

Does School-wide Positive Behaviour System Improve Learning in Primary schools? Some Preliminary Findings

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Abstract

Background: A school-wide program known as Positive Behaviour for Learning (PBL) that systematically reinforces positive behaviours in schools based on the USA model of Positive Behavioral Interventions and Supports (PBIS) but also emphasizes learning processes and outcomes was implemented in the Western Sydney Region (WSR) of Australia.

Aim: The study aims to critically compare those schools that implemented PBL (experimental) and those that did not (control) in learning-related psychosocial outcomes.

Sample: Third and fifth graders from 4 primary schools implementing PBL (experimental group, n=474) and 2 primary schools which would join the intervention in the following year (control group, n=83) were compared.

Method: Confirmatory factor analysis (CFA) was used to validate 9 psychosocial measures: (1) school self-concept (cognitive), (2) school self-concept (affective), (3) English self-concept, (4) mathematics self-concept, (5) parent self-concept, (6) effort goal orientation, (7) planning, (8) study management, and (9) persistence. Then multivariate analysis of variance (MANOVA) tested between-group differences in the 9 measures.

Results: CFA found support for the 9 measures. MANOVA found significant between-group differences in (2), (3), (5), and (7), favouring the experimental group.

Conclusion: By extending the strength of a positive behaviour support system to include an emphasis on learning processes and outcomes, PBL has made small but important contributions to some psychosocial determinants of student outcomes that may facilitate long-term learning benefits.

Keywords: Positive behaviour; behaviour management; school environment

在小學推行全方位正面行為計劃能否增強學習?

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概要

背景: 一個名為「正面行為促進學習(PBL)」的全方位計劃在澳洲西悉尼區域的學校中進行試驗, 該計劃源自美國的PBIS的學童行為管理模式, 並加上增強學習過程和效果的元素。

目的: 本研究旨在測試引入PBL的學校(實驗組)和未引入PBL的學校(控制組)之間, 在與學習有關的社會心理學元素方面有沒有差別, 以驗證PBL是否有效地促進學習。

對象: 是項研究選取當地其中四所小學的三年級和五年級學生以進行PBL計劃(實驗組, 人數為474人)與兩所在下一年度才開始引入PBL的小學(控制組, 人數為83人)作比較。

方法: 首先採用確定分子分析法(CFA)以確定本研究中的九個主要分子:(1)學校自我觀(認知方面); (2)學校自我觀(喜好方面); (3)英文自我觀; (4)數學自我觀; (5)家長自我觀; (6)努力目標; (7)計劃; (8)學習處理, 和(9)恆心, 然後以MANOVA測試兩組之間有何差別。

結果: CFA 確定該九個元素, 而MANOVA 則發現其中(2)、(3)、(5), 和(7)有顯著的組與組之間的差別, 以實驗組佔優。

總結: PBL實驗計劃有系統地強化學生的正面行為、促進學習。數據顯示能增強與學習有關的九個重要元素, 增長值雖微, 但由於此等元素對學習有長期的裨益, 意義重大。

關鍵詞: 正面行為; 行為管理; 學校環境

The implementation of school-wide positive behaviour support programs has become a hot topic in recent years. Such programs are designed primarily with an intention to improve the school environment. In the USA, one of the recently most popular programs with such an intention is called *Positive Behavioral Interventions and Supports* (PBIS), also known as *Positive Behavior Support* (PBS; see www.pbis.org/schoolwide.htm), which is a “systems approach to enhancing the capacity of schools to adopt and sustain the use of effective practices for all students” (Lewis & Sugai, 1999, p. 4). Whereas such programs have been reported to be successful in reducing behavioural and discipline problems (McCurdy, Mannella, & Eldridge, 2003; Scott, 2001), based on the assumption that an improved school environment would lead to an improved focus on academic work and subsequently better academic achievement (Twemlow, Fonagy, Sacco, Gies, Evans, & Ewbank, 2001), one may expect that such programs may also improve educational outcomes that are more directly related to academic learning. In the present investigation, we examine the effects of a *Positive Behaviour for Learning* (PBL) initiative implemented in the state of New South Wales in government/public schools, and scrutinize the possibility of improvement in learning outcomes. Due to the short span of implementation since its recent introduction to schools, it would be unreasonable to expect dramatic improvement in achievement scores as a consequence of PBL. Hence the present investigation focuses on psychosocial factors that have been found to be important determinants of academic success. If PBL is able to improve these learning outcomes, then there will be good reasons to extend the current form of behaviour management to a systems approach to improving educational outcomes beyond discipline management.

