

UNDERSTANDING MATHEMATICS TEACHERS' PROFESSIONAL DEVELOPMENT FROM THE PERSPECTIVE OF SOCIAL LEARNING THEORY

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In this paper, I draw attention to social learning theory. My primary aim is to foreground the theory in order that it may be used in the context of teachers' professional learning. Social learning theory is used extensively in other fields. However, it has not been used in the context of teachers' professional development. Presently there are a diverse range of theories in this sub-field. Most do not account for the complexity of teacher learning. A theory of professional learning needs to take account of teachers' individual beliefs and thinking as well the influence of the social context of teaching. Social learning theory incorporates individual, cognitive dimensions as well as the social dimensions of learning. Here I argue the strengths and potential merits of using social learning theory in the field of professional development.

Keywords: Professional development, professional learning, self-efficacy, social learning theory

INTRODUCTION

Social learning theory is based on the principle of learning through observing others' behaviour. Substantial parts of teachers' practices are developed through the observation of other teachers. This is especially true at the beginning of a teacher's career. They observe and model a range of practices. They might include those of their own teachers, teacher educators and the teachers they work with during their school placements. This is not direct imitation of behaviour. It involves a sophisticated observation and modelling process leading to the creation of novel behaviours. This same idea can be applied to the professional learning of experienced teachers. The key difference being that these teachers have developed and often stable practices. As a result, change can be difficult. Social learning theory explains how new behaviours are formed, by an observer, through manipulating and enacting mental models of observed behaviour. The theory accounts for the cognitive, affective as well as social processes. While social learning theory offers powerful explanatory and predictive capacity it has been used very little in mathematics teachers' professional development (PD). The exception is the sub-construct of self-efficacy. In this paper, I describe social learning theory. My aim, primarily, is to describe and draw attention to it, and in so doing, make it possible for other researchers to apply the theory.

Teacher professional development research is diverse: there are a range of theories and approaches (Roesken, 2011, p. 5). It has been suggested that theoretical perspectives are often overly simplistic and do not take account of the complexity and contextual aspect of teachers' work (Borko, 2004; Clarke & Hollingsworth, 2002; Darleen Opfer & Pedder, 2011; Timperley & Alton-Lee, 2008). It may be, as a consequence of this, that often the overall effects of PD can be disappointing (Darleen Opfer & Pedder, 2011; Guskey & Huberman, 1995). While it has been argued that diverse theory is necessary in order to reflect the complex and contextual nature of teachers' professional learning, I take the view that integrated models of professional learning are both achievable and vital in the development and evaluation of professional development. Social learning theory is an integrated theory of learning in this sense.

Before describing social learning theory in detail I want to consider the range of theories currently in use. To do this I draw on a review and classification of professional learning developed by Jaworski (2011). This classification demonstrates the *either/or* nature of professional learning theory. It is generally *either* related to individual cognition, *or* it is related to the social context.

A CLASSIFICATION OF LEARNING THEORY IN PD

The range of theoretical perspectives can be classified into the following groups: *direct instruction models*, *constructivist instructional models*, *reflective practice models* and *socio-cultural models* (Jaworski, 2011, pp. 21–22). The *direct instruction models* are associated with behaviourist learning approaches. The *constructivist approach* draws on the related learning theory, with teachers involved in sense-making and knowledge construction. *Reflective practice* describes learning, in professional development, that draws on the perspectives of Schön (1983) and *socio-cultural models* treat professional learning as a participatory process (for example, Lave & Wenger, 1991).

While it is acknowledged that PD may draw on one or more of these theories (Jaworski, 2011, p. 22). None of these represent an integrated approach to professional learning. An integrated approach accounts for individual cognition and thinking as well as the social, contextual and community aspects. The *direct instruction* and *constructivist instructional models* are related to individual thinking, beliefs and cognition. *Socio-cultural models* are associated with learning in context and the effects of participating in a community.

Clarke and Hollingsworth (2002) proposed an integrated model which attempted to account for the cognitive and the social aspects of learning in professional development. This model represents a step forward, although it is limited in the sense that it does not offer a well-developed theory of learning; it mainly draws attention to

the need to coordinate individual learning and the context. In the next section I describe social learning theory.

BANDURA'S SOCIAL LEARNING THEORY OR SOCIAL COGNITIVE THEORY

Albert Bandura's work on social learning theory began in the 1950s, building on the work of earlier social learning theorists such as Millar and Dollard. He developed a core theory of social learning built on extensive empirical evidence. This has been applied in a wide range of fields such as health, criminology, therapy, sport, business and education. Like earlier social learning theory, the cornerstone of Bandura's conception is imitative and observational learning.

