficacy. They believe students will learn if they feel supported and encouraged in their efforts, and they see their role as providing clear expectations of achievement, helping students set achievable goals and rewarding effort. An example of an item to measure this perspective is "I find something to compliment in everyone's work or contribution".

The focus of the tutor demonstrating a dominant Social Reform perspective is to change society. They encourage students to question the status quo and they are less interested in the construction of knowledge than they are in the questions of "who constructs knowledge and why?" Respondents with this perspective are likely to strongly agree with the item "My teaching

focuses on societal change, not the individual learner". The analysis and deconstruction of texts are important activities in the social reform classroom.

The Transmission and Developmental perspectives are considered key indicators in the study to determine whether tutors have the propensity to implement the PBL reform as mandated by the institution's leadership. PBL is an approach that is based on the belief that learners construct their own meaning and assumes that students are able to work in a self directed manner, determining their own learning needs and goals (Moust, Bouhujis & Schmidt, 2007). Such an approach is contrary to more teacher-centred methods where the teacher is the main transmitter of information to the student.

The TPI has been used widely and regularly by single departments for curriculum programmes in several countries. Researchers using the instrument have tended to use it as a tool to describe a snapshot of professionals' views on teaching, be they health educators, occupational therapy instructors, or tutors in schools and universities. Only recently, has there been a study that traces changes in tutors' perception of teaching using the TPI (Hubball, Collins & Pratt, 2005). No study however has used the TPI to map tutors' perspectives in relation to a leadership's perspective.

### ***Procedure***

The TPI was administered to 73 newly recruited tutors before they commenced their teaching position at the polytechnic. It was administered online via [teachingperspectives.com](http://teachingperspectives.com). The online version of the instrument generated an individual report for each participant, which produced the mean values for each of the five perspectives and the mean values for the three indicators: beliefs, intentions, and actions for each of the five perspectives.

The TPI was administered on the first day of a five-day PBL orientation programme that is designed to help prepare tutors for their teaching role. After approximately 18 months of teaching, the TPI was re-taken by the same group of tutors to determine whether there were any changes in their teaching perspectives. In addition to the pre- and post-comparison, the TPI was administered to nine members of the institution's senior administration including those responsible for academic standards such as curriculum design and assessment procedures, and senior members of the centre responsible for professional development including those who determine whether tutors are awarded certification as an effective facilitator of PBL. These nine individuals were asked to complete the TPI from the viewpoint of an 'effective tutor' of PBL. This procedure enabled the generation of a prototype TPI profile and its use as a reference point to

evaluate potential changes in teaching perspectives of the test group. This prototype TPI profile is referred to in the study as the 'leadership profile'.

In addition to the TPI, a 20-30 minute interview was conducted with 30 of the 73 participants who responded positively to an invitation to take part in the interviews. The interview was conducted just after the first TPI was administered and within the tutors' first two weeks of teaching. The participants were asked two questions: (1) Was there a particular teacher who you remember and who you believe had an effect on you while you were a student (either negative or positive) - can you describe the behaviours, actions and /or teaching methods of that teacher? and (2) Do you believe that students will benefit from PBL? If so, how? If not, why not?

The purpose of the first question was to further assess the validity of the TPI, as it was assumed that the tutors' responses would say something about their perspective as reported through the questionnaire. This question was also designed to corroborate or refute (albeit on a small scale) the literature that suggests tutors' perspectives are shaped by personal experiences. The second question was designed to elicit the level of 'buy-in' for PBL from the new tutors.

Seven researchers conducted the interviews over a three-week period beginning one week prior to the start of the term and ending two weeks after classes had commenced. This timeframe was chosen to gather the views of the new staff before they had had much experience of teaching. All interviews were audiotaped and participants were assured that their comments, if reported, would be kept anonymous.

### **Analysis**

The TPI data were analysed to determine whether there are statistically significant differences between the leadership's profile (LTPI) and the tutors' profile at two points - when the tutors enter the polytechnic and again 18 months later. This period of time was chosen because after approximately 18 months tutors are invited to undertake a certification process to determine their effectiveness as a PBL tutor.

A paired-samples *t* test was conducted to statistically assess mean level differences between the first measure of the TPI (TPI 1) and the second (TPI 2). It was determined whether any observed changes over 18 months resembled a statistically significant shift towards the leadership's profile. All of the analyses were conducted at both a general level that is, the 'totals' of the perspectives (sum of beliefs, intentions, and actions) and at the more detailed beliefs, intentions and actions levels. For all of the analyses, *p*-values and Cohen's *d* measure of effect-

size were generated. Using the Bonferroni approach to control for Type I error across the 20 comparisons, a  $p$ -value of less than .0025 ( $.05 / 20 = .0025$ ) was required to reach statistical significance. Besides the test for significance, the effect-size was determined by means of Cohen's  $d$ , which is defined as the difference between two means divided by the pooled standard deviation for those means. According to Cohen (1992) .20 is indicative of a small effect, .50 a medium and .80 a large effect size.

The responses to the first question in the interview 1) *Was there a particular teacher who you remember and who you believe had an effect on you while you were a student (either negative or positive) - can you describe the behaviours, actions and /or teaching methods of that teacher* were coded according to key words that describe the five TPI perspectives as derived from the TPI questionnaire. Appendix A lists these key words. Two independent judges coded the responses. The agreement level between the judges was high at 88%.

The codes for question 2) *Do you believe that students will benefit from PBL? If so, how? If not, why not?* were drawn from the results of a previous survey of the levels of confidence the staff had in the polytechnic's educational practices. Using *SPSS Text Analysis for survey 2.1*, the following themes had been identified as being either a satisfying aspect of the institution's educational practices or a concern: *acquisition of content knowledge, level of interaction with students, graduates being prepared for work, time for learning, growth of students*. Once again two independent judges coded the interviewees' responses against these predetermined themes. This question about the benefits of PBL was not intended to validate the institution's survey of confidence levels but as a way of eliciting more descriptive data about whether new staff share a similar range of views (although they may be preconceived) about the concerns and/or the satisfying aspects of using PBL.

The quotes that appear in the text were those identified, independently, by the two coders as being representative of comments made by the interviewees, they are not intended to be viewed as conclusive evidence of a finding.

## Results and discussion

The results of the analysis of the institution's leadership profile can be seen in Column 2, Table 1. Inter-rater agreement between the nine leaders was .80 which suggests high agreement, allowing the group to be used as a norm score for subsequent comparisons. The TPI profile for the leadership reveals a high Developmental perspective and a low Transmission perspective. This is not surprising for a leadership team that has introduced PBL as the underpinning pedagogy of the institution.

A comparison between the leadership's profile and the tutors' profile when they start working at the polytechnic shows little alignment. The comparison was done for each of the five perspective of the TPI. See Table 1 (overall totals) for a summary of the findings.

**Table 1. Paired-Samples *t* Test for the TPI 1(on entry to the polytechnic) and TPI Leadership - Overall Totals, Belief, Intentions, and Actions**

Perspective	Leadership (SD)	TPI TPI 1 (SD)	<i>t</i> (df=72)	<i>p</i> -value	Cohen's <i>d</i>
<b>Overall Totals</b>					
Transmission	25.11 (3.41)	31.73 (3.94)	14.36	<.01	-1.80
Apprenticeship	34.22 (4.27)	36.27 (3.14)	5.59	<.01	-.55
Developmental	41.56 (3.38)	33.85 (4.23)	-15.38	<.01	2.01
Nurturing	35.56 (5.83)	36.82 (3.95)	2.73	.01	-.25
Social Reform	32.11 (5.18)	30.81 (4.10)	-2.68	.01	.28
<b>Beliefs</b>					
Transmission	8.89 (1.45)	11.07 (2.03)	9.17	<.01	-1.24
Apprenticeship	10.89 (2.15)	12.10 (1.65)	6.24	<.01	-.63
Developmental	12.78 (1.99)	10.22 (2.19)	-10.00	<.01	1.22
Nurturing	11.89 (1.97)	12.66 (1.58)	4.14	<.01	-.43
Social reform	10.78 (2.28)	10.37 (1.41)	-2.49	.02	.21
<b>Intentions</b>					
Transmission	7.11 (1.54)	9.15 (1.81)	9.64	<.01	-1.21
Apprenticeship	11.78 (1.79)	12.51 (1.43)	4.36	<.01	-.45
Developmental	14.33 (1.41)	11.95 (1.94)	-10.53	<.01	1.40
Nurturing	11.67 (2.83)	12.59 (1.67)	4.69	<.01	-.40
Social reform	11.33 (2.18)	10.21 (2.00)	-4.79	<.01	.54
<b>Actions</b>					
Transmission	9.11 (2.67)	11.51 (1.63)	12.53	<.01	-1.04
Apprenticeship	11.56 (1.51)	11.67 (1.31)	.72	.47	-.08
Developmental	14.44 (.73)	11.68 (1.70)	-13.86	<.01	2.11
Nurturing	12.00 (1.73)	11.58 (1.62)	-2.25	.03	.25
Social reform	10.00 (1.23)	10.25 (1.82)	1.16	.25	-.16

The results demonstrate that for all five perspectives, there are significant differences between the leadership's profile and the tutors' first TPI profile. The largest differences were observed for the Transmission perspective and the Developmental perspective. The results suggest that new tutors are more Transmissional and less Developmental as compared to the leadership's profile. Again this is not surprising when we consider that facilitating PBL is generally the first teaching experience for the new staff and that their experiences of education have been in a conventional, teacher-centred education system.

A further analysis was conducted to dig deeper into each of the five perspectives. An examination of the three indicators of each perspective (beliefs, intentions and actions) suggests that there are important differences between the leadership and tutors profiles (see Table 1). The tutors' beliefs in the Transmission, Apprenticeship, and Nurturing perspective were significantly higher than the leaders but their Developmental and Social Reform beliefs were significantly lower. The same pattern was found in terms of tutors' intentions. For the Transmission, Apprenticeship and Nurturing perspectives tutors' intentions were significantly higher than the leaders and conversely were significantly lower for the Developmental and lower for Social Reform but not significantly at the .0025 level. The picture for actions was somewhat different. Although the Transmission actions for the tutors were significantly higher than the leaders and their Developmental actions were significantly lower, there was alignment between the two parties in terms of the actions for the Apprenticeship, Social Reform and Nurturing perspectives.

In other words, the beginning tutors demonstrate a great deal of misalignment in relation to the institutions' leadership profile and therefore may be out of kilter with the pedagogy being implemented in the polytechnic. A possible reason for this lack of congruence between the two groups may be found in both the interview data and the literature on beliefs and actions.

The analysis of the link between the dominant perspective of the tutor as reported on the TPI self-report and the perspective derived from the interview data for question 1 revealed the Contingency Coefficient as being equal to .46. Hence there is a reasonable association between how the tutors describe themselves on the TPI and how they responded to the interview question about a tutor who had influenced them.

Two tutors with a dominant Transmission perspective spoke of influential tutors who were content experts and who managed to convey the content in an easily accessible format, usually achieved by breaking down the content so that it was easy to digest:



*There were two attributes that had an impact - good understanding of the content and able to breakdown the content in a way that was very easy for me. I know he helped me from the tests.* (Male, Mathematics Tutor, aged 27)

*He would go around the classroom and if you would have any questions he would go through step by step. He would use textbooks and worksheets so it was very traditional. He was a responsible teacher, he would make sure that we understand.* (Female, Sports Tutor, aged 29)

In the same way two tutors who had dominant Apprenticeship and Developmental perspectives respectively when asked to reflect on an influential teacher gave a description of a person who appears to be using teaching strategies that are common to each perspective. First about the tutor with a dominant Apprenticeship perspective:

*There is one teacher who was my basketball coach at Junior College. He always talked to us, share his experiences. He had quite a big influence on me. He guided us through the training and taught us the skills.* (Female, Enterprise Tutor, aged 36)

The next is from a tutor with a dominant Developmental perspective:

*In second year Jeffery gave a lot of work to us. He would assign and we would prepare and we'd come back and have a look at our ideas. We would be ready to articulate our ideas. He facilitated really well just pulling in different things and at the end of it there was a sense of closure.* (Female, Cognitive Skills Tutor, aged 30)

This Developmental perspective is the one most closely aligned with that of the leadership at the polytechnic. All other things being equal, one would expect tutors for whom this is a dominant perspective to experience the smoothest transition to the role of PBL facilitator.

During the interviews, participants with a dominant Nurturing perspective often described the behaviours and attitudes of influential tutors as being 'patient', 'encouraging' or 'interested in the students' learning'; behaviours that might be described as demonstrating social congruence (Schmidt & Moust, 1995).

The following description of a History teacher who was considered influential, is a good example of a teacher showing aspects of social congruence:

*Her lessons were more informal, we felt comfortable. We didn't feel that there was an authority - lots of jokes, discussions and looking at each other's essays.* (Female, mathematics Tutor, aged 30)

Interestingly, no participant had a dominant profile of Social Reform, and none of the tutors spoke of an influential teacher who had got them to question the status quo in society or examine literature with a view to analysing power relationships. This, perhaps, is a reflection of the political economy of Singapore, dominated for the last 40 years by a single political party, where open descent is not common.

In summary, there are certainly signs that the tutors interviewed were influenced by their personal experiences of tutors and that this influence has, in part, shaped their early views of teaching. As such, the findings echo those of Nespor (1987), Clark and Peterson (1986), and Richardson (2003), mentioned earlier. If this is the case, and most of the polytechnics' teaching staff have been drawn from the conventional Singaporean education system (67% graduated from local universities) it is not surprising to see the tutors' Transmission perspective being much higher and their Developmental much lower than that of the 'effective PBL facilitator' as described by the leadership.

So, if the tutors' views about teaching and learning are well established but misaligned at the start of their career at the polytechnic can they change within a period of 18 months, when they are due to begin the tutor certification process? The results of the analysis to determine the extent of any change are depicted in Table 2.

The results of the paired-samples *t* test showed significant changes for the Transmission perspective and the Developmental perspective. Over the 18 months there is a significant decrease in tutors' Transmission perspective and a significant increase for their Developmental perspective. This outcome suggests a closer alignment between the tutors' second TPI profile and the leadership profile. Again, since the analysis is based on the overall perspectives, a further examination at the indicator level was undertaken. By and large, no significant changes could be observed for their beliefs. However, when it comes to the changes in tutors' intentions and actions a statistically significant shift did occur. See Table 2 for a summary of the changes for these three indicators. The results demonstrate that the changes between tutors' first and second TPI occurred in the Transmission perspective.

However, when we examine to see whether the changes result in a closer alignment with the leaders' profile we find that this is not the case, see Table 3.

**Table 2. Paired-Samples *t*Test for the TPI 1(at Entry at the Polytechnic) and TPI 2 (After 1 to 1.5 Years) for Overall Totals, Belief, Intentions, and Actions**

Perspective	TPI 1(SD)	TPI 2 (SD)	<i>t</i>	<i>p</i> -value	Cohen's <i>d</i>
<b>Overall Totals</b>					
Transmission	31.73 (3.94)	29.92 (4.09)	3.37	<.01	.45
Apprenticeship	36.27 (3.14)	35.77 (3.48)	1.17	.25	-.15
Developmental	33.85 (4.23)	35.74 (3.41)	-.88	<.01	-.49
Nurturing	36.82 (3.95)	36.04 (3.98)	1.89	.16	.20
Social reform	30.81 (4.10)	29.97 (4.62)	2.04	.16	.19
<b>Belief</b>					
Transmission	11.07 (2.03)	11.00 (1.99)	.22	.82	.03
Apprenticeship	12.10 (1.65)	11.90 (1.77)	.82	.42	.12
Developmental	10.22 (2.19)	10.59 (1.77)	-1.64	.11	-.20
Nurturing	12.66 (1.58)	12.52 (1.30)	.59	.56	.05
Social reform	10.37 (1.41)	10.23 (1.74)	.72	.47	.09
<b>Intentions</b>					
Transmission	9.15 (1.81)	8.27 (1.79)	3.79	<.01	.49
Apprenticeship	12.51 (1.43)	12.38 (1.41)	.61	.55	.09
Developmental	11.95 (1.94)	12.52 (1.43)	-2.42	.02	-.33
Nurturing	12.59 (1.67)	12.49 (1.69)	.47	.64	.06
Social reform	10.21 (2.01)	10.10 (1.97)	.71	.72	.06
<b>Actions</b>					
Transmission	11.51 (1.63)	10.64 (1.57)	4.02	<.01	.54
Apprenticeship	11.67 (1.31)	11.48 (1.38)	1.12	.27	.14
Developmental	11.68 (1.70)	12.63 (1.41)	-4.56	<.01	-.61
Nurturing	11.58 (1.62)	10.25 (1.82)	2.35	.02	.77
Social reform	10.25 (1.82)	9.64 (2.00)	2.23	.03	.32

**Table 3. Paired-Samples *t* Test for the TPI Leadership and the TPI 2 (after 18 months) for Overall Totals, Belief, Intentions, and Actions**

Perspective	Leadership TPI (SD)	TPI 2 (SD)	<i>t</i> (df=72)	<i>p</i> -value	Cohen's <i>d</i>
<b>Overall Totals</b>					
Transmission	25.11 (3.41)	29.92 (4.09)	10.05	<.01	-1.28
Apprenticeship	34.22 (4.27)	35.77 (3.48)	3.80	<.01	-.40
Developmental	41.56 (3.38)	35.74 (3.41)	-14.58	<.01	1.71
Nurturing	35.56 (5.83)	36.04 (3.98)	1.03	.31	-.14
Social Reform	32.11 (5.18)	29.97 (4.62)	-3.95	<.01	.43
<b>Beliefs</b>					
Transmission	8.89 (1.45)	11.00 (1.99)	9.08	<.01	-1.21
Apprenticeship	10.89 (2.15)	11.90 (1.77)	4.91	<.01	-.51
Developmental	12.78 (1.99)	10.59 (1.77)	-10.57	<.01	1.16
Nurturing	11.89 (1.97)	12.52 (1.30)	4.13	<.01	-.37
Social reform	10.78 (2.28)	10.23 (1.74)	-2.69	<.01	.27
<b>Intentions</b>					
Transmission	7.11 (1.54)	8.27 (1.79)	5.56	<.01	-.69
Apprenticeship	11.78 (1.79)	12.38 (1.41)	3.66	<.01	-.45
Developmental	14.33 (1.41)	12.52 (1.43)	-10.78	<.01	-.38
Nurturing	11.67 (2.83)	12.49 (1.69)	4.16	<.01	-.35
Social reform	11.33 (2.18)	10.10 (1.97)	-5.36	<.01	.59
<b>Actions</b>					
Transmission	9.11 (2.67)	8.64 (1.57)	8.36	<.01	.21
Apprenticeship	11.56 (1.51)	11.48 (1.38)	-.50	.62	.06
Developmental	14.44 (1.73)	12.63 (1.41)	-10.97	<.01	1.15
Nurturing	12.00 (1.73)	10.25 (1.82)	-4.43	<.01	.99
Social reform	10.00 (1.23)	9.64 (2.00)	-1.52	.13	.22

Despite the change in tutors' profile towards the leaders' profile in terms of their Transmission perspective after 18 months, gaps still exist between the leadership and the tutors. With the exception of the Nurturing perspective there continues to be a misalignment between the leadership's profile and the tutors' profile 18 months later. Significant differences were

observed between all perspectives for beliefs and intentions. For the actions, only the Apprenticeship and Social Reform perspective showed alignment with the leaderships' perspective; all the other perspectives showed significant misalignment. The outcome suggests that although the tutors are moving towards the leadership perspective (or norm) the differences are still large.