The Need for Positive Behaviour Support

Student behaviour and its implications for learning are a frequent concern of teachers, parents and policy makers in Australia and elsewhere. Disruptive student behaviour not only impacts on the school environment but also impedes students’ learning outcomes. An undesirable school environment would probably lead to low student engagement and motivation, and learning may become less effective in the classroom. In New South Wales (NSW) of Australia, the Department of Education and Training (DET) recently revised its discipline policy guidelines to emphasize that “quality learning environments” should provide “an environment free from disruption, intimidation, harassment and discrimination. To achieve this, all schools are expected to maintain high standards of discipline” (NSW DET, 2006). However, despite this unambiguous policy direction, NSW DET Western Sydney Region (WSR) has noted an increase of referrals to the regional behaviour team. While a proportion of these referrals involved serious behaviours, WSR found on investigation that many could have been dealt with more appropriately at the school level. It was also apparent that failure to manage problems at the school level had frequently led to an escalation of conflict. This is consistent with research findings that show that coercive discipline aggravates problem behaviour (Lewis, 2001).

Further, WSR has noted disparities across the region in the capacities of different schools to deal effectively with student behaviours. Consequently, WSR has highlighted the need for schools and teachers to employ more effective behaviour management programs and emphasized the adoption of a consistent region-wide professional development strategy for behaviour management.

As noted by Porter (2000) and Edwards and Watts (2004), the range of existing approaches to dealing with student behaviour can be differentiated in terms of their relative emphases on teacher control or student autonomy. Many Australian schools have adopted approaches that seek to balance these two dimensions by applying behavioural principles while emphasizing the need to establish and maintain strong relationships with students and build student responsibility for their own behaviour. The models proposed by William Glasser (1992) and Bill Rogers (1998) both exemplify this dual focus, perhaps accounting for their popularity with school educators. However, despite the recent emphasis given by both these theorists to adopting a consistent school-wide model, application of their approaches in schools, particularly in WSR has been patchy. For example, the Glasser model, which advocates that students take responsibility for making their own behavioural choices, is frequently wrongly invoked by teachers as a means of threatening students to choose between two aversive teacher-imposed “choices”. The Glasser model is sometimes misunderstood or misused and staff development sessions, though popular, had not eventuated in lasting positive change. Research on classroom management across Australia has found that teachers frequently revert to coercive and ineffective forms of discipline when they are challenged with difficult behaviour (Lewis, 1997). Consequently, the establishment of workable, positive and sustainable processes for dealing productively with student behaviour issues remains an educational challenge for the Western Sydney Region and others. In an attempt to address this behavioural management issue, WSR has introduced a proactive discipline model called Positive Behaviour for Learning (PBL) to schools within the region. This model, based

on the USA model of PBIS, adopts a behaviourist approach to managing behaviours, which aims to equip schools with the capability to identify and teach behaviours that they have determined are appropriate for their students, but also emphasizes strengthening of teaching and learning so as to capitalize on the improved school environment.

Positive Behaviour for Learning

PBL in Australia is a school-wide system adapted from the PBS concept originated in the USA. Consistent with PBS, which is underpinned by established behaviourist methods, PBL eschews punishment in favour of approaches that reinforce students’ engagement in positive interactions within a preventative behaviour approach. This is because “teaching behavioral expectations and rewarding students for following them is a much more positive approach than waiting for misbehavior to occur before responding. The purpose of school-wide PBS is to establish a climate in which appropriate behavior is the norm” (OSEP Center on PBIS, 2006).

Like PBS, an outstanding feature of the Australian PBL model is its systemic focus and an emphasis on the need for schools to comprehensively monitor student behaviour as a basis for developing and applying school-wide and teacher-initiated behaviour management strategies. Furthermore, to address issues of sustainability, PBL promotes an explicit, structured, team-based, problem-solving process for developing schools’ capacities to assess and address behavioural issues.