The importance in education of imitative and observational learning has been afforded little regard because of its associations with behaviourist perspectives on learning. Moreover, in education, we have endeavoured to offer the learner greater agency and this appears at odds with the idea of learning through imitation. But, as I shall describe shortly, social learning theory does afford agency because of the way in which observed behaviours are modelled and formed to be behaviours.

The fundamental element of social learning theory is the idea of triadic causality and reciprocal determinism. This describes the interrelated nature of a person's thinking, their behaviour and the social setting in which they act. This idea gives social learning theory its integrated quality. In order to explain triadic causality I shall describe how Bandura developed the idea.

Triadic causality and reciprocal determinism

I will use similar notation to that used by Bandura. A person's behaviour will be denoted by, B. Their personal characteristics—for example, their thinking and beliefs—will be represented by P; and the social setting, environment or context as E.

Bandura starts with a behaviourist perspective, that a person's behaviour is the result of environmental stimuli and this can be represented by the following equation:

$$B=f(E)$$

Or, behaviour is *some function* of environmental stimuli. A development of this is to introduce the effects of the individual on their behaviour:

$$B=f(P,E)$$

From this, behaviour is some function of both the person and their environment. Bandura began to revise this by suggesting *reciprocal determinism*. That in fact, their environment directly influences a person and vice versa; the person influences the environment. Bandura introduces the following refinement:

$$B=f(P\leftrightarrow E)$$

He refines this further by introducing a *triadic causality* scheme (see Figure 1). Behaviour, personal factors and the environment all determine each other reciprocally. This represents a significant breakthrough in understanding the relationship between behaviour, thinking and environmental context. Bandura explains it as follows.

Personal and environmental factors do not function as independent determinants, rather they determine each other. Nor can “persons” be considered causes independent of their behavior. It is largely through their actions that people produce the environmental conditions that affect their behavior in a reciprocal fashion. The experiences generated by behaviour also partly determine what a person becomes and can do which, in turn, affects subsequent behavior (Bandura, 1977, p. 9).

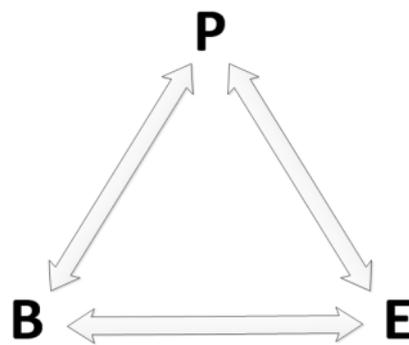


Figure 1 Triadic causality and reciprocal determinism (Bandura, 1977, p. 10), B signifies behaviour; P, person factors and E, the environment.

Triadic causality and reciprocal determinism together with observational learning form the basis of social learning theory. From this we can account for individual thinking and beliefs, the social and environmental setting, and behaviour. In the context of teaching, this is a useful framework. With this, we can account for teachers’ behaviours, their *practices*; teachers’ personal characteristics, their *thinking, beliefs and motivations*; and the school, educational environment and the social context. In order to illustrate how teaching and professional learning can be deconstructed along these lines it is necessary to discuss how behaviours are formed from the perspective of social learning theory.

The formation of behaviour

Bandura stresses that people cannot simply construct novel behaviours based on their own experiences. They need others to provide sources of modelled behaviours.

[F]rom observing others[,] one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action. Because people can learn from example what to do, at least in an approximate form, before performing any behavior, they are spared needless error (Bandura, 1977, p. 22).

It is important to realise that not all behaviours are observed and remembered. Sophisticated sub-processes contribute to the formation of behaviours. These are: *attention*, *retention*, *production processes* and *motivation*. In terms of *attentional processes*, Bandura explains that individuals do not learn through observation unless they ‘attend to and perceive accurately, the significant features of the modelled behavior’ (1977, p. 24). Similarly, from the perspective of *retentional processes*, observed behaviours will not have much influence unless a person remembers what they observed. The *production process* involves the conversion of the symbolic codification of observed behaviours into action. Finally, the *motivation processes* address how, out of the numerous behaviours observed and symbolically retained, certain behaviours are constructed and enacted.

So far I have described some of the key theoretical concepts in social learning theory. The reciprocal causality of thinking, environment and behaviour, and the processes involved in observing behaviour. There is one further and vital component in social learning theory: self-efficacy. Self-efficacy represents a forward oriented belief in the extent to which a person thinks they will be successful in an activity or domain. This one aspect has been used quite extensively in teacher education. Self-efficacy is the mediating property in social learning theory’s triadic causation. The extent to which we deviate from norms or try something new in our teaching is dependent on our levels of self-efficacy. In the next section, I will explore this concept in more detail.