In summary, tutors are not aligned with the leaders when they start working at the polytechnic. However, important changes seem to occur in the tutors' profile over 18 months – specifically in the key perspective: Transmission, which shows a shift closer towards the leadership's profile. When looking at the three indicators of the Transmission perspective the analyses revealed that a change in tutors' intentions and actions could account for the overall shift—not a change in their beliefs. However, despite the move towards the leadership profile in terms of this perspective the changes are too marginal to result in an alignment with the leaders of the institution.

### **General discussion**

The study set out to examine two issues: (1) the alignment between the tutors' perspectives (in terms of their beliefs, intentions and actions) towards teaching and those espoused by the leaders of the pedagogical reform: the senior administrators and policy makers at the polytechnic, and (2) whether tutors change in their perspectives over a period of 18 months. To study these issues, it was examined whether tutors are aligned with the leadership's perspective when they enter the polytechnic. Subsequently it was assessed whether the tutors change significantly over the period of 18 months. Finally, it was investigated whether there was an alignment between the leadership's profile and the tutors' profile after 18 months. The TPI was used to measure these changes.

The findings of the study show that the leadership at the polytechnic has a very coherent view of what an effective tutor looks like. This is an important finding as this group of nine is responsible for writing academic policy and determining teaching standards. The TPI profile of this group will influence the setting of the benchmark for new tutors. It seems that the leadership is very clear about the type of tutor they believe to be effective – a tutor high in the attributes of a Developmental perspective and low in those of a Transmission perspective. The question then becomes one of ascertaining whether tutors will conform to this prototype.

As noted in the introduction, the literature on tutors' beliefs is unclear about whether tutors will comply with practices advocated by leaders if these practices are not consistent with the tutors' beliefs about effective teaching, or their beliefs about the need for change (Prosner et al., 1982; Pittman, 1998). The perspectives of the tutors in this study are not aligned to those of the leadership. Indeed there are significant differences with respect to the Transmission and Developmental perspectives, which indicate fundamental differences in approaches to teaching between the two groups.

The data suggest that even when an institution makes its pedagogical philosophy clear, new teaching staff appear content to join the institution with different beliefs. In terms of "buying into" PBL, the findings from the interviews were somewhat unexpected. On the surface, tutors are comfortable with this approach, reporting, when they entered the polytechnic, that they believed PBL was a method that they thought would help students learn. Indeed, given the fact that the polytechnic is very clear about its pedagogical approach, for a new staff member to join and not be aware of the preferred pedagogy would be most unlikely. One might consider it equally unlikely that staff would express reservations about PBL before they have established themselves in the institution or experienced the approach at first hand. The following statement is an example of dissonance between a tutor's beliefs and how she can apply PBL in her subject. The tutor's dominant perspective is Transmission.

*I don't know whether you could combine using the traditional and the PBL. I was thinking maybe some kind of learning needs the traditional way. I think there are situations that you can use PBL to entice them but some subjects you maybe still need the traditional method. I don't know, maybe like Statistics or Mathematics because with Mathematics it's all about figures, and equations and formulas so using PBL I don't know how to convey the message to students that, you know, these are the steps that you need to do to come up with a solution. They have to go through steps. PBL works for subjects that require creative thinking or subjects, for instance, like culture and communication - there is no specific sequence to go through. It's really based on linking situations and scenarios together. I can't see a Maths subject doing PBL. (Male, Mathematics Tutor, aged 27)*

More significant, perhaps, are the remarks made by a tutor with a dominant Developmental perspective. Her TPI profile suggests that she would feel comfortable in a setting where the transmission of content is not the focus of a tutor's work, yet we find in the comment below that she is open to the idea of using mixed methods of teaching despite recognizing that her subject was well suited to PBL.

*Personally I said PBL is relevant. It's good but I think also let's not throw away conventional method of learning also. I think certain things still can be delivered by the conventional way depending on what you are delivering - the subject, but I think it should be complemented by PBL. So, I am for a balance of the conventional and PBL. If we swing either way it's not ideal to me. So I feel that the conventional way of teaching may still have value. (Female, Mathematics Tutor, aged 27)*

A frequently mention point in the interviews was the acquisition of content knowledge within a PBL model. Specifically, the interview data show that new staff appreciate PBL for its capacity to develop generic thinking and learning skills, but are concerned that the approach may not result in students acquiring the requisite disciplinary knowledge demanded by industry. This concern was evident across all the TPI perspectives. The following example is fairly typical:

*The only trouble I foresee is when the students graduate in terms of content whether they would have the same level of content [knowledge] as students graduating from neighbouring polytechnics. This is one of my concerns that they will not be able to be hired. When you are going for an interview you have 15-20 minutes to answer whatever technical questions they give you, a problem that you have to figure out and you have to have all of this at your finger tips. If not, the employer is not going to hire you. In that sense the traditional system may be better. (Male, Information Technology Tutor, age not given)*

Again, given the polytechnic's very public stance on its PBL pedagogy, this anxiety about the acquisition of content knowledge appears contradictory. Tutors are well aware of the polytechnic's vision to move away from a teaching methodology that is steeped in memorisation, drill-and-practice, and teaching to the test. So what might account for the tutors' apprehension and their rather crude understanding of PBL? An explanation may be found in the context of the study. As stated earlier, the tutors are successful products of a traditional education system, they do not have experience as managers of learning, and they are provided with a meagre five days of orientation before they are expected to teach in a way that is not only unfamiliar to them but is unique in the educational system in which they are living and working.

However, this finding is not too problematic. Within 18 months, the core perspectives, in particular the Transmission perspective, of these staff change and become more aligned with those of the leadership although, as a closer analysis reveals, changes in beliefs are slower than actions. There are two possible explanations for this gap between actions and beliefs. The first is

in the tradition of Rokeach (1968) and suggests that the tutors in the study held core beliefs about teaching that were so strongly held that there was little shift within a year. The other explanation proposes that tutors are willing to put into place a pedagogy that they do not necessarily believe in but have been mandated to implement. Such an explanation is in line with studies that state that external factors shape what tutors do as much as their beliefs (Kilgore et al., 1990).

The tutors' concern about the acquisition of content knowledge is a good example. As stated earlier, many of the tutors expressed a view that PBL may not enable students to acquire the requisite body of knowledge deemed necessary by employers. Yet, despite this concern, the tutors tended to become less transmissional in their practices over the course of 18 months. Perhaps it is unreasonable to expect tutors to make a major paradigm shift in their perspectives of teaching and learning, in such a short period of time. Indeed, for there to be any shift at all – especially after only five days of staff development – might be considered solid progress.

A brief, preliminary examination of the perspectives of 16 staff (not part of the group studied here) who have taken the TPI after more than three years at the institution reveal that their TPI profiles are significantly more aligned with that of the leaders than the 73 staff who formed the cohort of this study. This suggests that it takes at least this period of time for staff to become comfortable enough with the pedagogical reform for it to influence not only their actions but also their beliefs. However a further, more thorough, examination of long-term change in perspectives is required.

The overall findings of the study—that staff at the polytechnic are capable of implementing a pedagogy that is unfamiliar to them, mandated by the leadership and over which they have little control—is a reflection, perhaps, of the rigidity of the PBL structure in ensuring that the preferred pedagogy is being enacted in the classrooms. Set times for meetings with students and clear descriptions of the activities to take place during those meetings provides tutors with the necessary scaffolding to influence their practices even if they have yet to fully “buy-into” the pedagogy espoused by the leadership. In this way, the mandated reforms at the institution have provided an important mainstay in shaping the actions of a significant group of staff. It is not beyond the realms of possibility that, over the medium term, so long as the leadership continues to propound a coherent view of effective teaching to staff, and provides tutors with adequate support for staff development (certainly much more than the five day programme currently offered), there will be a much stronger alignment between the profiles of the leadership and tutors. The nature of the staff development could also help tutors move towards the beliefs, intentions and actions of a Developmental tutor. Tutors should be provided



with opportunities to experience learning environments that reflect the PBL classroom, hence staff development activities should perhaps challenge thinking, require reasoning, elaboration and justification of views from the participants as well as model the behaviours of an effective tutor of PBL.

The context of the study and in particular the rigid structuring of the polytechnic's PBL pedagogy may present some limitations to the generalizability of the findings. Not many institutions are in the position to mandate the use of PBL across the entire curriculum, nor are their timetables designed such that students can work in the same groups on a single problem for a whole day. However, whilst the administration of PBL at the polytechnic may be difficult to mimic, the high level of curriculum support for staff in terms of tutor guides (detailing the problem objectives, questions that could be asked in each meeting with students, likely obstacles to the students learning), exemplar problem solutions, briefings on the problems to be facilitated, are measures that could be replicated in other institutions wanting to ensure some uniformity in practice, especially with tutors new to PBL.

A limitation of the study is that it is dependent upon the use of the TPI which is a self-report. The literature suggestions that self-reports may not be reliable measures of what tutors actually do and think (Hook & Rosenshine, 1979; Porter, 2002). Further studies may benefit from the use of additional data to cross check the findings of the TPI, such as student and/or peer observations of tutors.

The study leaves some important questions unanswered. How long does it take for greater congruence between the perspectives of tutors and those espoused by the institutions leaders? What can be done to help staff examine their perspectives about teaching more systematically? What support needs to be provided in order to change perceptions of teaching and learning with greater efficacy? Should the current tutor certification process after 18 months be reconsidered? Would a more formal tutor certification process at the polytechnic after perhaps three years deliver a tutor profile that is more consistent with the leadership profile? These questions require further research not just at this polytechnic but also in other institutions attempting to introduce educational reform mandated by people other than the tutors themselves.

## Chapter 3: Do students' observations of their tutors concur with tutor self-reports?

### Abstract

This study examines the differences between tutors' reports about their teaching and how students experience their tutors in a student-centred learning environment. Thirty-four tutors and 797 students participated in the study, which was conducted in Singapore. The Teaching Perspectives Inventory was administered to both tutors and students as a means of measuring tutors' approaches to teaching. The results of the study revealed agreement between the students' observations of teaching-related actions in the classroom. However, there was a discrepancy between the tutors' self-reports and what students observe, with tutors seeing themselves in more idealistic terms than perceived by their students. The implication of the finding is that student observations may be a useful determinant of whether tutors in student-centred learning environments are actually behaving in ways that are appropriate.

### Introduction

To ensure that pedagogical practices espoused by tutors are being enacted in the classroom it is not sufficient for tutors to say they are doing what they planned to do; their intended behaviours need to be experienced by students. This is especially the case in the context of mandated pedagogical reform. The designers and initiators of change need to be confident that their envisaged innovations are actually being implemented in the classroom by tutors – the agents of change – otherwise they are likely to fail or have limited impact on student learning (Fullan, 1993). The issue is all the more important if the innovation requires tutors to put into practice pedagogies with which they are unfamiliar, such as student-centred pedagogies like problem-based learning (PBL). Tutors in a student-centred learning environment need to shift from being transmitters of information to being enablers of learning (Hmelo-Silver & Barrows, 2006; Krajcik, Blumenfeld, Marx & Soloway 1994). One way to determine if tutors can make the shift is to ask them, but the use of self-reports requires validation to assess whether the tutors are really doing what they say and think they are doing. Hence, the aim of this study was to examine whether student observations can be used to confirm what tutors say about their teaching practices.

A number of issues are associated with the use of tutor self-reports. Any study that measures perceptions of behaviour through self-reports is subject to questions of response bias.

In an occupation that is generally carried out in isolation, tutors do not always have knowledge about what happens in other classes even within their own institution, making it difficult for them to compare themselves with others. So, when asked to make judgements about themselves, tutors have little information on which to make a normative decision (Muijs, 2006). In addition, as teaching is action-based it is not always possible for tutors to reflect on their actions during class-time and they may find it difficult afterwards to be specific about what they did, and why they did it. This time lapse between doing, and reporting what was done, can affect the reliability of self-reports (Newfield, 1980).

Self-reports can also be subject to self-presentation bias or a socially desirable response. This is a tendency to present oneself or the work one does in a positive light when responding to a survey. Research in this area suggests that self-presentation bias may occur when respondents feel the need to look good to others or to conform to the values of their community (Kopcha, and Sullivan, 2007; Moorman and Podsakoff, 1992). Schaeffer (2000) suggests that this form of bias may be a result of respondents feeling inadequate or threatened. Although her work is conducted in a non-teaching setting her conclusions do raise the question whether new tutors about to embark on a career in an institution that advocates a particular pedagogy may demonstrate self-presentation bias as a way of conforming to the education values of the institution. Kopcha and Sullivan's study carried out in a teaching context found evidence of self-presentation bias in schools. They examined 50 middle school tutors and their use of educational technology and concluded that tutors want to be seen in a positive light in terms of assessment, instructional design, learner-centred instruction and curriculum alignment (Kopcha and Sullivan 2007). Other work suggests that the use of tutor self-reports may be particularly unwise if the findings are used in high stake decision making such as tutor evaluations, because as Porter (2002) states "The temptation to look good would simply be too great for some" (p12). These studies suggest some caution is warranted when viewing the results of tutor self-reports.

Other research that looks at the differences between self-reports and observed behaviours have highlighted additional concerns with the accuracy of data which is generated by tutors making judgements about what they do. A study by Mayer (1999) of Mathematics tutors and their use of classroom practices to meet the standards required by the National Council of Tutors of Mathematics (NCTM) revealed tutors inflated their individual measures and hence were considered to be unreliable. For example, when compared to observations, tutors tended to exaggerate the time they spent on practices required by NCTM. Indeed the work of Mayer (1999) echoes the findings of earlier work by Hook and Rosenshine (1979) who reviewed studies of

tutors' self-reports and found that the accuracy of these reports was questionable. It seems that in nine of the eleven studies they reviewed there was no relationship between the tutors' accounts of their behaviour and the actual occurrence of this behaviour in the classroom as observed by a third-party. The authors concluded that caution should be exerted when determining the accuracy of tutor self-reports.

However, self-reports cannot be totally dismissed. They do offer a way of measuring tutors' beliefs and intentions and they can prompt self-reflection (Pratt, Collins & Jarvis-Selinger, 2000). On a more pragmatic level, they are a cost effective method of gathering large amounts of data in an inconspicuous manner. Done well, they can posit accurate results. If the survey instrument includes well-written items related to specific behaviours, and the time period given to tutors to reflect on their conduct is kept short, they can be deemed reliable (Newfield, 1980). Work by Blank, Porter & Smithson, (2001) found that using representative samples and ensuring high response rates can yield valid measures through self-reporting. Their study showed that when tutors thought the results of their efforts could inform their practice they were more likely to respond to the survey. Providing time within the working day was another way of improving response rates.

So the literature on the reliability of tutor self-reports as a measure of what they do seems somewhat inconclusive. Given this ambiguity on the reliability of self-reports, third-party tutor observations could be used as a cross check. However, classroom observations are costly and are also subject to problems such as observer bias and generalisability, meaning that the observed actions may not be typical of the tutor's behaviour when not observed (Muijs, 2006). The use of student questionnaires is an option increasingly used by education institutions to determine tutor effectiveness. The use of such questionnaires is not unproblematic and has often invoked resistance amongst the teaching fraternity (Aleamoni, 1999). Based on his work from 1987, Aleamoni reviewed over 150 articles to arrive at 16 commonly held beliefs by educators about student ratings of tutors and concluded that many of these beliefs were based on myths rather than on researched facts. One of the most commonly held myths is that students are not capable of making consistent judgements about their tutors because they are immature and lack experience (Wilson, 1999). Aleamoni (1999) cites numerous studies that have refuted this and in fact show a strong consistency in student judgments. Another popular assumption that he dismisses is that tutor ratings are nothing more than a popularity contest, with the warm and friendly types winning ahead of the more effective but less popular tutor. Yet the assumption persists and is backed by some research studies. Indeed Shelvin, Banyard, Davies & Griffiths (2000) have found that student evaluations of teaching effectiveness are heavily influenced by

what they call the charisma of the tutor and that this personal view of the tutor may lead to higher ratings “irrespective of the actual level of teaching effectiveness” (p. 399). Arubayi (1987) in his review of studies focussing on the reliability of student ratings found the literature supported the position that student ratings are reasonably reliable. However, it seems that reliability is higher when questions are specific and personal (Wilson, 1999; Aleamoni, 1999).

The presence of the tutor when completing the survey could be thought to influence the students’ responses. Das, Mpofu, Hasan & Stewart, (2002) when examining student perceptions of tutor skills in PBL found this not to be the case, although the evidence they offer to support this claim is unclear and may be simply students’ in-class responses to the question of whether the tutor being present effects how they respond to a questionnaire. Using an online questionnaire that can be completed outside class-time may alleviate any concerns about the physical presence of the tutor.