Also consistent with PBS, PBL places a strong emphasis on gathering observational data and on evaluating specific outcomes on the basis of the data collected. Behaviourist methodologies have long stressed this empirical approach, involving

comprehensive and specific data collection and explicit specification of target behaviours, as vital to facilitating positive behaviour change (Sulzer-Azaroff & Mayer, 1994). A clear advantage of this in the school context is its capacity to challenge perceptions based on prior assumptions that are often inaccurate or unhelpful. Teacher misjudgements and false assumptions are more easily debunked when behaviours are analysed in terms of what actually has occurred, in what circumstances and to what effect. Current literature in the field has indicated that programs such as PBS have positive influences on behaviour, classroom and school environment and importantly, student outcomes (Nelson, Martella, & Marchand-Martella, 2002). Locally, the emphasis on a team-based approach to developing school-wide positive behaviour strategies has been welcomed by schools in WSR, with many schools responding with an expression of interest in implementing PBL in their schools. The major difference between PBL and PBS is PBL's emphasis on teaching and learning and the provision of in-service training for teachers on teaching strategies. The assumption is that given an improved school environment, students will have increased time on task and higher levels of engagement such that innovative teaching strategies can be applied in the classroom. This element of the PBL system is particularly welcome by the teachers involved.

DET WSR has committed to offering the PBL program to all schools in the region, rolling it out initially between 2005 and 2009, and providing for its ongoing sustainability through to 2009 and beyond. To date, over 100 schools have started to implement the program, and many schools are on the waiting list to join in the program. Because of limited human resources available for the training of the staff from

participating schools, new schools are included by phases, and only a limited number of schools can be included at each phase.

Important Learning Outcomes

Although PBS has been reported to be successful in reducing behavioural and discipline problems (McCurdy, Mannella, & Eldridge, 2003; Scott, 2001), the Australian PBL model with its emphasis on learning (Positive Behaviour for Learning) assumes that the positive effects of the program would extend beyond behavioural benefits, and there may be ultimate benefits in broader educational terms. Unclear, however, is whether this assumption that learning will be enhanced as a direct result of improving the learning environment through positive behaviour management is supported.

One of the most important learning outcomes other than behavioural changes is obviously achievement scores. However, one would not, and should not anticipate any quick gains in terms of achievement scores within a short span of implementation, even though the intervention may be very effective. Hence the present investigation conducted within a short span of implementation focuses on some psychosocial factors that have proven to be important determinants of academic success. They include student self-concept, motivation and engagement.

Student self-concepts. Students' academic behaviour and achievement have been found to be closely associated with their academic self-concept (Marsh & Craven, 2006; Marsh & Yeung, 1997a, 1997b). Recent research on academic self-concept has shown self-concept to be an important educational outcome in itself, and also an important factor that contributes to other valued educational

outcomes (Craven, Marsh, & Burnett, 2003). Academic self-concept and academic achievement has been shown to have reciprocal effects on each other such that enhanced self-concept can positively influence subsequent achievement whereas enhanced achievement can also lead to an enhanced self-concept (Marsh & Craven, 2006). In studying academic self-concept, recent research has adopted a multidimensional approach to the specification of key constructs. For example, Marsh, Craven, and Debus (1999) have distinguished between the cognitive and affective components of self-concepts. Thus, whether students perceive themselves as competent in academic work (cognitive component) and whether they perceive themselves as liking schoolwork (affective component) can be conceptualised as two distinct components of self-concept with respect to academic work. In the present study, for academic self-concepts, we examined students' cognitive and affective components of school self-concept and the domain-specific self-concepts of English and mathematics. Apart from academic self-concepts, we also examined the possible impacts of PBL on students' parent self-concepts. Because students' positive behaviour is expected to have positive influences on their social development (see Cushing, Horner, & Barrier, 2003), we may anticipate that by improving students' behaviour, PBL may also improve the relationship between the students and their parents, resulting in higher parent self-concept.

Motivation and engagement.

Students' motivation and engagement in schoolwork can influence not only student achievement but also their enjoyment and interest in learning (Martin, 2007). Like self-concept, motivation is often taken as an important learning outcome and as a factor contributing to success.