Self-efficacy and teaching

Bandura defines self-efficacy as, ‘beliefs in one’s capabilities to organise and execute the courses of action required to produce given attainments’ (Bandura, 1997, p. 3). He applies self-efficacy to a wide range of human activity including medicine and health, sport, and business organizations as well as looking specifically at teachers’ self-efficacy. A range of studies demonstrates the importance of teachers’ self-efficacy. Teachers that are more efficacious give more time to academic activities, providing students with more guidance than low efficacy teachers. Lower efficacy teachers spend more time on non-academic activities and were likely to criticise students for their failures (Gibson & Dembo, 1984). Student teachers with a higher sense of efficacy are more adept at presenting lesson plans, offer more effective approaches to questioning and are better able to manage their classrooms effectively (Saklofske, Michayluk, & Randhawa, 1988). In terms of practising teachers it has been found that higher levels of teaching efficacy also relates to the way in which teachers view the educational process. Low instructional efficacy teachers are more pessimistic about student motivation and believe in strict classroom regulation and rely on extrinsic inducements and negative sanctions to get students to study (Woolfolk, Rosoff, & Hoy, 1990). Teachers’ individual levels of self-efficacy have been shown to be related to student achievement (Armor et al.,

1976; Ashton & Webb, 1986). Higher efficacy teachers are more likely to innovate and experiment with their teaching (Berman, McLaughlin, Bass-Golod, Pauly, & Zellman, 1977; Guskey, 1988; Stein & Wang, 1988). Its proponents do not understate the strength and value of this construct.

Teacher efficacy has proved to be powerfully related to many meaningful educational outcomes such as teachers' persistence, enthusiasm, commitment and instructional behaviour as well as student outcomes such as achievement, motivation and self-efficacy beliefs (Tschannen-Moran & Woolfolk Hoy, 2001, p. 783).

Teacher's self-efficacy is undoubtedly important in contributing to effective education. In the next section I describe how, according to social learning theory, self-efficacy can be developed.

Sources of self-efficacy

Bandura proposes four sources of self-efficacy: *enactive mastery experiences*, *vicarious experience*, *verbal persuasion* and *physiological and affective states* (Bandura, 1997, pp. 79–113). Enactive mastery experiences offer the most powerful sources of self-efficacy beliefs. If we are successful in something our efficacy will increase, if we fail it will be undermined. Easy successes beget an expectation of quick results but can lead to being easily discouraged by failure (1997, p. 80). Self-efficacy can also be developed through vicarious experience, this provides an alternative and complementary source where individuals assess their own abilities and capabilities based on the attainments and successes of others. Bandura illustrates the process:

More often in everyday life, people compare themselves to a particular associate in similar situations, such as classmates, work associates, competitors, or people in other settings engaged in similar endeavours (Bandura, 1997, p. 87).

Comparing our performances with others leads to increases in self-efficacy, if we believe we can be more effective than the person observed. A further, but weaker source of self-efficacy is through verbal persuasion. If an individual is persuaded that they have the abilities and capacities to achieve a particular level of success this will have an influence on whether the outcome of their performance is successful. However, if persuasion is unrealistic then this can undermine the individual performance and discredit the persuader (Bandura, 1997, p. 101).

Finally, physiological and affective states have an effect on self-efficacy. If we feel ill or we are in a bad mood, this will have an impact on the extent to which we believe we will be successful. This according Bandura is especially relevant in areas related to 'physical accomplishments, health functioning and coping with stressors' (1997, p. 106). This is particularly important in teaching in which high levels of stress are often experienced. Consequently, self-efficacy can be enhanced by improving physical status, reducing levels of stress and correcting misinterpretations

of bodily states. Effectively, improving our physical condition and the way in which stress is dealt with as well as having an improved understanding of our physical self.

THE APPLICATION OF SOCIAL LEARNING THEORY TO TEACHERS' PROFESSIONAL LEARNING

The aim, in this paper, has been to describe social learning theory and draw attention to it. Nevertheless, I want to illustrate how it can be used to understand teachers' professional learning. I will draw on evidence and observations from a PD programme; a programme that I have been researching in England recently. The programme involves four secondary schools with 36 mathematics teachers. In each school, teachers meet twice each term for around one hour. One teacher leads the PD session. The PD is designed so that groups of teachers can work together, autonomously, with limited external expertise or input. The aim of the PD is to support the teaching of student-centred problem-solving. The initial PD session includes videos of real teachers in real classrooms using student-centred problem-solving approaches. Included in the PD, are suggested lesson plans, which provide a lesson structure for orchestrating collaborative student problem-solving. There are also example problem-solving tasks.