The literature that compares students’ and tutors’ perceptions of tutors’ behaviour indicates that, on the whole, there is agreement between the two cohorts although; (i) students’ perceptions of the tutor are closer to observational data than the data provided in tutor self-reports, and (ii) tutors do not always behave in the classroom as they indicated they do in self-reports, indeed, they tend to judge themselves in idealistic terms (Wubbels & Levy, 1993). However, much of the research comparing tutor self-reports and students’ observations of their tutors’ classroom practices has been conducted in secondary schools with a mix of pedagogies. This study takes place in an institution that has mandated the use of a single student-centred pedagogy. It examines the tutors’ perceptions of their own teaching in this environment and then validates these self-judgements through students’ observations. The study is comprehensive, involving over 30 tutors and more than 750 students; it focuses not only on tutor behaviours but also their beliefs and intentions; and it examines whether tutor or student judgements are a better predictor of student achievement.

The student-centred pedagogy examined in this study is PBL. Students in PBL classrooms work in small groups on an authentic problem that reflects the real-life environment in which the learner is to function. They are expected to take ownership of both their approach and solution to the problem (Savery & Duffy, 1995). The role of the tutor (referred to as a facilitator at the institute in question) is to facilitate student learning. The successful facilitation of any student-centred approach requires a range of teaching behaviours that differ from instruction in more conventional classrooms. In a traditional classroom the IRE discourse predominates (Cazden, 1986), the tutor *initiates* a question of which the answer is already known, the student *responds*, and the tutor

*evaluates* the response. So whilst the student is involved, it is the tutor who does most of the talking and is constantly seeking information about what the student knows. A tutor who is focused on making sure the students know the facts rather than on listening to how students are making sense of information, has a tendency to intervene and provide unsolicited explanations and examples that are not connected to what the students are thinking (Schoenfeld, 1998). In contrast, the emphasis in the student-centred classroom is on tutors assisting students to construct their own understanding of knowledge. To do this, tutors must be alert to obstacles impacting on student learning and be ready to apply appropriate strategies to facilitate understanding. Specifically, they must make a judgement whether to step in and scaffold student learning or to allow students to work through the issues and obstacles uninterrupted (Hmelo-Silver & Barrows, 2006). It follows that what tutors intend to do and what they actually do, and what they say and when they say it, are of fundamental importance to the student-centred learning process. This is why it is important to examine both their conceptions of teaching and their actual teaching behaviours if there is to be successful adoption and implementation of a student-centred pedagogy such as PBL.

### **Context of the study**

The institution that forms the basis of the research is a large polytechnic in Singapore. Like other polytechnics in this island state it has a focus on developing the technical and vocational skills of young people generally aged between 16 and 20 (O'Grady & Alwis, 2002). What is different about this polytechnic is that PBL has been mandated across the entire curriculum, for all students, in all courses, in all years. Each day, the students work in small collaborative teams to solve a given problem that is designed to stimulate or initiate the learning process (Schmidt, 1983).

In an attempt to ensure that PBL is appropriately implemented by the tutors, the senior administration has determined that all staff must undertake a five day orientation programme before they can set foot in the classroom. In addition, after a period of 18 months to two years, staff are invited to undertake a certification programme that assesses whether the tutor has understood the institution's teaching philosophy and is enacting this philosophy in their classroom practices. The expectations of a student-centred tutor are clearly articulated in documents and in staff development programmes.

There are few instruments available to measure tutor perspectives on teaching, and students' views of their tutors. An instrument that has the potential to do both is the Teaching Perspectives Inventory (TPI) (Pratt, et al., 2000). The TPI was developed through an iterative

process of interviews, observations, evaluations, and second interviews. Based on the input of over 250 tutors in numerous countries, including Canada, China, Hong Kong and Singapore, it has shown to have a high degree of validity and reliability (Collins & Pratt, 2008). It is a self-report instrument consisting of 45 items that measures tutors' orientation towards their role as a manager of the learning process and consists of five scales, called 'perspectives'. Nine items are used to measure each of the five perspectives which are: (1) Transmission (effective delivery of content), (2) Apprenticeship (modeling ways of being), (3) Developmental (cultivating ways of thinking), (4) Nurturing (facilitating self-efficacy), and (5) Social Reform (seeking a better society). The TPI differentiates between three subscales: beliefs, intentions and actions that are the three indicators of a tutor's perspective. Three items are used to measure each subscale for each perspective; hence three sets of three items constitute the nine items that measure each perspective. While not specifically designed to measure students' perceptions of their tutors, the TPI has the capacity to do so by asking students to make inferences about tutors' beliefs and intentions from their observations of tutors' actions.

To date the instrument has only been used in institutions that employ a mix of pedagogies. This study uses it in a polytechnic that implements a single pedagogy. While the institution does not mandate that staff should work towards the actions and beliefs of any one of the five perspectives it does stress that the behaviours described by the Transmission perspective (tutors represent content accurately and efficiently and students learn that content in its authorised and legitimate forms) are likely to be at odds with student-centred pedagogies. On the other hand, when looking at the items for the other four perspectives, the descriptor for the Developmental tutor at face value appears to describe the types of behaviours expected of a tutor in a student-centred classroom. The Developmental tutor believes that effective teaching is planned and conducted from the learners' point of view, tries to build on what students already know, intends to help learners develop more complex ways of reasoning, challenges students' ways of understanding the subject matter and asks lots of questions. Such behaviours seem to be aligned with those of effective tutors in student-centred environments such as PBL (De Grave, Dolmans & van der Vleuten, 1999). This study will determine whether this is indeed the case as reported by the tutors and as experienced by the students at the polytechnic.

The TPI has been used widely in several countries. However, to date, no study has used the TPI to match students' perceptions of tutors with the teaching perspectives of the tutors themselves.

To summarise, the aim of this study is to examine whether students see tutors doing what they have reported they do via self-reports about their teaching practices. A novelty of the study is that it is conducted in the context of an institution that has implemented a single student-centred pedagogy. Hence, the findings will help to establish whether student observations can provide a reliable validation of tutors' behaviours in a learning environment that requires tutors to behave in ways that they are not generally used to.

## **Method**

### ***Participants***

In the study, data were collected from 67 tutors and from 797 students in 40 classes at a polytechnic in Singapore. The average age of the tutors is 33 years (SD = 6.58) and the average age of the students is 18.70 (SD = 1.751).

### ***Measures***

The Teaching Perspectives Inventory (TPI) was used to measure both the tutors' perspective on teaching, and the student's perceptions of their tutors. Using a scale of "Never", "Rarely", "Sometimes", "Often", and "Always", (or "Strongly Disagree", "Disagree", "Neutral", "Agree", and "Strongly Agree") and 45 items subdivided into items which measure 'actions', 'intentions', and 'beliefs' the TPI determines respondents' orientation towards each of the five perspectives: (1) Transmission - "I make it clear to people what they are to learn", (2) Apprenticeship - "I model the skills and methods of good practice", (3) Developmental - "I encourage people to challenge each others' thinking", (4) Nurturing - "I find something to compliment in everyone's work or contribution", and (5) Social Reform - "My teaching focuses on societal change, not the individual learner". After taking the TPI, respondents receive a profile indicating a score on each of the five perspectives. The profile shows which of the perspectives are dominant and which are recessive. A score is also given for each subscale of each perspective. Three items measure each subscale. Using the Nurturing perspective as an example: one of the three items for beliefs is "It is important to acknowledge learners' emotional reactions", one item for intentions is "My intent is to build people's self-confidence and self-esteem as learners"; and one item for actions is "I find something to compliment in everyone's work or



contribution". Hence it is possible for respondents to see how aligned are their beliefs, intentions and actions within each of the five perspectives.

The instrument demonstrates adequate reliability in terms of the internal consistency of the scales; Cronbach Alpha values ranged from .70 (Developmental) to .83 (Social Reform) and average .76 across the five scales. Construct validity of the instrument has been established by means of exploratory factor analysis. The results demonstrated that all items made a meaningful contribution to at least one of the perspectives, with none of the items having less than .30 factor loadings (Collins & Pratt, 2008).

As mentioned above, a slightly modified version of the TPI was devised to measure students' perceptions about the teaching of their tutors. For instance, the original item "I make it very clear to people what they are to learn" was changed to "The facilitator explains clearly what I am expected to learn". The modifications were undertaken with the intent of maintaining the integrity of the meaning of the original items.

### ***Procedure***

Students were invited to complete the survey online. The decision to make the survey available online was taken to address the issue of the tutor's presence possibly influencing the students' responses (Das et al., 2002). The 797 students in the study are a subset of 4085 students who voluntarily responded to an invitation. This subset represents students who were in classes where 15 or more students (mean 20 students) made judgements about the same tutor and constitutes 19.1% of students who responded to the survey. Setting a cut-off of 15 or more students was considered appropriate because in classes of 25 students, 15 students equate to 60% of each class. Simultaneously, a general email was sent to all 811 staff asking them to take the TPI online. Of these, 180 staff responded; a response rate of 22%. The 34 tutors in the study consist of staff who completed the TPI and who taught classes where more than 15 students responded to the invitation to take the TPI.

### ***Analysis***

Before statistically comparing the tutors' self-rating with the students' ratings, the reliability of the student responses was determined. To this end, intraclass correlation coefficients (absolute agreement) were calculated for each class. The intraclass correlation coefficient is a measure of agreement between raters, in this case, the students. A cut-off value of .70 and above is considered adequate agreement between the raters (Koch, 1982). As a second step in the

analysis, a one-way ANOVA was conducted to examine potential differences between the tutor and student TPI scores. In addition to the  $F$  and  $p$ -values, effect sizes were generated by means of Cohen's  $d$  (Cohen, 1992).

## Results

In order to evaluate the agreement between the students' ratings for all 45 items of the TPI, the intraclass correlation coefficient was calculated for all 40 classes, the values ranging from .54 to .83 (the average .70 shown as Overall TPI in Table 1). The intraclass correlation coefficient was then calculated for each of the five perspectives (nine items for each perspective) the values ranging from .37 to .68 (average .55). The Transmission perspective and the Developmental perspective were the two perspectives with the highest levels of student agreement, being .68 and .65 respectively. The other three perspectives had somewhat lower levels of agreement amongst the students suggesting that the students had more difficulty distinguishing the teaching perspectives of these tutors. In addition to the overall value, the intraclass correlation coefficient for the beliefs, intentions, and actions sections of the instrument were determined. Not surprisingly, the intraclass correlation coefficient was highest for the actions section (.77) and lowest for the intentions section (.53), the belief section falling between the two (.60). The results demonstrate that there was an acceptable level of agreement between the students' observations when it comes to the TPI as a whole, and for the actions these tutor display in the classroom, but the students had lower levels of agreement when asked to make inferences about their tutors in terms of the tutors' intentions and beliefs.

**Table 1. Intraclass Correlation Coefficients for the 40 classes for the Teaching Perspectives Inventory (TPI)**

TPI sections	ICC value
Overall TPI	.70
Actions	.77
Beliefs	.60
Intentions	.53
Transmission	.68
Apprenticeship	.51
Developmental	.65
Nurturing	.37
Social Reform	.54

On the basis that there is sufficient evidence of reliability in the student judgements, a one-way analysis of variance (ANOVA) was conducted to assess whether there are mean level differences in TPI scores between the tutors and the students. The independent variable was tutor/student TPI. The dependent variable was the difference in the mean level on the five subscales of the TPI. Table 2 shows that the mean for the tutors' overall perspective is highest for Nurturing (closely followed by the Apprenticeship perspective) and lowest for Social Reform. A comparison with the data from the student observations shows that in contrast to tutor data the student mean is highest for the Transmission perspective but like the tutor self-reports the Social Reform perspective is lowest. So whilst the tutors rate themselves as being higher in Nurturing and Apprenticeship than the other three perspectives, the students are stating that they are seeing a higher Transmission perspective in the classroom than any other. Interestingly the mean from the tutor data suggest similarities in the Transmission and Developmental perspectives, although the mean for both these perspectives are lower than those derived from the student observations data. These findings suggest that there are differences in how the tutors rate themselves and what the students observe.

**Table 2. ANOVA for all Five Scales of the TPI**

Perspective	Student/Tutor	Mean (SD)	<i>F</i>	<i>p</i>	<i>d</i>
Transmission	Tutor	3.67 (.46)	.48	.48	.13
Apprentice	Tutor	4.08 (.37)	53.25	< .01	1.55
Developmental	Tutor	3.77 (.35)	14.03	< .01	.78
Nurturing	Tutor	4.09 (.44)	28.78	< .01	1.12
Social Reform	Tutor	3.42 (.47)	8.12	< .01	.55

When examining whether the differences between the student and tutor scores are relevant, it was found that for all TPI scales except for the Transmission perspective there were statistically significant differences. Taken as a whole, the results showed that the tutors rated themselves significantly higher on the Apprenticeship, Developmental, Nurturing, and Social Reform perspectives as compared to the students. The tutors rated themselves higher in the Transmission Perspective than their students, but the difference was not significant. The effect sizes for these four scales ranged from .55 to 1.55 (average 1.00). For Transmission the effect size was weak:  $d = .13$ .

The Developmental perspective, which is the perspective that on face value appears to be more obviously aligned to a student-centred teaching approach than any other perspective, did

not stand out in either the analyses of the tutor nor the student data. Although tutors see themselves as being more Developmental than the students observe, they do not rate themselves strongly in this perspective.

#### Discussion

The study set out to examine whether students' observations of their tutors concur with tutors' self-reports of their teaching. The context of the study is a polytechnic that has introduced a single, student-centred pedagogy that requires tutors to behave in ways that may be unfamiliar.

The argument that student observations are too unreliable to be used to cross reference what tutors say they do cannot be supported by the findings of this study, certainly in terms of students' observations of tutors actions. In over 40 classes with 15 or more students observing 34 different tutors, there was a reasonable level of agreement amongst students, suggesting that the teaching practices these students experience in a classroom are similar and hence an accurate measure of what their tutor actually does. The study therefore supports the findings of the review conducted by Aleamoni (1998).

Tutors' perspectives do not simply involve their actions, but also incorporate what they intend to do in the classroom and the beliefs that underpin their approach to students and instruction. However, determining tutors' beliefs and intentions present difficulties for researchers as they cannot be directly measured but rather inferred from a range of techniques such as self-reports, audio and videotapes accompanied by a checklist or observation sheet, and Q-sorts, all methods that are time consuming and which often generate concerns about the validity and reliability of the information collected (Haertal, 1993; Forrester, 2007; Ambrose, Clement, Philipp & Chauvot, 2004; Rimm-Kaufmana, Storma, Sawyera, Pianta & LaParob 2006). This study attempted to use students as observers to overcome these difficulties. To address any reservations over the reliability of student observations, only tutors for whom 15 or more students (representing 60% of each class cohort) commented on them were included in the study. The findings suggest that whereas the level of agreement amongst the students regarding the tutors' actions was strong (.77), for beliefs and intentions, the level of agreement was somewhat weaker. Yet even for tutors' beliefs and actions, student observations should perhaps not be dismissed out of hand. Given the complexity of making judgements about these latent constructs, the agreement that was evident in the student data is encouraging (beliefs .60 and intentions .53) and with some revisions the TPI may be effectively used with students.

The findings also support the early work of Hook and Rosenshine (1979) who question the reliability of tutor self-judgements about their teaching. Tutors in the polytechnic's student-centred learning environment rated themselves statistically significantly higher than the students in the

Apprenticeship, Developmental, Nurturing and Social Reform perspectives and higher in the Transmission perspective although the difference was not significantly different, having just a .07 difference between the student and tutor ratings for the Transmission perspective. It seems clear that the results show that on the whole the students do not agree with what the tutors reported about their own teaching. Does this mean that the students are providing a 'truer' picture of tutors than the tutors themselves? Given the number of students judging each tutor and the general agreement amongst them, some degree of credence should be afforded the student observations as being more informative about tutors' perspectives than the tutor self-reports.

What can be gleaned from the findings? The tutors overrating themselves in all five perspectives and the students experiencing more Transmission behaviours than any of the other perspective suggest that tutors may be struggling to adapt to a student-centred learning environment. The surprisingly low rating of the Developmental perspective by both tutor and students may also indicate that tutors are unsure of what student-centred approaches to teaching looks like. It may be that the five day orientation programme is either insufficient in getting across the message that Transmission teaching behaviours are inappropriate, or does not provide sufficient time for tutors to develop teaching strategies suited to the pedagogy they are supposed to enact. If this is indeed the case, then the polytechnic may need to consider providing more support to staff so that they are clear, not only about what they should not do, but also what they should do.

### **Conclusion**

In conclusion, the study suggests that student judgements could be used to cross check tutor self-reports, particularly in confirming actual behaviours in the classroom. Tutors, as the sole judges reporting classroom practices, have a tendency to overrate themselves and provide an incomplete picture of what they really do in a classroom. Our data demonstrate that if sufficient numbers of students' judgements are used they can be reliable enough to act as a validation of tutor's self-reports in terms of tutor's actions and with some caution can be used to provide information about tutors' beliefs about, and intentions towards, teaching. In addition, the study concludes that tutors even in an institution with a clear, single student-centred pedagogy have trouble adopting teaching strategies that are appropriate.

## Chapter 4: Tutor effectiveness: A comparison of student and third-party observations of tutors.

### Abstract

This paper reports the findings of a study comparing student observations and third-party observations of tutors in problem-based learning classrooms. The aim of the study was to test whether students or peers can identify the qualities of effective tutors and whether these qualities are predictive of student learning outcomes. Data for 268 tutors were collected from a polytechnic in Singapore. The data were gathered from three sources: a student survey, third-party observations of PBL tutors, and end-of-course student achievement results, and were analysed using a structural equations modelling approach. This technique allowed the testing of a theoretical model that linked actions of PBL tutors, as seen from student and third-party perspectives, with student achievement. The results show that while students are better able than peers to recognise the moves of an effective tutor neither were capable of predicting students' academic achievement.