For example, students who have a strong effort goal orientation tend to invest their effort in the mastery of knowledge and skills in order to achieve academically (Yeung & McInerney, 2005). However, it is unclear whether PBL can improve students' effort orientation. Furthermore, motivation entails both cognitive and behavioural dimensions that can be expected to predict improvements in academic outcomes. Martin (2007) proposed a model of student motivation and engagement that delineates adaptive and maladaptive as well as cognitive and behavioural dimensions. The present study focuses on the adaptive behavioural dimensions that include planning, study management, and persistence. Planning and monitoring is the extent to which the students plan their schoolwork and study. Study management is the way students use their study time and organize their work. Persistence is how much students keep trying to understand a problem or to face challenges. We examined whether PBL could change students' motivation and engagement behaviours.

The Present Investigation

The present study examined the impacts of PBL on the important psychosocial outcomes of learning by comparing a sample of students from schools where PBL was implemented with a sample of control students from schools where PBL had not been introduced. The variables of interest were (a) students' self-concepts: perceived competence in schoolwork, how much they liked to go to school, their perceived competence in English and maths, and their perceived relationship with their parents or guardians and (b) motivation and engagement: effort, planning, study management, and persistence. The purpose was to examine whether it would be possible to extend the strength of PBS to facilitate

long-term learning benefits. The findings would have important implications for further improvement of the Australian PBL strategy to benefit students and the schools in which they study.

Method

Participants

The participants in the study were 557 students from six schools in the Western Sydney Region (WSR), Australia. These schools were public primary schools under the Western Sydney Region of the New South Wales Department of Education and Training (NSW DET WSR). From a comprehensive list of public primary schools in WSR, four primary schools that were implementing the PBL program were randomly selected. These schools formed the experimental group in the following analysis. From a waiting list of primary schools that have shown their intention to join the PBL program in the next year, two public primary schools were randomly selected to serve as a control group for comparison. At the time of data collection, the experimental schools had implemented PBL for 9 months starting from the first term of the school year. The two schools in the control group had not started with PBL and were not implementing any similar behaviour management programs.

From each school, all students in Years 3 and 5 were invited to complete a survey. The total sample ($N = 557$) consisted of 474 students from the experimental and 83 students from the control schools. The control schools' numbers were limited because a large proportion of schools in the WSR had already attended information seminars or commenced implementing PBL. Although the comparison samples varied in size, the background of the schools was very similar. For both groups, the students' ages

ranged from 8 to 11 (median = 9). In the experimental group (52% boys), the mean age was 9.20 and the mean age of the control group was 9.33 (50% boys). Both groups were multicultural with a wide range of different languages spoken at home. Less than 35% of the students in both groups were from monolingual English-speaking families. Typical of WSR families, more than 100 different languages were reported to be spoken at home.

Material and Procedure

Apart from background data such as age, gender, and language background, the survey instrument included nine psychosocial factors that are considered to be important learning outcomes. These educational outcomes were: school self-concept (cognitive), school self-concept (affective), English self-concept, maths self-concept, parent self-concept, effort goal orientation, planning, study management, and persistence. A total of 41 items were used to form nine *a priori* scales.

School self-concepts. Two school self-concept scales were adapted from Marsh's Self-Description Questionnaires (SDQ). Specifically, the cognitive scale (5 items) was adapted from the Academic SDQ (Marsh, 1990) whereas the affective scale (5 items) was adapted from the SDQII (Marsh 1992; also see Yeung et al., 2004). An example of a cognitive item is: "I am good at most school subjects", and an example of an affective item is: "I like going to school".

English self-concept. The English self-concept scale was adapted from Marsh's (1990) ASDQ. Only the cognitive component of English self-concept was examined. There were five items, and an example is: "I learn things quickly in English".

Maths self-concept. The maths self-concept scale

was also adapted from Marsh's (1990) ASDQ. Only the cognitive component was examined. There were five items, and an example is: "Work in maths is easy for me".

Parent self-concept. Four items from the Marsh (1992) SDQII instrument were used to ask students about their relationship with their parents or guardians. An example is: "I get along well with my parents/guardians".

Effort goal orientation. Five items were adapted from the Inventory of School Motivation (ISM) instrument (McInerney & Ali, 2006; McInerney, Yeung, & McInerney, 2001). Effort pertains to the mastery orientation (also conventionally referred to as intrinsic motivation). An example is: "The harder the problem the harder I try".