The theoretical framing of this PD draws on teachers' beliefs about teaching and the relationship between these beliefs and their practices. The PD is designed to support teachers in developing reform-oriented beliefs to supplant or supplement traditional, teacher-centred views about teaching. This then, it is hoped, influences their practice in the long-term. The PD, effectively, is designed to facilitate a change from existing predominantly traditional, teacher-centred approaches to student-centred problem-solving approaches. Teachers find no difficulty in 'believing' in the reform approach. Moreover, generally, they are enthusiastic about trying out the tasks and suggested lesson plans with their classes. Although they do express reservations about placing greater authority over the learning and the mathematics with students.

However, difficulties arise when teachers attempt to extend and sustain the reform approaches. In this example, and consistent with other PD, teachers tend to revert to traditional approaches; much of their teaching continues to be traditional and teacher-centred in the longer-term. The reason for this is the historical-cultural factors and the contextual influences within schools. The historical-cultural factors refer to practices that are sustained through time. The contextual factors include, for example, the practical demands of the job of teaching; the demanding teaching timetable; and the expectations of students, parents and colleagues. Historical-cultural and contextual factors are not accounted for in the beliefs-practice model. However, 'beliefs', in the context of PD, are important. It is necessary that PD provides models and examples of reform-oriented approaches. Yet, professional learning cannot be fully explained in terms of beliefs.

Social learning theory takes account of the historical-cultural and contextual factors. At this point it would be helpful to refer to the section on triadic causality and Figure 1 (pp. 3 – 4). I will consider the relationship between teacher thinking, practice, and the culture and context (these are consistent with P, B and E in Figure 1). As argued above, the culture and context of schools and the nature of the teaching result in traditional, teacher-centred teaching. This reflects the reciprocal relationship between B (in this context, B refers to sets of behaviours or ‘practices’) and E, the culture and context. Also, and as has been found in PD research on teachers’ beliefs, the context and practices have an influence on teachers thinking. Teachers often hold beliefs that are consistent with traditional teaching (See, for example, Swan, 2006). Social learning theory explains the status quo: the reciprocal relationship between beliefs, practices and the context. In addition, it reveals how much stronger the effect of the culture and context of teaching is over individual thinking and beliefs.

Now let us introduce a change to the system. In the PD described above, the change derives from changes to thinking and beliefs with the aim of changing practices. Changes to teachers’ beliefs (P on Figure 1) are likely, ultimately, to result in a return to the status quo. This can be explained in terms of reciprocal causality in Bandura’s theory of triadic determinism: culture and context influences teachers’ beliefs and behaviour. Moreover, as a result, traditional practices will be restored. This then explains why many attempts to change teaching by influencing teachers’ thinking will have limited success (or possibly no success at all). It would seem then, other than by changing institutional contexts or directly changing practice, there is little hope in changing practice. However, there is hope, from a social learning theory perspective, and one has to look to the construct of self-efficacy.

So far, I have painted a very grim picture of the effects of PD. However, there have been successes, though they may have been relatively small-scale and may not necessarily have been sustained. I suggest the main factor that can be associated with successful reform-oriented PD is self-efficacy. Self-efficacy, it can be argued, simply equates to confidence. Clearly, PD that enhances a teacher’s confidence in their teaching will be generally beneficial. However, self-efficacy in contrast to confidence, as pointed out by Bandura, has a greater degree of specificity and reflects underlying levels of skill as well as affective components such as self-esteem, motivation and confidence. Specificity refers to the belief we will be successful in a specific *domain or activity*. The domain or activity could for example, be in teaching and instruction, or in reform-oriented teaching.

I have presented evidence, in this paper, of how more efficacious teachers are effective teachers on a number of measures. But most importantly, from the perspective of PD, more efficacious teachers tend to be more willing to experiment with their teaching. What is more, efficacious teachers are more likely to sustain innovation. Teaching efficacy is a key aspect in professional learning. It is necessary

therefore, that PD promotes and enhances teaching self-efficacy. In this paper, I also refer to the four sources of efficacy: mastery experiences, vicarious experience, persuasion and physiological states. In effective PD these sources need to be developed and optimised.

There is one final point to be made. Changes as a result of PD can be small and have proved difficult to measure. Measures of teaching self-efficacy have shown a great deal of promise and have proved to be effective with smaller sample sizes. Quantitative measures could therefore be used to support qualitative analysis of smaller-scale PD trials. This has the potential to provide evidence to support the scaling-up of PD initiatives.

CONCLUDING COMMENTS

From a social learning theory perspective, there are two key components in developing effective PD. PD needs to offer models of practice as well as support and enhance teachers' self-efficacy. A social learning theory view of reform-oriented PD provides an improved and integrated theoretical basis. Instead of viewing teaching practices as exclusively a consequence of teachers' beliefs, it is necessary *also*, to view practices as a result of social influence. At the same time, it is important not to diminish the effects of individual knowledge, thinking and beliefs.

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