### Introduction

The opening of classrooms to observers has becoming increasingly common in schools and institutes of higher education. Nowadays it is not uncommon for the actions of tutors to be scrutinized by both their students and their peers. However the purpose and benefits of such observations continue to be a source of contention with much of the debate focusing on whether they can be used to identify effective tutors and whether they lead to improved teaching quality (Hall, Smith & Nowinski, 2005; Muijs, 2006). Given the time and cost expended in making judgements about what tutors do, it is important that these observations are accurate and useful. This study contributes to the debate by i) measuring the actions of tutors as reported by students, ii) comparing these with third-party observations of tutors' classroom behaviours and iii) determining whether students' observations of tutors or peer observations are a better predictor of student achievement.

The literature on what constitutes an effective tutor is abundant if somewhat problematic (Seidel & Shalveston, 2007). Some studies define effectiveness in terms of inputs such as the qualities of tutors; their qualifications and the courses they attend (Boyd, Grossman, Lankford, Loeb & Wyckoff, 2005; Carr, 2006; Darling-Hammond, Holtzman, Gatlin & Heilig, 2005) or the characteristics of tutors, namely their gender or pedagogical beliefs (Krieg, 2005; Staub & Stern,

2002), others scrutinize on the basis of teaching practices (Cohen & Hill, 1998; Smith, Lee & Newman, 2001), while some make judgements that take into consideration student outcomes (Noell, 2006). This study focuses on the latter and takes a somewhat narrow definition of effectiveness by looking at observable practices as rated by students and peers and comparing these to the outcomes achieved by students as measured by an end of course grade.

The literature on classroom observations is equally abundant for both types of observations: student observations and third-party observations. However, the studies vary somewhat in nature. Much of the work into the use of students' observations is concentrated on how they are used as an evaluation tool, with the debate then centring on issues of validity and reliability (Marsh, 2007; Greenwald, 1997), whereas studies of third-party observations tend to focus on models of observations, their purpose and processes, along with their merits or drawbacks (Gosling, 2002; Siddiqui, Jonas-Dwyer, & Carr, 2007).

Tutor effectiveness is often measured through the use of student questionnaires asking them to rate tutors based on their experiences of the tutors and interactions in the classroom. The ratings given by students have been under much scrutiny for many years both from practitioners and researchers (Aleamoni, 1999; Theall & Franklin, 2001). A common theme in this literature is that students do not make good judges of tutors' behaviour because their decisions are readily influenced by the personality or charisma of the tutor, with more popular tutors receiving high ratings regardless of their effectiveness in terms of student learning (Shelvin, Banyard, Davies & Griffith, 2000). Those sceptical of student surveys point out that many of them are conducted with the tutor in the room and hence may positively influence the students' judgements (Das, Mpofu, Hasan & Stewart, 2002). Marsh's work (2007) is more positive, finding that student judgements are reliable, yet he stresses that the survey instruments should be tested using a construct validity approach. This point is pertinent as many questionnaires administered to students have been developed in-house and not tested for validity and reliability (Richardson, 2005). A number of studies that examine reliability suggest that it can be improved by making the survey questions specific and personal to the students (Wilson, 1999; Aleamoni, 1999). Cashin (1999) also reports that ratings of tutors by students can be depended upon, but suggests that they should be used in conjunction with other information to evaluate teaching.

Another measure of tutor effectiveness could be made through third-party observations, which have been described as "the gold standard for assessing the quality of classroom discourse" (Matsumura, et al., 2006, p.6). Work into such observations has tended to look at the

purpose of the observations (Gosling, 2002); their merits - whether they can and should be used for formative or summative purpose, their benefits and drawbacks (Hammersley-Fletcher & Osmond, 2005; Muijs, 2006). There are also numerous papers dedicated to the process of the third-party observations that do not include any empirical study (Fernandez, 2007; Siddiqui, et al., 2007). From the literature it seems that there is debate as to whether the observations should be carried out by peers or by another non-peer third-party, typically a senior member of staff or someone from the school's management team. Studies of peer observations suggest that those involved view the exercise as being formative and developmental; a way of colleagues assisting tutors to improve their teaching (Martin and Double, 1998; Fernandez, 2007). These peer observations generally follow a negotiated process between the observee and observer and include a pre-observation discussion, observation and post-observation discussion. The observation is often perceived as a learning opportunity for both parties (Siddiqui et al., 2007). Rarely does it seem that the results of such observations are correlated to student achievements.

Observations by a third-party, who is not a peer, often play a more summative role where the findings are used to assess the tutor. Gosling (2002) describes this type of observation as the "evaluation model" (p5). The observed tutor may be assessed as part of an audit, annual appraisal or a confirmation of a probationary period or for some other summative purpose such as a quality assurance or accountability exercise (McMahon, Barrett & O'Neill, 2007). The questions of validity and reliability do not seem to be so prevalent in the literature about third-party observations. One study that did look at the issue of reliability was that of Marsh (2007) who found that both peer and third-party ratings were not very reliable and indeed there was little correlation between the observations and any indicator of effective teaching.

A number of studies have been conducted in the last decade that examine the relationship between the observations of tutors (whether by students or a third-party) and student outcomes as determined by academic grades at the end of a course. The study by Heneman, Milanowski, Kimball & Odden, (2006) which was primarily focused on the validity of a tutor evaluation instrument, is pertinent in two ways; first, it concluded that there was a strong link between what the tutors were observed to be doing in the classroom and their students' achievement, hence, confirming that tutors' actions do impact on student learning, and secondly, that there is value in conducting multiple observations by highly trained observers.

The Heneman, et al., study (2006) used the framework developed by Danielson (1996) in *Enhancing Profession Practice: Framework for Teaching* (1996) as the performance measure of teaching effectiveness. This framework has been popular with a number of researchers including



Kane, Taylor, Tyler & Wooten (2010). In their study of public schools in Cincinnati, U.S. the researchers used scores from the Cincinnati Tutor Evaluation System to see whether the classroom practices of tutors of high achieving students were different compared to tutors of low achieving students. Their findings suggest that this is indeed the case. They state that their study provides evidence that classroom observations can identify teaching practices that are related to student achievement.

So, in summary, the literature on observations of tutors is abundant and includes; models of observations, suggested processes to conduct the observations, tests of validity and reliability and examinations of their correlations with student achievement. This current study uses observations of tutors in three ways i) to measure the actions of tutors as reported by students, ii) to compare these with peer observations of tutors' classroom behaviours and iii) to determine whether students' observations of tutors or peer observations are a better predictor of student achievement. The findings will have a pragmatic benefit. Conducting third-party observations is time consuming and is costly when compared to systematic and routine collections of students' observations of their tutors. However, if these observations by colleagues are found to be better predictors of student achievement then the cost of the exercised is warranted, if not, then school administrators may choose to use other indicators to measure effective tutors, possibly including a survey of student observations.

### **Context of the study**

The study was conducted in a polytechnic in Singapore. Like all polytechnics on the island it is designed to equip young people (generally aged between 16 and 20) with well developed skills that will enable them to enter the workforce after three years of study. All courses at the institution are taught using a particular model of PBL. Typically students are taught in groups of five. Each class contains five groups. The polytechnic's approach to PBL is to have the students work on one problem during the course of one day. Hence, the students work on five problems a week for the fifteen weeks that constitute each semester. A tutor guides the five groups and meets with the class three times over the course of the day. Once for an hour in the morning to present the problem, then for a second hour at mid-day to facilitate the groups through any learning obstacles and then for two hours at the end of the teaching day to hear the students solutions to the problem, to seek clarification and elaboration and to question and challenge their conclusions. The three meetings are interspersed with two self-study periods. Classes rarely deviate from this structure.

## Method

### *Participants*

The study involved 268 tutors of PBL (47% female and 53% male) who were observed in their classrooms conducting a single, day-long lesson. The third-party observations were conducted by 136 staff (48% female and 52% male). These observers were colleagues, who had successfully undertaken a Certificate in PBL Facilitation and hence had been assessed by the institution as being a competent tutor of PBL. Data for the 268 tutors were also gathered from their 10854 students. The average number of student observations per tutor was 41.

### *Instruments*

The study used two instruments: the Tutor Evaluation Survey and the Lesson Observation Form. Each semester, after about ten weeks of teaching, students are asked to respond to the Tutor Evaluation Survey developed by Schmidt and Moust (1995). This questionnaire contains ten items that measure three separate constructs: (1) social congruence, (2) subject-matter expertise, and (3) cognitive congruence. Social congruence refers to how well a facilitator (as the tutor is called in the polytechnic) is socially aligned with the students – “The facilitator showed interest in our personal lives”. This implies that a socially congruent facilitator shows interest in the students’ lives, in what they are doing, what concerns them, and understands their problems and the difficulties they are going through. Subject-matter expertise refers to a facilitator’s knowledge about a professional domain - “The facilitator used his/her content knowledge to help us”. Cognitive congruence refers to how well a facilitator is able to present the problems and question the students in ways that are accessible to the students and which help them to engage in learning. This suggests that a cognitively congruent facilitator knows where potential obstacles are in learning, is able to ask the right questions and encourages or stimulates students to engage with the problem – “The facilitator asked questions we could understand”. Students were asked to respond to the items on a five-point Likert scale, from 1 = strongly disagree, to 5 = strongly agree. Information garnered from the questionnaire provides a measure of the quality of PBL teaching at the polytechnic and allows the institution to benchmark itself internationally against other institutions using PBL.

Schmidt and Moust (1995) demonstrated that students who have a tutor ranked high in cognitive congruence tend to engage more in learning, perform better, function more effectively in their teams, are more interested in the subject matter, and enjoy the module more, as compared to students who have a tutor judged low in cognitive congruence.

The Lesson Observation Form (LOF) was used by colleagues to rate the tutors’ performance in the PBL classroom. It has been developed by staff at the polytechnic to assist in

a peer-coaching programme. Based on a document that outlines the expectations of a PBL tutor at the institution, it lists observable behaviours that are expected to occur in a day-long PBL activity. In total, the form consists of 20 items about tutors' actions and includes for example, "Employs appropriate questioning techniques to generate discussion"; "Helps students to build on each other's ideas"; "Provides timely and appropriate feedback"; "Allows sufficient wait time for questions and answers". A confirmatory factor analysis was carried out to determine the construct validity of the LOF. All factor loading (i.e. standardized regression weights) were statistically significant at an average of .65. The model fit was also good: the Chi-square/df ratio for the LOF was 2.02,  $p < .00$ , RMSEA = .05 and CFI = .95. Overall, the results showed a good model fit indicating that the LOF is a valid instrument to determine appropriate behaviours in a PBL classroom. The reliability of the LOF was assessed using the coefficient H, which represents the degree of replicability of a construct based on its measured indicator variables. On average the value was found to be .80. Overall, the results of the study demonstrate that the LOF is a valid and reliable instrument that can be used to make observations about tutors in a PBL classroom.

### ***Procedure***

The LOF was used during the routine observation of staff at the polytechnic. These observations form part of a peer coaching process. The observations are conducted by experienced staff who have successfully negotiated a certification process to test their knowledge and skills of facilitating PBL. Each observation involves the observer spending four hours in class with the tutor who is conducting a PBL activity that covers a seven-hour learning day. The observer is therefore with the tutor for the three sessions that involve student-tutor contact time for that day. The data were collected electronically and stored in a central repository. The data was treated confidentially.

Each semester, after approximately 10 weeks of teaching, students complete the Tutor Evaluation Survey. This survey of students is compulsory, with only students who are on approved leave during the survey period being exempt, hence the response rate is consistently 90% and above. The data were collected electronically over a period of two-three weeks during the same semester as the tutor observations.

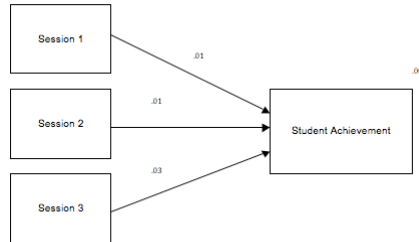
### **Analysis**

As a first step in the analysis, overall mean scores were calculated for each tutor, for each of the three sessions that constitute the PBL day, and for each of the three constructs: social congruence, expertise and cognitive congruence. A class level mean score was also calculated for the academic achievement of students in each of the classes taught by the 268 tutors. In order to determine whether student or peer observations of tutors are a better predictor of student achievement two path models were developed and tested. Path analysis was selected because of the multiple variables that can be observed. The first theoretical model tested the relationship between student academic achievement in PBL and third-party observations of tutors' behaviours during the three sessions of a daily PBL activity at the polytechnic. The assumption underlying this theoretical model is that a tutor's actions during the three contact sessions of the day whilst being different will all play an important part in a student's knowledge building and hence will be reflected in the student's academic achievement. The second path model tested the link between students' observations of tutors and students' academic achievements as describe by Schmidt and Moust (1995). This model hypothesized that tutors' levels of social congruence, expertise and cognitive congruence will impact on students' academic achievement. Three indicators were used to assess the goodness of fit, the Cmin/df, Comparative Fit Index (CFI) and the Root Means Square Error of Approximation (RMSEA). For the model to be considered a good fit, Cmin/df should be lower than 3 and nearer to 1 (Arbuckle, 2006), CFI values should be larger than 0.95, and RMSEA scores ought to be below 0.06 (Browne & Cudeck, 1993).

### **Results**

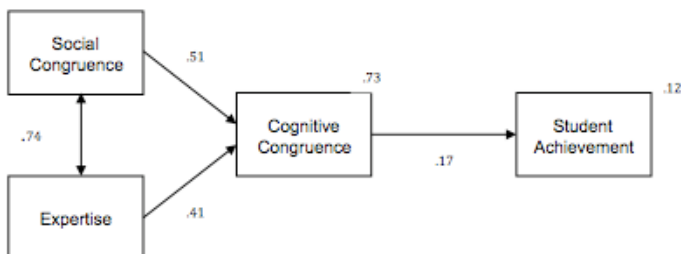
Diagram 1 shows the results of the path analysis for the peer observations of tutors and student achievement; there is almost no link between what peers see tutors do in the three daily PBL sessions and students' academic achievement (range from .01 to .03). Overall the tutors' behaviours in the three meetings account for none of the variation in students' academic achievement. The model fit was reasonable with CMIN/DF being 1.079, RMSEA being .488, and CFI being .999.

**Diagram 1: Path analysis of tutors' behaviours in the three PBL sessions (as measured by peers) and student achievement.**



Analysis from the second path model showed that students' observations of their tutors were linked more strongly to student academic achievement, although the relationship was not robust (.17). In addition, the facilitators' behaviours that were observed by the students' accounted for only .12 of the variance in academic achievement. The model fit was also reasonable with CMIN/DF being .993, CFI being 1.000 and RMSEA being .000

**Diagram 2: Path analysis of tutors' behaviours in PBL sessions (as measured by students) and student achievement**



## Discussion and conclusion

The study set out to do three things, i) measure the actions of tutors as reported by students, ii) compare these with third-party observations of tutors' classroom behaviours and iii) determine whether students' observations of tutors or peer observations are a better predictor of student achievement. The context of the study was a polytechnic that has introduced a PBL pedagogy that requires staff to teach in a particular way.

Data about tutors' behaviours were gathered for 268 tutors from two sources. In total 10854 students completed the Tutor Evaluation Survey, this amounted to an average of 41 student observations per tutor, and 136 experienced staff observed the 268 tutors. The findings from the study indicate that student observations of their tutors are a slightly better predictor of academic achievement than the observations of peers. Although to reiterate, in both cases the judgements fall short of providing a useful predictor of student academic achievement.

A number of points can be gleaned from these findings. The first is that although the ratings given by students may not predict academic achievement, they can be trusted to provide formative information about tutors in PBL classrooms as long as the ratings are part of a wide scale, mandatory survey, using a valid and reliable instrument. This was the case with the Tutor Evaluation Survey. Such a verdict is consistent with the conclusions reached by Cashin (1999) Marsh (2007) and Wilson (1999). A second point is that the use of a single observation of a peer is time consuming and may be less useful than the ratings made by students asked to judge the moves of their tutor. The differences are not simply explained by the disparity in numbers between students and third-party observers although of course the more judgments made the better the reliability of the information. Third-party observations are qualitatively different to those made by students. The former are judgements made by fellow professionals who are aware of what a PBL classroom should look like and are making judgements in the context of how things ought to be done, whereas students' ratings are expressions of a decision about what was actually done; they represent the lived experience of the student in the classroom. As such, a third point should be made. As an initiator of a conversation between peers, the results of third-party observations may be useful. The more experienced colleague can use the exercise to highlight to the newer tutor what they noted as gaps between actual classroom actions and the ideal behaviours that the tutor should strive towards. However, in cases where the outcomes of observations are used for summative rather than formative purposes then it is preferable that the information be gleaned from multiple students who can and will reflect what is happening in their classrooms.

The study has two limitations; both are common to studies of this type. The first concerns the measure of student academic achievement. The polytechnic's end of course assessment

was never intended to be used in an evaluation of tutors. Despite this limitation it was selected as an indicator of tutor effectiveness as it is a summative assessment of how well the student has performed over 15 weeks of study and is based on a set of criteria that is documented and used across the polytechnic. Internal tests have shown that it is both a reliable and valid measure of student learning and hence may be used as a proxy for effective teaching. The second limitation is related to the number of observations. Whereas the data for the student observations included rating of tutors where 15 or more of their students completed the observation form (on average there were 41 student observations of a single tutor), the third-party observations of the tutors were made by just one or two other tutors. A reading of the conclusions to the study should bare these limitations in mind.

In conclusion, the study shows that students are slightly better able to identify the dispositions of an effective tutor than peers. Hence given the cost and time required conducting third-party observations it might be more expedient for institutions to conduct large-scale surveys of students to determine the quality of teaching as opposed to depending upon the judgments of a single source of peers. However, whilst observations by students can be useful they should not of themselves be used to predict student academic achievement. It seems that there are many more variables that are involved in contributing to student outcomes, variables that were beyond the scope of this study.