Planning. Four items adapted from Martin's (2007) Student Motivation and Engagement Scale (SMES) asked students how much they planned their schoolwork and study. Planning pertains to one of the three adaptive behaviours (planning, study management, and persistence) described by Martin (2007). An example is: "Before I start a project, I plan out how I am going to do it".

Study management. Study management was also one of the three adaptive behaviours described by Martin (2007). Four items adapted from Martin's (2007) SMES asked students the extent to which they used their study time and organized their study. An example is: "When I do homework, I try to find a place where I can do it well".

Persistence. Also one of the three adaptive behaviours described by Martin (2007), four items asked students how much they kept working to understand a problem or to find an answer. An example is: "If my homework is difficult, I keep working at it trying to figure it out".

After obtaining approval from the Ethics Committee of the University, consent was obtained from the school and the parents of the students before data collection. The survey was administered to Years 3 and 5 students in intact classes by the class teachers or by a research assistant, as deemed appropriate by the school principal. The students responded to the survey items on a 6-point scale (1 = disagree strongly to 6 = agree strongly).

Statistical Analysis

The students' responses were coded such that higher scores reflected more favourable responses. Hence the negatively worded items were reverse coded. In preliminary analysis, we examined the internal consistency of each *a priori* scale.

Before conducting any comparisons, it is important to establish the validity of the measures. To test the validity of the nine scales for further analysis, we applied confirmatory factor analysis (CFA) as illustrated in Figure 1 (see P.32). The procedures for conducting CFA have been described elsewhere (e.g., Byrne, 1998; Joreskog & Sorbom, 1993; Pedhazur & Schmelkin, 1991) and are not further detailed here. The CFA was conducted with the SPSS version of PRELIS and LISREL (Joreskog & Sorbom, 1988). The goodness of fit of the CFA models was evaluated based on suggestions of Marsh, Balla, and McDonald (1988) and Marsh, Balla, and Hau (1996), with an emphasis on the Tucker-Lewis index (TLI, also known as the non-normed fit index) as the primary goodness-of-fit index. However, the chi-square test statistic, the relative noncentrality index (RNI) and root mean square error of approximation (RMSEA) are also reported. In general, for an acceptable model fit, the values of TLI and RNI should be equal to or greater than .90 for an acceptable fit and .95 for an

excellent fit to the data. For RMSEA, according to Browne and Cudeck (1993), a value of .05 indicate a close fit, values near .08 indicate a fair fit, and values above .10 indicate a poor fit.

The present CFA used a 41 x 41 covariance matrix. That is, we tested the ability of the 41 items to form nine *a priori* factors using the sample of primary students. Support for the nine-factor model requires (a) acceptable reliability for each scale (i.e., alpha = .70 or above), (b) an acceptable model fit (i.e., TLI and RNI = .90 or above and RMSEA < .8), (c) acceptable factor loadings for the items loading on the respective factors (> .30), and (d) acceptable correlations among the latent factors such that they could be distinguishable from each other ($r < .90$).

When the nine-factor model was established, then we would be able to compare the experimental and control groups with confidence. Based on the factors established in the CFA model, using the mean scale scores by averaging the items for each scale, a multivariate analysis of variance (MANOVA) was conducted to compare the scores of the nine latent variables between two groups of students (experimental vs. control). The advantage of the MANOVA was that all comparisons were made within a single analysis. However, the *F*-statistics, the effect sizes (η^2), and observed power are reported for each univariate comparison at the .05 level of significance.

Results

Preliminary Analysis

The alpha reliability of each scale was acceptable (Table 1). The lowest alpha value was .74 for Persistence and the highest alpha was .89 for Maths self-concept. Further to this preliminary support for internal integrity of each scale, CFA was

conducted to test the convergent and discriminant validities of all the scales in a single model.

Table 1.

Alpha Reliabilities of Factors

Factor	No. of items	Alpha
School self-concept (cognitive)	5	.84
School self-concept (affective)	5	.82
English self-concept	5	.88
Maths self-concept	5	.89
Parent self-concept	4	.74
Effort goal orientation	5	.84
Planning	4	.81
Study management	4	.77
Persistence	4	.74

Note: All items were arranged in a random order in the survey. Students responded to the items on a 6-point scale (1 = disagree strongly to 6 = agree strongly).