## **Chapter 5: Are tutor behaviours in problem-based learning stable? A generalizability study of social congruence, expertise and cognitive congruence.**

### **Abstract**

The purpose of this study was to investigate the stability of three distinct tutor behaviours (1) use of subject-matter expertise, (2) social congruence and (3) cognitive congruence, in a problem-based learning (PBL) environment. The data comprised the input from 16, 047 different students to a survey of 762 tutors administered in three consecutive semesters. Over the three semesters each tutor taught two of the same course and one different course. A generalizability study was conducted to determine whether the tutor behaviours were generalizable across the three measurement occasions. The results indicate that three semesters are sufficient to make generalizations about all three tutor behaviours. In addition the results show that individual differences between tutors account for the greatest differences in levels of expertise, social congruence and cognitive congruence. The study concludes that tutor behaviours are fairly consistent in PBL and somewhat impervious to change. Implications of these findings for tutor training are discussed.

### **Introduction**

The role of the tutor in problem-based learning (PBL) is important (Hmelo-Silver, 2004; Albanese, 2004). Together with the quality of the problem, the learning resources, and the students' prior knowledge, what the tutor does in the classroom can determine the quality of the students' learning experiences, their levels of motivation to learn (Rotgans & Schmidt, 2011; Chung & Chow, 2004), the functioning of the small groups in which each student works (Dolmans & Wolfhagen, 2005; Azer, 2009), and the academic achievement of the student (Schmidt & Moust, 1995; De Grave, Dolmans & van der Vleuten, 1999; Finch, 1999). Much research has been conducted that has dissected the role of the tutor in PBL and described the characteristics and behaviours of those who are effective (as measured by students' academic achievement) as compared to those who are not. We know that tutors' subject-matter knowledge and their ability to facilitate the learning process are important factors in students' knowledge construction (Groves, Rego & O'Rourke, 2005; Hmelo-Silver & Barrows, 2006; Neville, 1999; Das, Mpofu, Hasan & Stewart, 2002;). What is unclear is whether the behaviour of tutors is stable, or whether, for example, it fluctuates depending on time and context.



From the literature into students' learning in PBL it seems that their actions are often situational. The student-centred nature of these classrooms provide students with choices about what learning goals and issues they should pursue, and how much and for how long they should study (Hmelo-Silver, 2004). Fluctuations in student behaviour are therefore common. Are tutor behaviours also subject to oscillation as they adapt and modify to changing groups of students and different course content, or is tutoring in fact a more steady, habitual act?

One study that looked at consistency in PBL tutor behaviours was conducted by Gijsselaers (1997), who measured staff performance in a medical school. He found that there were low levels of stability across successive courses, meaning that the same tutor may behave in different ways even when teaching the same course. Indeed, he concludes that it may take the facilitation of up to 14, six-week courses (all 14 course are different) before reliable conclusions can be drawn about how a tutor generally behaves in a PBL classroom. Gijsselaers (1997) speculated that the fluctuation in performance may be due to the open nature of PBL where the tutor is expected to modify behaviours as required - for example, in one course a group of students may need more direction from the tutor than another group in a different course. He recommends that when trying to understand tutor behaviours more attention should be paid to wider contextual factors such as group composition and the subject discipline. Dolmans, Wolffhagen & van der Vleuten (1996) also investigated the long-term stability of PBL tutor performance. The aim of the study was to determine how many occasions were required to rate tutor performance before the scores from the ratings can be considered as reliable. The researchers concluded that for decisions regarding tenure and promotion, data should be collected over at least two to four occasions.

Both the Gijsselaers (1997) and the Dolmans, et al. (1996) studies looked at overall or aggregated ratings of tutor performance. Teaching is a complex combination of many factors, for example, knowledge of the topics being studied, an understanding of the learning process, communicating with young people, appreciating the cultural and organisation constraints of the classroom. An overall rating makes it difficult to identify the level of competence of the tutor in each area and so will make it hard to ascertain how their performance in each factor is contributing to overall performance. The current study differs in that it investigates three specific theory-supported behaviours that describe how a tutor performs in an active learning environment. These behaviours have been identified by Schmidt and Moust (1995) and are known as (1) social congruence, (2) use of subject-matter expertise (from this point referred to simply as expertise), and (3) cognitive congruence. Social congruence is the term given to how

well a tutor is socially aligned with the students; whether they are interested in the students' lives, in what they are doing, what concerns them, and understands the difficulties they are going through - "The tutor showed interest in our personal lives". Expertise refers to a tutor's knowledge about a subject domain - "The tutor used his/her content knowledge to help us". Cognitive congruence measures how well a tutor is able to present the curriculum content in such a way that it is accessible enough to engage the students in learning - "The tutor asked questions we could understand".

Schmidt and Moust (1995) tested their theoretical model which linked subject-matter expertise, social congruence and cognitive congruence with the functioning of small student groups, time spent on individual study and student outcomes. The data fit the model well but unfortunately, they did not repeat their study to determine whether the three behaviours are stable across courses and across years.

Social congruence and cognitive congruence have been further examined in a study by Lockspeiser, O'Sullivan, Teherani & Muller, (2008). These researchers looked at the value of both behaviours in a medical programme that used near-peer tutoring (whereby second year medical students took on the role of tutor to first year students). They found that when there existed a social and cognitive congruence between the students and their near-peers powerful learning experiences occurred. Students in the study felt that the near-peer tutors could anticipate problems they may have in understanding concepts, and also the tutors were able to share strategies that could assist the students to overcome their learning obstacles. However, the study did not look at the development of these behaviours by the near-peer tutors over a number of courses.

This study is based on the work of Schmidt and Moust (1995) and seeks to determine the level of stability of expertise, social congruence and cognitive congruence across three semesters when tutors are 1) facilitating two different modules in the same academic year and 2) facilitating the same module but across the first semester of two successive academic years.

#### *Context of the study*

The study was conducted in a polytechnic in Singapore and involved 762 tutors delivering more than 130 different courses from a broad range of vocational diplomas including diplomas in Biomedical Sciences, Biomedical Electronics, Healthcare Administration, and Health Management and Promotion. Students must complete 30 courses in order to graduate, which in practice equates to five courses per semester for three years.

Each course lasts one 15-week semester and is comprised of 15 problems. The same 15 problems will be given to all students enrolled in the course. Each problem represents content

that the curriculum writers have determined cover the key concepts that need to be explored in the course. Each course is offered in either first or second semester each academic year. A diploma's curriculum is fairly stable from year to year with few changes to the problems across the semesters. Any major changes to the problem objectives must be approved through the polytechnic's quality review process. Hence it is highly likely that a problem delivered in one semester will be very much the same when it is delivered one year later. None of the courses in the study had gone through the systematic, formal, quality review process.

Tutors are employed to teach using PBL. Before entering the classroom they are required to attend a five day PBL orientation programme which is designed to familiarise them with the PBL structure used at the polytechnic as well as introduce them to the rationale behind the polytechnic's choice of pedagogy. Tutors are then expected to fulfil a further 90 hours of PBL training in their first 18 months of service. This training is usually in the form of workshops, to explore a broad range of topics related to their day-to-day work as a tutor. Tutors who do not fulfil this training requirement will be in breach of their contract, which may then not be renewed at the end of the two-year employment cycle. Tutors work with a class of twenty-five students who work in groups of five for a full seven-hour teaching day. On average they teach one or two courses per semester. Whilst the level of tutors' prior knowledge was not measured, tutors are hired because of their knowledge of the subject and experience in a related industry. It is likely that as graduates in the field of study they will be knowledgeable of the key concepts covered in their courses. In addition, prior to the delivery of each problem, tutors must attend a problem briefing that is conducted by the curriculum writers. In these briefings key concepts are discussed and likely student learning obstacles are identified. If tutors are unable to attend a briefing they are sent a facilitation sheet that outlines the main points covered in the briefings.

Every PBL tutorial follows a similar pattern regardless of the course, the tutor, or the grade of students. Each teaching day the tutor meets with the class of 25 students on three occasions interspersed with two student self-study periods. The structure of each of the three class meetings is similar across the courses and typically involve a meeting to define the problem, a meeting to share what has been learnt thus far and to discuss learning obstacles, and a meeting to present, elaborate and defend solutions to the problem. During each meeting the tutor is expected to take the role of a facilitator of student learning rather than an instructor or transmitter of information.

## Method

### *Participants*

The sample consisted of 762 tutors (54% female, 46% male, average age 35.7 years old) who had been evaluated by students on at least three consecutive occasions. This group of 762 tutors represents approximately two thirds of the total teaching staff at the polytechnic. As the evaluations are a mandatory part of the polytechnic's quality assurance process for tutors, all participants in the study were teaching at the time. All 762 tutors were evaluated for all three measurement occasions - there were no drop-outs. The PBL experience of the tutors ranged from three semesters to twelve semesters.

Data for the 762 tutors were based on the input of 16,047 different students. The student data set varied with each semester, as only those students who were being taught by one of the 762 tutor participants were included. There were 6,164 students (38.4%) who provided input to all three semesters. However, only 13 students (0.081%) happened to have evaluated the same tutor in all three semesters. The level of prior knowledge and experience held by each student in each course was likely to vary. However, every student undertook the same PBL learning process each day and was therefore familiar with teaching through facilitation rather than direct instruction.

### *Measures*

*Tutor Evaluation Survey.* The instrument used by the students to evaluate their tutors was based on the questionnaire developed by Schmidt and Moust (1995) with only minor modifications to suit the polytechnic used in the study, for example the word 'tutor' was replaced by 'facilitator' and the word 'course' was replaced by 'module' as these are the terms used in the polytechnic. The questionnaire (called the tutor evaluation questionnaire) contains ten items that measure the three separate constructs: (1) social congruence- four items, (2) expertise – two items, and (3) cognitive congruence – four items. The items included for example: "The facilitator showed interest in our personal lives", "The facilitator has a lot of content knowledge about this module" and "The facilitator asked questions we could understand". Students were asked to respond to the items on a five-point Likert scale, from 1 = strongly disagree, to 5 = strongly agree. The construct validity of the modified instrument was tested using confirmatory factor analysis and was found to be both valid and reliable. The coefficient  $H$  for social congruence was .74, for expertise .70 and for cognitive congruence .77, each falling within the cut-off value for coefficient  $H$  of .70.

**Procedure**

The tutor evaluation questionnaire was administered to students on three occasions; first semester, then second semester of the same academic year; and again during the first semester of the following academic year. Each time, the survey was conducted during week ten of a fifteen-week semester. It was administered online and was mandatory. Students could complete the survey at any time during the survey period; however, those who did not submit the survey by the submission date were denied access to the polytechnic's intra-net. Access was denied until they complied. Only students who were on extended medical leave or other endorsed leave were exempt. Hence the response rate by students was 93 per cent.

**Analysis**

As a first step in the analysis, students' ratings were averaged per tutor. Data were analysed at the tutor level. Generalizability studies were conducted to estimate the reliability of the students' judgments for social congruence, expertise and cognitive congruence. In addition to determining reliability such analysis indicates whether the tutor behaviours are generalizable across the three semesters. A generalizability study, which is based on analysis of variance, is able to recognise multiple sources of error in the data rather than a single source of error, for example, differences among the tutors and differences among the measurement occasions – the semesters. The tutors were used as the universe of generalization. The study included variance-component estimation of three sources: (1) differences between tutors, (2) differences between measurement occasions (semesters), and (3) tutor – occasion interaction and unidentified sources of error variance. The levels of generalizability are reported through a dependability coefficient. According to Brennan and Kane (1977) a dependability coefficient is similar to a reliability coefficient but involves absolute error variance. An acceptable coefficient is considered to be .80 or higher.

**Results**

The results of the generalizability studies are presented in Table 1. This table provides a summary of the sources of variability and the estimated variance components. The variance associated with tutors is 60.5% for social congruence, 50.0% for expertise and 56.1% for cognitive congruence. These percentages indicate that the instrument has identified large differences between tutors across the three semesters for all three behaviours, particularly social congruence. In contrast, the results showing the variance related to measurement occasions

(semesters) is much lower .1% for social congruence; .5% for expertise; and .1% for cognitive congruence, suggesting that the semester, and by extension the course taught in the semester, has virtually no impact on tutor behaviours. The variance associated with the interaction of tutor –occasion is higher at 39.4% for social congruence; 49.5% for expertise; and 43.8% for cognitive congruence. This interaction effect does show that there is some change in tutor behaviours from semester to semester but the change is small, particularly for expertise. In summary, the results reported in Table 1 suggest that changes in tutor behaviours are largely associated with the differences between tutors rather than differences between courses delivered in the three semesters.

Table 2 uses the estimated variance components to determine whether data collected over three semesters are sufficient to enable generalizations to be made about the three behaviours. The dependability coefficients after three semesters are .821 for social congruence, .750 for expertise and .793 for cognitive congruence. These results show that for all three behaviours, using three semesters of data provides just about an acceptable level of .80 to establish reliability and hence generalizations can be made. After four semesters all behaviours

## Discussion

The objective of the study was to investigate whether specific rather than overall tutor qualities are stable across three consecutive semesters. The three behaviours investigated were expertise, social congruence and cognitive congruence. Data for 762 tutors were gathered from students on three separate occasions and analysed in a generalizability study.

Overall, the results suggest that using data from a survey conducted on three successive occasions provides a reliable enough measure to make generalizations about the stability of tutor behaviours. Furthermore, the findings show that any differences in the three specific tutor behaviours are largely accounted for by differences between tutors rather than measurement occasions or even tutors-occasion interactions. In short, students rate their tutor in similar ways in terms of the tutor's use of expertise, social congruence and cognitive congruence regardless of the semester. Such a finding is both reassuring and rather disconcerting. It is encouraging to know that tutors' actions are not erratic and that similar performances can be observed across different courses and in different semesters. However, this result suggests that there is little development of the three behaviours over the three semesters – PBL tutors seem to be obdurate. can be predicted with even greater certainty.

**Table 1: Sources of variability and variance components for three tutor behaviours over three semesters.**

	Source of Variability	Sum Squared	Degs of Freedom	Mean Squared	Estimated Variance	% of Total Variance
Expertise	Difference between Tutors	113.70	761	0.1494	0.03745	50.0%
	Difference between Semesters	0.68	2	0.3408	0.00040	0.5%
	Tutor-Semester interaction and unidentified sources of variance in error	56.43	1522	0.0371	0.03708	49.5%
Social Congruence	Difference between Tutors	187.75	761	0.2467	0.06755	60.5%
	Difference between Semesters	0.22	2	0.1119	0.00009	0.1%
	Tutor-Semester interaction and unidentified sources of variance in error	67.07	1522	0.0441	0.04406	39.4%
Cognitive Congruence	Difference between Tutors	104.83	761	0.1377	0.03644	56.1%
	Difference between Semesters	0.16	2	0.0788	0.00007	0.1%
	Tutor-Semester interaction and unidentified sources of variance in error	43.27	1522	0.0284	0.02843	43.8%

**Table 2: Dependability coefficients and standard error measurements for three tutor behaviours**

No. of Occasions	Expertise Use		Social Congruence		Cognitive Congruence	
	Dependability Coefficient	Standard Error of Measurement	Dependability Coefficient	Standard Error of Measurement	Dependability Coefficient	Standard Error of Measurement
		nt		nt		nt
1	0.500	0.1936	0.605	0.2101	0.561	0.1688
2	0.666	0.1369	0.754	0.1486	0.719	0.1194
3	0.750	0.1118	0.821	0.1213	0.793	0.0975
4	0.800	0.0968	0.860	0.1051	0.836	0.0844
5	0.833	0.0866	0.884	0.0940	0.865	0.0755
6	0.857	0.0790	0.902	0.0858	0.885	0.0689
7	0.875	0.0732	0.915	0.0794	0.900	0.0638
8	0.889	0.0684	0.924	0.0743	0.911	0.0597

The results of this study contradict the findings of Gijsselaers, (1997) who concluded that tutors' behaviours were not stable over time. He suggested that the reason could lie in the nature of PBL which require tutors' to respond in a variety of ways depending upon students' needs at particular points in their learning. However, his explanation rests on tutors being skilled enough to adapt to these dynamic classrooms. In contrast, the results of this study shows that not all tutors are so adept at PBL and that on the whole tutors' behaviours are quite resilient to change.

The findings from this research are more in keeping with Dolmans, et al. (1996), in that data gathered over a few courses are sufficient to make generalisations about PBL tutors' behaviours. Dolmans, et al, (1996), reported that if scores across all the items in their questionnaire are aggregated for each tutor then four measurement occasions yield reliable results, if a single overall judgement of each tutor's performance is used then reliability can be established after just two measurement occasions. This study examining specific PBL behaviours concurs with such a timeframe. Generalizations about social congruence can be made after three measurement occasions. Generalizations about expertise and cognitive congruence can also be made after three measurement occasions, although the dependability



coefficients are just short of the .80 target being .750 for expertise and .793 for cognitive congruence.

Turning to each of the behaviours, it is clear that although the results for all three behaviours are generally similar, differences in expertise are accounted for by both differences in tutors and differences in tutor-occasion interaction (tutors' ratings vary slightly when teaching different courses), whereas the results for social congruence and cognitive congruence show that the variance of tutor-occasion interaction is not so high.

The finding that tutors' expertise varies across semesters and hence across courses is somewhat surprising given that tutors are hired for their subject knowledge, and are provided with teaching resources prior to entering the classroom. These practices were designed to ensure that all tutors have the requisite content knowledge to facilitate the curriculum as intended, and hence it was speculated that there would be consistency in their level of expertise across the three semesters. Tutors are rarely asked to facilitate courses that are outside of their subject domain, hence it is likely that the issue is not so much the amount of subject knowledge a tutor possesses but, their skill in determining how and when they apply that knowledge in the classroom. In PBL, a tutor's use of expertise is linked to their students' prior knowledge of a problem. When students lack knowledge concerning a subject it is incumbent upon the tutor to intervene, this may require the tutor sharing expert knowledge about a topic. Neville's (1999) reiterates this point in his review of the role of the tutor in PBL. It could be that the tutors in this current study possess sufficient content knowledge but are not adroit at deciding when it is appropriate to share this knowledge with their students. A teacher development model used by Hativa (2000) could help tutors to make competent choices about their use of expertise. Hativa (2000) describes a very intense personalised programme where teachers watch videotapes of their classes, write summaries of what they learned about their teaching from the tapes, and then meet in one-on-one discussions with an experienced teacher to talk about strategies that could be employed to improve pedagogical knowledge and skills in the classroom. A less intense observation and mentoring programme could be adopted for those tutors identified with low levels of expertise as a way of starting a dialogue between new tutors and experienced staff on how to improve the application of expertise in the PBL classroom. Indeed, many institutions already have mentoring programmes; it may just be a matter of targeting the dialogue between those involved and directing conversations towards the identification and resolution of difficulties in using expertise appropriately.

The finding that variance in social congruence is explained by differences between tutors rather than by differences in occasions or differences in tutor-occasion interaction suggests that some tutors rate consistently highly in this behaviour while others continue to perform poorly. Is social congruence then an innate quality rather than a behaviour that can be developed? As a pedagogy, PBL places emphasis on tutors being student-centred in their focus. Relationships in the PBL classroom are important, with the tutor being required to engage students in the problem, generate discussion, empathise with the way learners think and to resist any temptation to take over the learning process. Such behaviour may in fact require a particular set of beliefs about learners that is at odds with some of the tutors in the study. A study by Chai, Teo & Lee (2010) into the beliefs held by Singaporean teachers about learners proves illuminating. Using structural equation modelling they discovered that teachers who believe that successful learners possess an innate ability tended to also believe in traditional teaching approaches while those holding the view that learning requires a process involving effort were more likely to favour constructivist teaching. Changing teachers' beliefs about learners is considered to be a difficult process (Richardson, 2003) hence to expect to see all tutors in the study interact with students in socially congruent ways in just three semesters may be unreasonable. Bowman and Hughes (2005) recognise the importance of the emotional relationship between tutors and students in PBL and provide ideas on how this relationship can be improved. They suggest that tutors agree on the roles and boundaries of tutoring; that more experienced tutors meet with new staff to discuss how to handle groups and individual students; they also propose that tutors get involved in social activities with students. Tutors may also benefit from information about the classes they are taking so that they can consider particular needs that the groups may have beyond curriculum needs. Tutor development programmes might need to look beyond the structure of a PBL course and the dos and don'ts of facilitation. Programmes may benefit from a focus on tutors' beliefs about learners, the psychological and emotional aspects of learning and communicating with adolescent learners.

Differences between tutors, and to a lesser extent differences between tutor-occasion interactions, account for the variance in levels of cognitive congruence, with semesters playing almost no role. It seems that while tutors may make some modifications to their behaviour towards students in different courses and in different semesters, by and large, their skills in asking comprehensive questions and being aware of students difficulties when grappling with content seem to be very much consistent. Communities of Practice (COP) may provide a vehicle for tutors to transition towards PBL and to improve the kinds of complex facilitation skills

described through cognitive congruence. Spronken-Smith & Harland (2009) studied a group of Geography lecturers as they set up a COP to help them move from teaching using traditional methods to adopting PBL. They found that while COPs helped tutors to understand PBL; its aims and its practices, working in groups was problematic for some and marred their development. Hence if COPs are to be used as part of a tutor development programme the dynamics and rules of the group need to be considered prior to its establishment.

The study shows that development as a PBL tutor does not come quickly for some. An implication from the study is that the initial five day training programme and 90 hours of on-going tutor development may not be adequate to ensure a shift in the three core PBL behaviours for all staff. It could be that tutors whose views on teaching and learning make it difficult for them to adapt to PBL require programmes that examine their belief systems and challenge their ways of thinking. An example of an alternative approach to the typical workshop-based tutor development programmes is described in a study of 282 pre-service teachers by Askell-Williams, Murray-Harvey & Lawson (2007). These new teachers were enrolled in an education course that was facilitated using PBL. The results were extremely positive with the teachers reporting that their experience of PBL lead to changes in their mental models about teaching subject content, motivating learning, and connecting theory with practice. Their study however, relied on tutor self reports and did not include practicing tutors hence further evaluations of the effective use of PBL in tutor development would be useful.

This study has a number of limitations; the first is related to the model of PBL adopted at the polytechnic. The tutors in this study are required to facilitate classes that consist of five groups of five students that is different to other PBL classrooms where tutors work with a single, larger group and where the tutor may take on a role that resembles that of a group member. It is difficult to ascertain whether in this study the same tutoring skills are required, and whether tutors engage with students in similar ways, using the same three behaviours as they might in a more typical PBL setting. A second limitation is also connected to the model of PBL that forms the context of the study. Each tutor is being examined by a large number of students at each measurement occasion. It might be that the number of measurement points needed for an acceptable level of reliability may be fewer than when smaller groups of students evaluate the teacher on each occasion. It may also be that having the same students rate the teacher over time decreases the number of instances needed to reach a reliable estimate of performance. Thirdly, the data analysis did not differentiate tutors by the department to which they belong; hence differences across faculties cannot be identified. In addition, the study did not take into

account years of experience with PBL. It could be that tutors who had been facilitating for many semesters prior to the data collection perform differently to those who have facilitated for just the three semesters covered by the study. Further longitudinal studies that take into account tutor characteristics such as experience, age, qualifications and levels of expertise may yield additional insights to the findings of the study.

In summary, despite PBL being an open and dynamic learning environment, tutors tend to behave in ways that are consistent regardless of the course or the different cohorts of students they are teaching. As such the implications from the study are primarily for tutor development. If, as it seems, PBL behaviours act like personal attributes that are consistent and resilient to change then tutor development programmes need to shift their focus. Emphasis may need to be placed on examining beliefs about teaching and learning, understanding adolescence, and building pedagogical content knowledge rather than focusing on the actions required to carryout PBL tutoring sessions. Those responsible for tutor development programmes may also want to consider conducting them using PBL.

## **Conclusion**

In conclusion, the study provides evidence that the tutor evaluation questionnaire if administered over at least three consecutive occasions will yield results that can be used to make generalizations about tutors' performance. The study also indicates that a tutor's performance in PBL is consistent. The differences in behaviours are overwhelmingly a result of differences between tutors rather than differences between measurement occasions or even differences between tutor-occasion interactions. Speculation about the possession of innate abilities to facilitate PBL is raised as well as the possibility that tutor development programmes may need to be modified to address the underlying beliefs of tutors for whom the facilitation of PBL is not instinctive. Finally, further studies that look at the antecedents of expertise, social congruence and cognitive congruence would be useful to ascertain whether factors exist that may result in some staff being "natural" tutors or whether such an idea is pure conjecture.

## **Chapter 6: Factors affecting PBL tutor behaviours: The antecedents to expertise, social congruence and cognitive congruence.**

### **Abstract**

The purpose of this study was to identify antecedents that may affect a tutor's behaviour in problem-based learning (PBL). Three distinct tutor behaviours (1) usage of subject-matter expertise, (2) social congruence, and (3) cognitive congruence have been identified as significant in terms of effectively facilitating student learning, but the influence of gender, age, teaching experience, level of qualification, relevance of qualification to course taught, possession of an educational qualifications, and study overseas, upon these behaviours have yet to be measured. Data were gathered from 376 tutors who are using PBL to facilitate courses in a polytechnic. The key findings of the study suggest that 1) the level and relevance of a qualification does not impact on the three behaviours, 2) there are no differences in tutors' behaviours based on gender, 3) age only seems to make a difference to a tutor's level of expertise, 4) the possession of an education qualification and a tutor's years of experience makes some difference to their level of cognitive congruence but not social congruence or expertise, and 5) having experience of an overseas education makes a small difference to the ratings for all three behaviours. These findings suggest that tutors' behaviours in PBL may be related to factors other than their personal attributes.

### **Introduction**

A problem-based learning (PBL) classroom is driven by the students' learning issues, needs and prior knowledge and is therefore a diverse and dynamic environment. The tutor behaviours and characteristics that have shown to be important in such a setting include not only knowledge of the subject but also the ability to facilitate a learning process that includes individual work and small group collaboration (Hmelo-Silver & Barrows, 2006; Barrows & Tamblyn, 1980; Neville, 1999; De Grave, Dolmans, van der Vlieten, 1999; Minor, Onwuegbuzie, Witcher & James, 2002). A study by Schmidt and Moust (1995) tested three key behaviours of PBL tutors: use of subject –matter expertise, social congruence and cognitive congruence. Using structural equation modelling they showed that tutors who demonstrated these qualities had a positive impact on student academic achievement. However, there has been no study that has investigated why some tutors score more highly than others in each of these behaviours.

The aim of this study is to identify the antecedents to these three behaviours in an attempt to understand more fully the profile of effective tutors.

According to Schmidt and Moust (1995), a socially congruent tutor refers to how well the tutor is socially aligned with the students; whether they are interested in the students' lives, in what they are doing, what concerns them, and understands the difficulties they are going through – "The facilitator showed interest in our personal lives". Use of subject-matter expertise (hereafter known as expertise) refers to a tutor's knowledge about a subject domain and their ability to use this knowledge to the benefit of student learning - "The facilitator used his/her content knowledge to help us". Cognitive congruence is a term that describes a tutor who knows where potential obstacles are in learning, is able to ask the right questions and encourages or stimulates students to engage with the problem – "The facilitator asked questions we could understand". Schmidt and Moust (1995) proposed a model that linked these tutor behaviours with the PBL learning process and student academic achievement. When they tested their model they found that tutors' levels of social congruence, expertise and cognitive congruence impact the way in which small groups function, in turn influencing how much time students spend on self study and subsequently influencing students' academic achievement. What Schmidt and Moust did not do was examine whether there are any antecedents that impact on expertise, social congruence and cognitive congruence.

In considering potential antecedents a number of questions were raised and propositions considered. For example, PBL requires tutors who are constantly alert to students' needs, aware of group dynamics, and capable of making split second decisions about when to step in and when to hold back their interventions (Haith-Cooper, 2003). It seems reasonable to expect that tutors who have an education qualification manage this student-centred environment better than their colleagues who do not possess such a qualification. The assumption being, that teacher training prepares tutors to understand students' thinking, provides them with sound questioning skills (Darling-Hammond, 2000) and helps them develop sufficient pedagogical content knowledge to ensure the cognitive congruence needed for PBL. In addition to the possession of an education qualification it seems likely tutors with higher qualifications in a related subject area would be rated more highly in terms of their expertise than those with lower level qualifications. More expert tutors should be able to recognise gaps in students' knowledge, identify confusion and misunderstanding in students' explanations and then use their expertise to respond in ways that facilitate student learning. Likewise, knowing that it takes time to develop as PBL facilitators (Dolmans, Wolfhagen & van der Vleuten, 1996; Gijsselaers, 1997) it is likely

that tutors with more experience with this form of pedagogy would be rated more highly than novices across all three behaviours.

The possession of an education qualification, the level of a qualification, and the experience of PBL are all external factors that could quite plausibly impact on the levels of tutors behaviour but what of innate tutor characteristics like age and gender? PBL requires students to study independently of the tutor, either as individuals or in small groups, as such the use of technology and social networking have become important tools in students' learning (English & Duncan-Howell, 2008). In which case would younger tutors who have been brought up using these learning tools be better equipped in helping students to maximise their use in PBL than older tutors? In addition, younger tutors because they are not so very different in age to their students may be more linguistically aligned with them and more aware of issues relating to adolescence. It was therefore speculated that younger tutors would be rated higher, especially in social congruence, than their older colleagues. What of gender? Is it the case that the empathy and patience necessary in the PBL classroom and the discipline and trust that requires tutors to hold back their own views and knowledge are more predominant in males or female or does gender make no difference at all?

Pondering the nature of the PBL classroom led to the identification of six variables as potential antecedents of tutor behaviour, 1) age, 2) gender, 3) years of teaching experience, 4) level of qualification, 5) relevance of qualification to course taught and 6) possession of a qualification in education. A further variable 7) overseas education experience was also added as a way of testing an anecdotal view prevalent in the institution under study, that those tutors whose educational experience included study through an overseas education institution are better equipped to use PBL than those who did not have this diversity of experience. In this study 43% of the tutors had experience of studying with an overseas university.

The literature that examines these variables in conventional education settings suggests that the evidence of their impact on the effectiveness of teachers (as measured by student academic achievement) is somewhat inconclusive (Wayne & Youngs, 2003; Goe, 2007). There is some agreement that years of experience matter particularly in the first five years of teaching (Rice, 2003; Harbison & Hanushek, 1992) after which time the achievements of students in classes with more experienced teachers starts to level off. The knowledge a teacher possesses about a subject (as measured by their level of qualification in the field) seems to be a factor in student achievement, although by no means a significant factor in all subjects (Betts, Zau & Rice, 2003). Indeed, it seems it is only in mathematics that there is conclusive evidence that a

higher qualification in mathematics leads to better student outcomes (Goldhaber & Brewer, 1999a). There is debate in the literature around the importance of the possession of a qualification in education (in the form of teacher certification or teaching license) on students' achievement. Darling-Hammond (2000) concludes that teachers who have undertaken a teaching qualification are more prepared for the classroom and have a better understanding of students' learning than those that do not possess such a qualification. Yet, another study on this issue has found that the impact of teaching qualification on student outcomes is inconclusive (Boyd, Goldhaber, Lankford & Wyckoff, 2007). Some types of certification may be more important than others for example, certification seems to be significant in the teaching of mathematics (Goldhaber & Brewer, 1999b). Finally, the age and the gender of a teacher are rarely measured as isolated variables in the performance of teachers. Where they have been investigated along with other personal characteristics such as race, they have shown to have little impact on the effectiveness of a teacher (Ehrenberg, Goldhaber & Brewer, 1995; Holmlund & Sund, 2008). However, the PBL environment is somewhat different to conventional classrooms, most notably in the relationships between tutor and student. PBL tutors facilitate a learning process rather than direct teaching; therefore the qualities of PBL tutor may of necessity be different to those of a conventional teacher in terms of social congruence, expertise and cognitive congruence.

In turning to the literature in PBL there are a number of studies that have examined and explored in detail the profiles of effective tutors (Neville, 1999; Maudsley, 1999). However, much of the work is focused on what tutors do rather than their personal characteristics and experiences. For example, De Grave et al. (1998 and 1999) provide useful insights into the facilitation strategies of effective tutors and present a valid instrument to measure these strategies but do not explore the prerequisites that lead to some tutors being better at elaboration, for example, than others. Indeed little seems to be known about the antecedents that lead to some tutors being more effective than others despite using similar PBL facilitation strategies.

One area of tutor behaviour that has been extensively examined is that of the role of expertise in tutor performance especially in the area of medical education. The findings of this body of research have been somewhat contradictory as the review by Dolmans et al. (2002) clearly documents, with many studies concluding that the extent and nature of the subject knowledge possessed by the tutor is critical for their performance in the classroom and consequently for their students' academic achievement (Davis, Nairn, Paine, Anderson & Oh, 1992; Hay & Katsikitis, 2001) and others contradicting this conclusion stating that a good tutor



needs to be able to facilitate the learning process rather than be a subject expert (Barrows, 1988). Gilkison (2003) states that much of the inconsistency in the findings is a result of differences in definitions of expertise and the variety of PBL learning environments that form the context of the studies. Despite these difficulties there now seems to be general agreement that expertise does play a role in student learning particularly when students are “learning the ropes” in PBL (Boon, Moust, van der Arend, Kokx & Schmidt, 1993) but that an over dependence on it can have a negative effect as the tutor may start to dominate the students’ learning (Kaufman & Holmes, 1998; Silver & Wilkerson, 1991).

Related to the issue of tutor expertise is the work of Matthews, et al., (2002) who looked at the relationship between student examination results and tutors’ level of qualification. A comparison was made between three groups of tutors in medical courses; peer tutors (fourth year students), junior staff (post graduate students) and senior staff (completed postgraduate courses). Their results show that students did better in their examinations when tutored by senior staff and that students who were tutored by their peers spent less time in weekly preparation for their course. In an additional analysis, Matthews, et al., (2002) also looked at the relationship between tutors who had at least one semester experience of PBL and those who had no previous experience. They found that tutors with experience, as compared to their non-experienced colleagues were rated significantly higher by students in a tutor evaluation survey but were found to be no different in terms of their students’ examination results. It seems then that tutors who have knowledge of their subject and have some experience are likely to better facilitate PBL than those who do not possess these attributes.

In summary, the literature on antecedents to the behaviours of PBL tutors is limited with the exception of tutor expertise. The consensus being that expertise has an impact on the quality of student learning. Studies on other factors have to be drawn from conventional educational settings and are largely inconclusive.

### **Context of the study**

The study was conducted in a polytechnic in Singapore and involved 376 tutors delivering a broad range of courses for a variety of vocational diplomas including Biomedical Sciences, Biomedical Electronics, and Healthcare. Each course lasts one 15-week semester and is comprised of 15 problems that explore key ideas and concepts in the subject as determined by the curriculum writers. The same 15 problems will be given to all students enrolled in the course.

All tutors are employed to teach using PBL. Before entering the classroom they must attend a five day PBL orientation programme which is designed to familiarise them with the PBL structure used at the polytechnic as well as introduce them to the rationale behind the polytechnic's choice of pedagogy. Tutors work with a class of twenty-five students who collaborate in groups of five for a day that is typically seven hours long. Every PBL tutorial follows a similar pattern regardless of the course, the tutor, or the grade of students. Every teaching day the tutors meet with their class on three occasions interspersed with two student self-study periods. The structure of each of the three class meetings is similar across the courses and usually involve a meeting to define the problem, a meeting to share what has been learnt thus far and to discuss learning obstacles, and a meeting to present, elaborate and defend solutions to the problem. During each meeting the tutor is expected to take the role of a facilitator of student learning rather than an instructor or transmitter of information

## **Method**

### ***Participants***

The sample consisted of 376 tutors (44% female, 54% male; average age 35.5 years, *sd* 6.16) who had facilitated a PBL class for at least one semester. The data comprised 12,108 student responses to a Tutor Evaluation Survey. On average, 32 (*sd* 2.82) students responded to each tutor.

### ***Measures***

*Tutor Evaluation Survey.* The instrument used by the students to evaluate their tutors was based on a questionnaire developed by Schmidt and Moust (1995) with only minor modifications to suit the polytechnic used in the study, for example, the word 'tutor' was replaced by 'facilitator' as this is the term used for tutors at the polytechnic. The questionnaire contains ten items that measure three separate constructs: (1) social congruence- four items, (2) expertise – two items, and (3) cognitive congruence – four items. The items included for example: "The facilitator showed interest in our personal lives", "The facilitator used his/her content knowledge to help us" and "The facilitator asked questions we could understand". Students were asked to respond to the items on a five-point Likert scale, from 1 = strongly disagree, to 5 = strongly agree. The construct validity of the modified instrument was tested using confirmatory factor analysis and was found to be both valid and reliable. The coefficient *H* for social congruence was .74, for expertise .70 and for cognitive congruence .77, each falling within the cut-off value for coefficient *H* of .70.