Confirmatory Factor Analysis

The CFA testing the nine-factor models resulted in a proper solution. The model provided an acceptable fit to the data (TLI = .90, RNI = .91, RMSEA = .05). The solution of the model is presented in Table 2. The factor loadings were acceptable (all > .5). The factor correlations were low to moderate (r s from .24 to .88). The correlation between the cognitive and affective components of school self-concept was .73, indicating that they were distinguishable from each other. Hence there was support for the separation of the two components of self-concepts (see Marsh, Craven, & Debus, 1999; Yeung et al., 2004). The relatively low correlation between English and Maths self-concepts ($r = .34$) was also consistent with previous research that found a low association between these two domain-specific academic self-concepts (e.g., Marsh, 1986). The lowest correlation was between the Affective component of school self-concept and Parent self-concept ($r = .24$) and the highest correlation was

Table 2.

CFA Solution for 9 Learning Outcomes

	SCHOOL	AFFECT	ENGSELF	MATHSELF	PARENT	EFFORT	PLAN	MANAGE	PERSIST
Variable Factor Loadings									
Item 1	.79	.75	.84	.78	.60	.77	.74	.60	.62
Item 2	.76	.83	.72	.77	.72	.77	.72	.65	.64
Item 3	.75	.83	.75	.81	.60	.73	.75	.73	.55
Item 4	.65	.83	.82	.53	.66	.71	.71	.78	.73
Item 5	.67	.66	.79	.64	--	.57	--	--	--
Uniquenesses									
Item 1	.37	.44	.30	.39	.65	.41	.45	.65	.62
Item 2	.43	.32	.49	.41	.48	.41	.48	.58	.59
Item 3	.44	.30	.44	.35	.64	.47	.45	.47	.70
Item 4	.58	.31	.32	.71	.57	.50	.50	.40	.47
Item 5	.56	.56	.37	.60	--	.67	--	--	--
Factor Correlation									
SCHOOL	--								
AFFECT	.73	--							
ENGSELF	.65	.40	--						
MATHSELF	.65	.50	.34	--					
PARENT	.37	.24	.32	.36	--				
EFFORT	.77	.56	.53	.73	.53	--			
PLAN	.70	.65	.42	.64	.41	.68	--		
MANAGE	.68	.59	.50	.60	.41	.79	.79	--	
PERSIST	.76	.60	.58	.66	.45	.88	.78	.79	--

Note: N = 557. Parameters estimates are completely standardized. The model had a $\chi^2 = 1772.42$ (743 df), TLI = .90, RNI = .91, RMSEA = .05. All factor loadings and factor correlations are statistically significant ($p < .05$). SCHOOL = School self-concept (cognitive). AFFECT = School self-concept (affective). ENGSELF = English self-concept. MATHSELF = Maths self-concept. PARENT = Parent self-concept. EFFORT = Effort goal orientation. PLAN = Planning. MANAGE = Study management. PERSIST = Persistence.

between Effort and Persistence ($r = .88$). This is not surprising as a student who is willing to put in effort for schoolwork will also be likely to persist when faced with challenging work. Hence the results provided further support for the convergent and discriminant validity of the factor structure.

In sum, these results showed that the correlations were sufficiently low for the factors to be clearly distinguishable from one another. Thus the CFA model provided good support for the intra-factor and inter-factor integrity of the nine constructs, and a sound basis for subsequent analysis.

MANOVA Results

The averaged score of items for each scale was compared between the experimental and control

groups. The means and standard deviations are presented in Table 3. Before making any group comparisons, because of the unequal sample sizes between the experimental and control groups, we first examined the homogeneity of the two groups by inspecting the Bartlett-box F -statistics for the scales. The results found no evidence of different variances between the experimental and control groups (all $ps > .05$), and therefore the mean scores across groups could be directly compared.