**Procedure**

The tutor evaluation survey was administered to students during week 10 of a fifteen-week course. It was administered online and was mandatory. Students could complete the survey at any time during the survey period. Those who did not submit the survey by the submission date were denied access to the polytechnic's intra-net until they compiled. Only students who were on extended medical leave or other approved leave were exempt. Not surprisingly the response rate by students was high at 92 per cent.

Information about the seven antecedents - tutors' gender, age, highest level of qualification, relevance of their qualifications to the course they taught, university that awarded their qualification (whether local or overseas); possession of a qualification in education, and number of semesters experience of PBL - were all gathered from the institution's staff database.

**Analysis**

For the analysis, each of the three interval variables (age, years of PBL experience and highest level of qualification) were categorised into three sub-groups. For age, tutors were grouped into '1' 30 years or under, '2' 31 to 39 years old, and '3' forty years and older. The three sub-groups for years of PBL experience were '1' three years and under, '2' four and five years, and '3' more than five years of PBL experience. Tutors were also categorised according to the highest level of qualification that they possess; '1' undergraduate degree, '2' post-graduate certificate or diploma and master's degree, and '3' Doctor of Philosophy (Ph.D). The remaining four variables had two categories each: male or female; possession of an educational qualification or not; experience of an overseas education or not; possession of a qualification relevant to the module taught or not. In addition to the analysis for each of the tutor behaviours, an analysis of an overall score was performed which is based on the aggregated score for all three behaviours. Once the categorisation had occurred differences between the sub-groups for each variable and the three tutor behaviours were calculated using one-way analysis of variance (ANOVA).

## Results

The results of the ANOVAs are presented in Table 1. The table provides the  $f$  and the  $p$  values for each ANOVA. The results show that the gender of a tutor makes no difference to the ratings for all three behaviours, nor their overall behaviour. Female tutors are no different in terms of their expertise, social congruence and cognitive congruence than their male counterparts. The same can be said for both the level of qualification the tutor possesses and the relevance of the qualification. In other words, tutors possessing a Ph.D or a master's degree are ranked no higher or lower than those with a bachelor's degree and likewise those tutors with qualifications in areas that are directly related to the course they are facilitating are rated no higher or lower than those whose qualifications are not directly related to the course. These results are the same across the three behaviours and their overall behaviour.

**Table 1: Results of the analysis of variance for the three tutor behaviours and the seven potential antecedents**

Tutor behaviours	Years of experience		Level of qual		Age		Possession of an education qual		Sex		Experience of overseas education		Relevance of qual	
	$f$	$p$	$f$	$p$	$f$	$p$	$f$	$p$	$f$	$p$	$f$	$p$	$f$	$p$
Expertise	.618	.539	.653	.521	3.437	.033	1.556	.213	.239	.625	13.68	.000	.103	.749
Social Congruence	2.296	.102	.344	.709	.207	.813	2.233	.136	.200	.655	4.713	.031	.004	.947
Cognitive Congruence	3.863	.022	.030	.971	.286	.751	7.618	.006	.062	.803	6.244	.013	.690	.407
Overall Behaviour	2.318	.100	.264	.768	.994	.371	4.287	.039	.006	.936	10.53	.001	.194	.660

Quite small differences can be observed between tutors for some of the behaviours and a number of the variables, namely, a tutor's years of experience has a small impact on their level of cognitive congruence, with more experienced tutors scoring higher than tutors with less experience. Older tutors appear to score more highly than younger colleagues for expertise and tutors who possess a qualification in education are rated higher for their cognitive congruence than those who do not. However, none of these differences should be over-stated as they are

minimal. There does seem to be some clearer differences between the rating of tutors who have had some experience of education outside of Singapore and those who have not, especially for expertise, cognitive congruence and overall behaviour.

### **Discussion and conclusions**

The objective of the study was to investigate the potential antecedents of three tutor qualities: expertise, social congruence and cognitive congruence. Previous studies conducted in conventional classrooms had identified six variables for further examination; gender, age, experience, highest qualification, relevance of qualifications to courses taught and the possession of an education qualification. The study also sought to explore whether overseas educational experience made a difference to ratings. This last variable was added because of the view amongst many within the polytechnic that tutors whose educational experience included studying with an overseas university may be more comfortable using PBL than those whose experience was limited to Singapore. Data were collected from 376 tutors and analysed using ANOVAs.

The results of this study are as notable for what they did not find as they are for what they did. Perhaps the most surprising findings are related to the qualifications that tutors possess, both in terms of their level and their relevance. Intuitively tutors who have gained qualifications over and above an undergraduate degree would be expected to be rated higher, for at least their expertise, than those without post-graduate qualifications. This study found no differences. Equally it does not seem to matter if a tutor does not possess a qualification that is directly related to the course the tutor is facilitating, for example, a tutor with a Ph.D. in Pharmaceuticals and facilitating a course in pharmacology and toxicology rates no differently to a tutor with an honours degree in Estates Management facilitating a course in cognitive processes; no differences are seen in expertise, social congruence or cognitive congruence. Such a finding adds to the literature that states that the evidence of the role of tutor expertise in PBL is inconclusive (Dolmans et al. 2002). A possible explanation for the finding could lie in the nature of the expert knowledge that the tutors possess. The polytechnic offers diploma level courses that are considered to be more vocational than academic. It may be that the knowledge tutors require in these classroom is rooted in industry and possibly more “hands-on” than the subject-matter generally mastered by tutors through higher academic qualifications. However, before conclusions can be drawn it would be useful to test this hypothesis by conducting a study of the nature of the knowledge explored in the polytechnic’s classrooms.

Equally surprising is the finding that tutors who possess an education qualification did not stand out overall from those who do not. This is in contrast to the work of Cavalluzzo, (2004) and Darling-Hammond (2000) who both found that teacher certification and teacher qualifications were important factors when measuring effective teacher performance. It is only when we look at cognitive congruence do we see that tutors who have had some credential in education score higher than those with no such certification. It could be that such a qualification gives these tutors some understanding of how students learn, and the development of teaching skills and strategies that help students as they acquire knowledge through PBL. In short, these tutors may be slightly more 'teacher prepared' than those without an education qualification. Why tutors with education qualifications are not seen to be significantly different to tutors without this qualification is an interesting question to ponder. It could be that the knowledge and skills acquired through an education qualification are not directly relevant to the facilitation of PBL. Again the finding should not be over-stated as the differences are small and until a closer examination is made of the education course that the tutors undertook, the explanations for the lack of difference between these tutors is purely speculative.

What is not surprising is the finding that the gender of a PBL tutor has little impact on their performance. Female tutors perform no differently to male tutors. This is very much in keeping with the study in conventional education by Ehrenberg, et al., (1995).

The literature that looks at the relationship between a PBL tutor performance and age is scarce, however, the study conducted by Ehrenberg et al., (1995) in non-PBL classrooms found limited evidence that the age of the teacher was a factor when determining their effectiveness. Hence the findings of this paper are similar. Age appears to have little impact on the behaviours of social congruence and cognitive congruence but there is a small difference in terms of a tutor's level of expertise. Older tutors seem to be a little more expert than younger tutors. It is difficult to explain this finding as simply a factor of older tutors being more likely to have higher level qualifications because even if this were the case this study suggests that the possession of a higher level, relevant qualification has no impact on any of the tutor behaviours, including expertise.

The findings relating to tutors' PBL experience are also somewhat unexpected and at odds with the literature that shows that years of teaching experience matter (Rice, 2003; Harbison & Hanushek, 1992). This current study shows that overall there is really no difference between tutors no matter how many years experience they have of facilitating PBL. In relation to cognitive congruence a case could be made that there are some small differences, with more

experienced tutors scoring higher than newer tutors but the difference is small. Whilst this finding on the surface appears surprising it is actually in keeping with literature on teacher development that shows that teachers are often resistant to imposed changes to education (Duffy and Roehler; 1986; Fullan, 1991; Datnow and Castellano, 2000; Richardson, 1990). It could be that in this study some tutors are equally slow to change.

The only variable that showed reasonable differences between tutors was experience of an overseas education, as such, this finding supports the anecdotal view at the polytechnic that tutors who have this experience are more comfortable with PBL than those who do not. The findings suggest that the differences exist across all three behaviours and for overall behaviour. A possible explanation for this finding could be that tutors who have experienced being a student in an unfamiliar education system (43% of tutors in the study) develop skills in empathy; they are forced to develop coping or problem solving strategies and must enhance their abilities to communicate. All these 'soft' skills may help this group of tutors understand how students new to PBL feel and may also help them see the relevance and value of encouraging students to develop learning and resilience skills that will help the students cope in any new situation. However, these explanations are speculative and further examination is needed to gain a better understanding of the differences between these two groups of tutors.

The study has two key limitations. The inter-relatedness of the seven variables has not been explored; therefore, it is unclear whether a particular combination of antecedents has an impact on one or more of the three tutor behaviours. In addition, the study takes a narrow definition of qualifications – limiting the term to the possession of credentials. A further study may benefit from exploring the previous work experience of tutors to determine whether it plays a significant role in tutor behaviours.

In conclusion, the study suggests that the proposed antecedents do not account for the differences in the scores of tutors' expertise, social congruence and cognitive congruence in PBL. A tutor's gender, level of qualification and the possession of a relevant qualification, plays no role at all. Older tutors are seen to be slightly more expert than younger colleagues, and in terms of cognitive congruence, the possession of an education qualification and experience of PBL accounts for some difference but not a great deal. Tutors who have some experience of study with an overseas institution may be more comfortable with using an unfamiliar pedagogy. In short, it appears that what a tutor brings into the classroom accounts for very little in determining how effective they are in facilitating PBL. Differences in performance should

perhaps be sought in the dynamics that occur in the tutor-student relationship and the learning processes that are such an important part of PBL.



## Chapter 7: Summary and conclusions

The tutor in PBL has long been regarded as a significant factor when measuring the success of this approach to learning (Rowan, McCourt, Bick, & Beake, 2007). As such, research on tutors has been extensive and can be organised into work that has tried to identify the characteristics and profiles of effective tutors; their strategies, approaches and styles of teaching, and another body of work that has looked at the impact tutors have on student outcomes in terms of academic achievement, the learning process and students' level of satisfaction with PBL. The findings from this canon have been varied, contradictory and often inconclusive; answers to some of the key questions at the heart of the literature remain elusive. For example, it is still unclear what shapes the views of PBL tutors, whether their philosophical beliefs determine their teaching practices even when their intentions are to adopt PBL, whether it is possible for tutors, whose beliefs and actions are not aligned with this pedagogy, to adapt over time, and the degree to which they are resilient to change.

Finding answers to these questions formed the basis of this thesis. They are important questions to ask because as the literature shows teachers' beliefs about teaching and learning affect the approaches they adopt in the classroom, which in turn can have an impact on how students learn (Trigwell, Prosser, & Taylor, 1994; Fang, 1996). If a tutor's view do not align with the constructive theory that underpins PBL, then it is unlikely that they will apply strategies that are conducive to learning in a student-centred, self-directed classroom, instead preferring to implement practices that they believe are more suitable, including possibly direct instruction. If this is the case then it is impossible to be confident that tutors are actually practicing PBL as intended and hence makes it very difficult to accurately measure the effectiveness of this approach to teaching.

All five studies reported in this thesis were conducted at Republic Polytechnic in Singapore. The purpose of a polytechnic in the city-state is to develop well-skilled young people (predominantly aged 16-20) through a three-year diploma programme, so that they are equipped to take up middle-level professional positions. In order to prepare students for these positions, Republic Polytechnic had chosen to adopt a particular brand of PBL, known in the institution as 'one day, one problem'. Each day, students are required to work in groups on one problem relevant to their domains of study. The tutor facilitates a class of 25 students for the entire day, and is expected to challenge students' assumptions about the problem, ask for elaboration of information and ideas, provide guidance on learning resources, question students in order to

elicit further information and to assist groups to work effectively. Hence their role is both complex and sophisticated and quite different to that of a teacher in a more conventional setting (O'Grady & Alwis, 2002).

The novel educational environment at the polytechnic acted as a driving force for this thesis. Information that could inform senior management about tutors, who are a key variable in the implementation of its approach to PBL, was considered to be critical in evaluating the effectiveness of its pedagogy. It is within this context that the studies were designed.

First, the research set out to determine whether tutors at the polytechnic are aligned with the philosophy and practice of this approach to PBL; how they develop in their views and actions over a period of 18 months; and whether their behaviours are stable or fluctuate from semester to semester. The research also sought to investigate whether some tutors are more inclined towards PBL as a result of pre-determining factors that impact on their teaching behaviours. In order to avoid the issues around measuring tutors' behaviours, specifically questions of reliability and validity of the measurement instruments (Dolmans & Ginns, 2005) the studies collected data via self-reports, student evaluations of their tutors, and third-party observations conducted by peer tutors.

There now follows a summary of the main findings from each of the five studies, overall conclusions, a discussion of the implications of the studies and suggestions for further investigations.

### ***Are tutor and leadership perspectives on PBL aligned? and Do tutors' perspectives of teaching and learning change as they become more familiar with PBL?***

Problem-based learning at Republic Polytechnic represents a shift away from the conventional methods of teaching in polytechnic education. Indeed for many of the tutors when they join the institution it is a pedagogy with which they are unfamiliar. Yet in order to implement this educational change, the senior management team who had initiated the new curriculum approach, require the compliance and understanding of their tutors. In Chapter 2 we see that the leadership of the polytechnic have a very coherent view of what an effective tutor looks like. However, the study shows that there is a misalignment between new tutors and the profile of an effective tutor of PBL as determined by this small leadership group. This is not altogether surprising as many of the new tutors had no previous experience with PBL and whose initiation into the new pedagogy consisted of just five days training. However, it was somewhat disappointing to find that even after 18 months few noticeable changes could be identified in the tutors' perspectives on PBL - they were still at odds with the views of the leadership team. Most

interestingly it appears that while there were some minor modifications to the tutors' behaviours such that what they were doing in the classroom was more aligned to PBL, their beliefs about teaching and learning were resilient to change.

In attempting to understand tutors' lack of propensity to change it is useful to delve into studies from educational psychology, particularly those that focus on the nature and formation of beliefs. Rokeach (1968) over four decades ago made the point that people can hold a myriad of beliefs, some of which are 'core' and others that are 'peripheral', with core beliefs being the most difficult to change. It is also possible for a person to hold quite contradictory beliefs simultaneously (Pajares, 1992). Hence, in Chapter 2 we can understand both the discrepancy between tutors' beliefs and actions, and also how it is that a tutor when interviewed talks about the importance of PBL but states in the same interview that it is not appropriate as the pedagogy for their subject. In addition, the study supports the literature that show that tutors with no previous experience of PBL (either as an educator or as a student) tend to draw their conceptions and models of teaching from conventional classrooms with which they are much more familiar. These views then impact on the way they perceive PBL at the polytechnic (Özgün-Kocaa, & Şen, 2006). As Gupta & Saravanan (1995) have suggested, the tutors arrive at the institution with prior beliefs that act as a filter when trying to make sense of the pedagogy they have been asked to implement. This filter is so robust that the tutors have made only moderate changes to their actions within 18 months and almost no changes in the beliefs they hold.

So are all attempts to change teachers' perspectives doomed to failure? According to Prosser, Striken, Hewson & Gertzog, (1982), certain conditions must prevail before successful change will occur. Individuals must not only be dissatisfied with their current beliefs, but they must find the alternatives attractive and useful. In addition, new beliefs must connect in some way to those that are currently held. The adoption of radically different beliefs is unlikely except for a small minority of individuals. The data from the study (both the survey data and the interview data) suggest that many teachers hold beliefs about teaching that are alternate to PBL and that they see the value of traditional teaching, hence making the transition to this pedagogy difficult.

A consistent theme in the literature is that teachers are most open to re-examining their perspectives on teaching and learning when they are about to enter a teacher education programme (Dana, McLaughlin & Freeman, 1998). According to some research, this change is generally brought about via one of two ways; through dissonance (Dana et al. 1998) or through

reflection (Zanting, Verloop & Vermunt, 2001). Guskey (1986) takes a slightly different view when he suggests that it is difficult to change teachers' beliefs but when it does occur it is generally preceded by a change in teachers' actions as a result of a positive classroom experience. The staff development programme at the polytechnic does not set out to cause dissonance in the tutors' thinking, neither does it require excessive reflection, preferring instead a pragmatic approach with a focus on what the tutors ought to do when they enter the classroom after their week of orientation. However, little classroom follow-up occurs, with tutors generally being left to their own devices for some time. It seems that until the beliefs that tutors possess are confronted and until the staff development programme provides sufficient role models of good practice and more observations of them in class accompanied by effective feedback, few changes will occur. In conclusion, it would be expedient of the polytechnic to examine its current staff development programmes with a view to increasing its emphasis on an examination of tutors' prior beliefs as well as providing more thorough and on-going practical support to provide tutors with positive early experience of PBL and to help them master the craft of the PBL classroom. Such measures as the introduction of reflection journals, peer tutoring, videoing and analysing classroom practice with an experienced colleague and observing the classroom of experienced tutors may bring about desired changes.

#### ***Do students' observations of their tutors concur with tutor self-reports?***

The study reported in Chapter 2 gathered data about teachers' views and behaviours regarding PBL from teacher self-reports and comments they provided in interviews. However, other studies had suggested that self-reports may not be reliable (Wubbels, Brekelmans & Hooymayers, 1991; Berger, 2010), hence a second study was devised using the same instrument, the Teaching Perspectives Inventory (TPI), to determine whether tutors' espoused views of PBL were experienced by the students. Having a fuller picture of what is actually happening in the classroom is crucial in the assessment of the effectiveness of PBL. The study, which is reported in Chapter 3, was also interested to examine whether students can infer a tutor's beliefs about teaching from their actions. The findings suggest that there are differences between what tutors say they believe and do, and what students encounter in the classroom. Tutors have a tendency to overrate themselves. In addition, the findings put forward the case that student judgements are sufficiently reliable to act as a validation of tutors' self-reports in terms of not only tutors' actions but also their beliefs about teaching. However, once again the study showed that there are tutors at the polytechnic that hold beliefs about teaching that are at odds with the philosophy that underpins PBL. Some of these tutors may not be aware that their

views are not aligned and hence may benefit from seeing the results of the inferences students are making about their beliefs. By doing this, a situation of dissonance may be created whereby the evidence before them contradicts what the tutors' think. As mentioned in relation to the first study, dissonance is thought to help bring about a change in beliefs (Dana, et al. 1998; Zanting, et al. 2001), as tutors are forced to confront alternate views of reality.

***Do student and third-party observations of tutors agree on the characteristics of an effective tutor?***

The studies reported in Chapter 2 and Chapter 3 used the TPI to gather data. Although this instrument has the benefit of allowing data to be collected about tutors' beliefs and intentions as well as their actions, it was not specifically designed for PBL. Instead the developers of the instrument, Pratt and Collins perceived it more as a "discussion tool to promote reflection, clarification and plurality of approaches to good teaching" (Collins & Pratt, 2008, p 8). So a third study, which is reported in Chapter 4, moves away from the TPI to the use of two instruments that were designed to be used in PBL classrooms: the Tutor Evaluation Survey, developed by Schmidt and Moust (1995), and the polytechnic's own Learning Observation Form. This study asked the question *Do student and third-party observations of tutors agree on the characteristics of an effective tutor?* The definition of an effective tutor was determined by the academic achievement of the students and therefore was rather narrow; it did not include a measure of how satisfied the students were with their tutors' performance. The study found that tutors who are judged highly by students and/or peers do not necessarily facilitate students with high academic achievement and vice versa. At first glance this finding may appear both surprising and disappointing. On the surface it would seem reasonable to expect that those tutors who can apply their understanding of PBL to their classroom practices are the same tutors whose students perform well academically. However, teaching using PBL (just like other pedagogies) is not simply a causal relationship between the inputs of the tutor and the outcomes of the student. Indeed, in PBL the inputs of the tutor are less explicit and perhaps more subtle than in other instructional methods. Other factors, such as group dynamics and learning resources are designed to play a significant role in the students' learning. Hence the mix of other variables is complex and will play a prominent role in students' academic achievements.

In terms of the question whether students or peers are better able to identify the dispositions of an effective tutor, the study shows that it is students rather than the tutors' peers who are slightly better. This being so, institutions considering tutor evaluations should perhaps be cautious when using peer observations especially when cost is factored into the decision. However, the study found that even evaluations using large-scale student surveys are not a strong predictor of student achievement; hence the study concluded that to understand students' success in PBL it is important to look beyond what it is that the tutor does and believes. The complexity of the classroom needs to be examined as a whole, including the students' prior knowledge, the quality of the curriculum, the group learning processes that are involved, and the assessment that students are asked to undertake. Such factors were beyond the scope of this particular study.

***Are the performances of PBL tutors stable across time and context?***

The study that is described in Chapter 5 was an investigation into whether tutors' behaviours are stable across time and context. It looked specifically at three distinct tutor qualities (1) subject matter expertise, (2) social congruence and (3) cognitive congruence, as well as overall performance which was an aggregate of the three behaviours. A generalizability study was conducted and found that generalizations about tutors' performance can be reliably made after three semesters. From the findings it seems that overall tutor performance is stable although there is some fluctuation in performance when teaching different courses and that this variation is largely accounted for by difference in cognitive congruence and subject matter expertise. Such a finding presents something of a dilemma for a leadership team who has implemented PBL across the polytechnic. While it is good to see that those tutors who are rated highly by students seem to perform well across semesters and courses, it is also true that low rating tutors continue to perform poorly. In some ways this finding is consistent with that of the first study that looked at the development of tutors' beliefs, intentions in actions. Both studies show that change in tutor behaviour is slow, and that tutors when they come to PBL often bring with them behaviours that will dominate their classroom practices whether they are appropriate to PBL or not. It is therefore unreasonable to expect all tutors to transition to PBL without a considerable amount of support. As stated earlier, staff development programmes at the polytechnic need to provide ongoing assistance to help them develop facilitation skills that are suitable to PBL.

On a broader level, the study provides evidence that the tutor evaluation questionnaire if administered over at least three consecutive occasions will yield results that can be used to

make generalizations about tutors' performance. There is comfort to be had for the polytechnic leadership in knowing that the tool that they have adopted to evaluate tutors can be used to help target tutors who require additional assistance.

***Factors affecting tutor performance: The antecedents to expertise, social congruence and cognitive congruence.***

Following the finding of the previous study, that tutors' behaviours are somewhat stable, the question of a predisposition to PBL was raised. Hence, the study described in Chapter 6 set out to investigate whether there are antecedents to the three key behaviours of PBL tutors; expertise, social congruence and cognitive congruence. Seven antecedents were selected and tested: 1. age, 2. gender, 3. experience of teaching PBL, 4. level of qualification, 5. relevance of qualification to course taught, 6. possession of an educational qualification, and 7. experience of study overseas. Rather surprisingly, the study found that the proposed antecedents barely account for the differences in the scores of tutors' expertise, social congruence and cognitive congruence in PBL. Such a finding has both positive and negative implications. It is reassuring to note that those characteristics over which tutors have no control; gender and age, do not seem to have an impact on performance, however, in contrast, it is somewhat disappointing to note that factors that tutors can control like experience of teaching PBL are equally ineffective. The general conclusion from the study is that differences in performance are more likely to be found in other components of PBL, such as the dynamics that occur in tutor-student relationships and the learning processes.

**Overall conclusions**

The findings of the five studies presented lead to two overall conclusions. The first conclusion that can be drawn from this work is that some tutors, even in an educational setting that has a clearly articulated pedagogy, enter the institution with conceptions of teaching that are at odds with PBL and behave in ways that are not conducive to this active learning environment. Of some concern is the knowledge that they are unlikely to change at least in the short to intermediate term. Change takes time. This finding should be taken into account when institutions are making decisions about the effectiveness of PBL. Until, we can be confident that tutors are practicing PBL as intended, the findings of any evaluation of this pedagogy should perhaps be modified or at least tentative.

The second overall conclusion is related to methodology. The studies discussed in Chapter 3 and Chapter 4 demonstrate that tutor self-reports may not be an accurate measure of what tutors believe about teaching nor a true assessment of their actions in PBL classrooms. It may be better for those assessing tutor performance to mediate self-reports through the observations of tutors by students. In addition, students seem to be able to identify tutors' beliefs about PBL as well as their intentions and actions.

### **Implications of the findings**

The study raises a number of policy implications that may be hard for any institution to adopt and implement: the re-thinking of employment practices, namely its hiring practices, its programme for staff development, and its contract renewal practices.

Because PBL has such a clear philosophical base it may be expedient to include in any recruitment interview some questions that help ascertain the prospective tutor's beliefs about teaching and learning. While not advocating for a policy that rejects any potential tutor who does not match a specific set of beliefs, such a practice serves two purposes, i) it sends a message to the future tutor that the institution does have a clear philosophical base and ii) helps to identify staff who may experience a difficult transition to PBL. Clearly this practice is subject to human resource rules and regulations but the point is that both parties need to be upfront about the values and educational beliefs that are held and expected by the institution, in order to minimize misunderstanding and future difficulties.

Given the finding that it can take at least 3 years for tutors to become aligned to the profile of an effective PBL tutor, the institution needs to see its staff development programme as a long-term policy. It seems that the current model of a short orientation followed by a smorgasbord of workshops which tutors self nominate to attend, does not provide sufficient support to help tutors develop theories of teaching, and educational practices that ensure a smooth and quick transition to PBL. Staff development programmes should not simply include workshops that tell tutors what to do but provide the opportunity to work with peers to see good facilitation in action, and to receive critical feedback on the new tutor's classroom practices.

The study shows that after three semesters an institution can predict the performance of a tutor and that some tutors who were misaligned to PBL when they began facilitating are still struggling with this pedagogy after 18 months, three years or even longer. If this is the case then it may be expedient to ask the question *Is the tutor likely to change such that they can facilitate PBL effectively?* If despite good staff development programmes and support from colleagues, the answer to this question is no, then it may be wise to consider whether to renew a



tutor's contract. Of course there are serious political and economic implications of making such a harsh decision but ultimately the needs of the students ought to be considered and if tutors are unable to effectively facilitate PBL then drastic measures may be required.

### **Critical reflection and directions for future research**

Conducting research in a polytechnic that has adopted a particular approach to PBL has both strengths and weaknesses. On the one hand it provides the institution with specific, detailed important information about how well its staff are faring in this context and presents findings that may assist in improving staff orientation programmes as well as on-going staff development. However, a limitation of using this context is that it is difficult to make generalization about tutors using a more typical PBL approach, where problems are explored over days, weeks or even months. Therefore, it would be useful to investigate tutors' beliefs in other institutions using a range of PBL approaches to see whether they change and develop over time.

Another limitation of the study is the use of a measurement instrument that was not designed specifically for PBL. Being able to differentiate between tutors' beliefs, intentions and actions can help identify and target areas where staff development programmes may be most needed, therefore, the development of a tool similar to the TPI but designed with PBL in mind would be helpful.

Finally, the study suggests that staff development is a key factor in developing tutors who are prepared for their role, and capable of being effective facilitators of PBL. As such, future work that investigates staff development programmes more thoroughly would be valuable. For example, an investigation into the types of programmes that are most effective would be useful? In addition, little is known about the effectiveness of the staff who are conducting the development programmes? Do particular profiles of effective staff developers exist? If so, what do these profiles look like? Such an investment in research would help to ensure that one of the key factors in PBL, the tutors, are given maximum opportunity to succeed.

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## Appendix

*Key words derived from the five perspectives of the TPI and used in the coding of the interviewees responses.*

Transmission: *content, subject expert, objectives, examinations, master.*

Apprenticeship: *real life, modelling, experienced, practitioner, knowledge application, demonstration.*

Developmental: *questioning, challenging, reasoning, complex thinking, prior knowledge, changing thinking.*

Nurturing: *encouraging, caring, sharing, emotions, confidence, rewarding, self-esteem.*

Social Reform: *changing society, ideals, values, society, morals*



## Curriculum vitae

Judith Caroline Williams was born on 11 September 1959, in Essex, England. She completed her secondary school studies at Latton Bush Comprehensive School in Harlow, Essex. In 1981, she graduated from Manchester Metropolitan University with a Bachelor of Arts Degree in Humanities and Social Studies. Judith then enrolled in a Post Graduate Certificate of Education, specialising in History and Drama. She spent five years teaching History in secondary schools in Harlow and Sheffield before moving to Australia. Judith then worked for many years in Vocational Education and Training, first in New South Wales and then in Queensland. In 1995, Judith was employed as a researcher by the Queensland Board of Senior Secondary School Studies to investigate the incorporation of key competencies into the senior secondary curriculum. Before moving to Singapore in 2003, Judith was a Manager in the Curriculum Strategy Branch of the Department of Education in Queensland. Judith has worked in the Centre for Educational Development at Republic Polytechnic, Singapore since April 2005, fulfilling various roles including Manager (Professional Development), Assistant Director (Academic) and more recently as a part-time Academic Associate.

## Publications

Williams, J. C., Alwis, W. A. M. & Rotgans, I. J. (2011). Are tutor behaviours in problem-based learning stable? A generalizability study of social congruence, expertise and cognitive congruence. *Advances in Health Sciences Education*, 16(4), pp. 505-515.

## Presentations

Williams, J.C. (2006). Exploring change in teachers' perspectives of teaching and learning within a PBL setting. Paper presented at the *International Conference on Teaching and Learning*, 6-8 December 2006, National University of Singapore, Singapore.

Williams, J.C. (2007). Profiles of new staff in a problem-based learning environment. Paper presented at the *2<sup>nd</sup> International Symposium on PBL: Reinventing PBL*, 10-12 June 2007, Republic Polytechnic, Singapore.

Williams, J. C., Ong, R., & Goh, K. (2007). Developing a faculty development programme to support a shift in teachers' beliefs and actions towards teaching and learning. Paper presented at the *32<sup>nd</sup> Annual Conference of the Professional and Organizational Development Network in Higher Education: Purpose, Periphery and Priorities*. 25-28 October 2007, Pittsburgh, U.S.A.

## Summary of thesis in English

The aim of this thesis is to gain an understanding of tutors as facilitators of student learning; to identify their beliefs about teaching, their educational intentions and goals, as well as examine the actions they display and the strategies they adopt when in the problem-based learning (PBL) classroom. The development of facilitators is also traced over several semesters to determine whether they change or remain the same and whether they become more or less aligned to the philosophy and methodology of PBL. The role of the tutor is investigated from the perspective of their students, their peers and the tutors themselves and uses data gathered from all three sources.

The thesis is comprised of five studies. Each study was conducted at Republic Polytechnic in Singapore. The polytechnic has adopted a particular brand of PBL, known in the institution as 'one day, one problem'; whereby each day, students are required to work in groups of five on a single problem scenario relevant to their domains of study. The tutor facilitates a class of 25 students for the entire day.

The findings of the studies have led to the following conclusions: 1) There is a misalignment between new facilitators and the profile of an effective facilitator of PBL as determined by the institution's leadership, 2) Facilitators demonstrate some change over the course of 18 months but it is limited, with their actions, rather than their beliefs, becoming more aligned to those of an effective facilitator, 3) Facilitators have a tendency to overrate themselves when reporting their views on teaching, 4) Student judgements are sufficiently reliable to act as a validation of facilitator's self-reports in terms of not only a facilitator's actions but also their beliefs about teaching, 5) Facilitators who are judged highly by students and/or peers do not necessarily facilitate students with high academic achievement and vice versa, 6) PBL facilitators' behaviours are stable and generalisations of their performance can be made after three semesters, and 7) The personal characteristics of facilitators do not account for differences in tutors' behaviours.

The studies raise a number of policy implications related to the recruiting and rehiring of staff, and to the development and delivery of professional development programmes. In addition, two limitations of the research were identified. The first relates to the context of the studies. Conducting the research in a polytechnic that has adopted a particular approach to PBL means it is difficult to make generalizations about tutors using a more typical PBL approach. In addition, the first two studies on facilitators' beliefs used a measurement instrument that was not

specifically designed for PBL. It is recommended that the studies be expanded to include research in more typical PBL classrooms, and that a measurement instrument that has been validated in a PBL setting be used in further research that examines PBL tutors' beliefs about teaching.

## Samenvatting van proefschrift

Het doel van dit proefschrift is het verkrijgen van een begrip van leraren als facilitators van het leren van de student, het identificeren van hun opvattingen over lesgeven, hun educatieve intenties en doelen, zowel als het bestuderen van de acties die zij nemen en de strategieën die ze adopteren in het klaslokaal van het probleem-gebaseerd leren klaslokaal (problem-based learning, or PBL, classroom). De ontwikkeling van de facilitators over verschillende semesters is ook gevolgd, om vast te stellen of zij veranderen of gelijk blijven en of ze min of meer in lijn vallen met de filosofie en methodologie van het PBL klaslokaal. De rol van de leraar wordt onderzocht vanuit het perspectief van de studenten, hun gelijken en de leraren zelf, en gebruikt data die ingewonnen is van alle drie. Het proefschrift bestaat uit vijf studies.

Elke studie was uitgevoerd op de Republic Polytechnic in Singapore. The polytechnic heeft een bepaalde versie van PBL aangenomen, die in het instituut bekend staat als "een dag, een probleem" ("one day, one problem"); waarin studenten verplicht zijn iedere dag in een groep van vijf te werken aan een enkel probleem scenario dat relevant is aan het domein van hun studie. De leraar verzorgt een klas van 25 studenten voor de gehele dag.

De bevinding van de studie hebben geleid tot de volgende conclusies: 1) Er is een misplaatsheden tussen nieuwe leraren en het profiel van een effectieve leraar van PBL, als vastgesteld door het leiderschap van het instituut, 2) Leraren vertonen wat verandering over een periode van 18 maanden, maar het is gelimiteerd tot hun acties, in plaats van hun opvattingen, in het meer gelijk stellen van een effectieve facilitator, 3) Facilitators hebben de neiging om zichzelf te overschatten wanneer ze verslag uitbrengen over hun opvattingen over lesgeven, 4) het oordeel van de studenten is betrouwbaar genoeg om als validatie te dienen voor het zelf-verslag van de facilitator, niet alleen met betrekking tot de acties van de facilitator maar ook hun opvattingen over lesgeven, 5) Facilitators die hoog worden gewaardeerd door studenten en/of hun gelijken, begeleiden hun studenten niet noodzakelijk tot hoge academische prestaties en vice versa, 6) Het gedrag van PBL facilitators is evenwichtig en generalisaties over hun prestatie kan na drie semesters vastgesteld worden, en, 7) De persoonlijke karakteristieken van de facilitators zijn geen verklaring voor de verschillen in het gedrag van de leraren.

De studies brengen naar voren een reeks beleid implicaties die gerelateerd zijn aan het rekruteren en her-aannemen van personeel, en de ontwikkeling en aanlevering van

professionele ontwikkelings programma's. Daarnaast zijn er twee limitaties geïdentificeerd in het onderzoek. De eerste heeft betrekking tot het zinsverband van de studies. Om het onderzoek te verrichten in een polytechnic die een bepaalde benadering tot PBL heeft aangenomen betekent dat het moeilijk is om generalizaties te maken over leraren die een meer kenmerkende PBL benadering gebruiken. Daarnaast gebruiken de eerste twee studies over de opvatting van facilitators een metings instrument dat niet specifiek ontworpen is voor PBL. Het is aanbevolen dat de studies worden uitgebreid met onderzoek in meer kenmerkende PBL klaslokalen, en dat een metings instrument gebruikt wordt dat in een PBL setting gevalideerd is voor verder onderzoek dat de opvattingen bestudeert van de leraren over lesgeven.