School self-concept (cognitive). There was no significant difference found between the two groups, $F(1, 555) = 0.01$, $MSE = 1.14$. The result indicated that PBL did not make any difference in the students' perceptions of their competence in schoolwork. An inspection of the mean scores found that both groups

Table 3.
Means, Standard Deviations, and ANOVA Results for 9 Learning Outcomes in 2 Groups

Factor	Experimental	Control	F	MSE	Partial η^2	Observed Power
	N = 474	N = 83				
	Mean(SD)	Mean(SD)	(1,555 df)			
SCHOOL	4.65 (1.08)	4.66 (1.02)	0.01	1.14	.00	.03
AFFECT	4.70 (1.23)	4.33 (1.28)	6.29*	1.54	.01	.70
ENGSELF	4.58 (1.20)	4.27 (1.23)	4.64*	1.45	.01	.57
MATHSELF	4.57 (1.21)	4.64 (1.11)	0.24	1.42	.00	.04
PARENT	5.46 (0.80)	5.24 (0.83)	5.24*	0.65	.01	.62
EFFORT	5.12 (0.99)	4.95 (0.98)	2.05	0.98	.00	.30
PLAN	4.62 (1.25)	4.27 (1.29)	5.35*	1.57	.01	.63
MANAGE	4.83 (1.12)	4.60 (1.10)	2.95	1.24	.01	.40
PERSIST	4.89 (0.97)	4.90 (0.94)	0.01	0.94	.00	.03

Note: $N = 557$. Students in the experimental group had experienced PBL for 9 months whereas the control group would be joining the PBL program in the coming year. They responded to survey items on a 6-point scale with higher scores reflecting more favourable responses. SCHOOL = School self-concept (cognitive). AFFECT = School self-concept (affective). ENGSELF = English self-concept. MATHSELF = Maths self-concept. PARENT = Parent self-concept. EFFORT = Effort goal orientation. PLAN = Planning. MANAGE = Study management. PERSIST = Persistence. * $p < .05$. Power = observed power. Barlett-Box F s are all nonsignificant, supporting homogeneity of variances between groups.

had high scores in this variable (M s = 4.65 and 4.66, respectively).

School self-concept (affective). There was significant difference between the two groups, $F(1, 555) = 6.29$, $MSE = 1.54$, $\eta^2 = .01$, observed power = .70. The result indicated that PBL did make a difference. The students in the experimental schools tended to like going to school after the implementation of PBL more than the control group. Nevertheless, an inspection of the mean scores found that both groups had high scores in this variable (M s = 4.70 and 4.33, respectively). Furthermore, the small effect size indicated that the difference was small, although statistically significant at .05 level.

English self-concept. There was significant difference between the two groups, $F(1, 555) = 4.64$,

$MSE = 1.45$, $\eta^2 = .01$, observed power = .57. Again, the small effect size indicated that the difference was small, although statistically significant at .05 level. The result indicated that PBL tended to improve the students' perception of competence in English after seven months' implementation. Although the experimental group had higher scores ($M = 4.90$), an inspection of the mean scores found that the scores of the control group were also high ($M = 4.33$). This difference is surprising, as the PBL system did not have any focus on any curriculum-specific improvement and hence apart from better behaviour as an outcome, there was no expectation of domain-specific enhancement as a function of the system.

Maths self-concept. There was no significant difference found between the two groups, $F(1, 555) =$

0.24, $MSE = 1.42$. The result indicated that PBL did not make any difference in the students' perceptions of their competence in maths. For both groups, the mean scores tended to be high ($M_s = 4.57$ and 4.64 , respectively).

Parent self-concept. There was significant difference between the two groups, $F(1, 555) = 5.24$, $MSE = 0.65$, $\eta^2 = .01$, observed power = .62. Again, the small effect size indicated that the difference was small, although statistically significant at .05 level. The result indicated that PBL tended to improve the students' perceived relationship with their parents or guardians. Although the experimental group had higher scores ($M = 5.46$), the scores of the control group were also high ($M = 5.24$). The difference between groups was not surprising. If the PBL system could improve students' behaviours, then we would expect a better relationship between the child and their parents or guardians. Because the scores were high even for the control group such that there was little scope for further improvement, even the seemingly small improvement would be noteworthy.

Effort goal orientation. The scores tended to be a little higher for the experimental group than the control group, but the difference was not statistically significant, $F(1, 555) = 2.05$, $MSE = 0.98$. The result indicated that PBL did not improve the students' effort goal orientation to a significant level. Both groups tended to have high scores in effort goal orientation on a 6-point scale ($M_s = 5.12$ and 4.95 , respectively).

Planning. Planning is one of the three adaptive behavioural dimensions in Martin's (2007) model of student motivation and engagement. For this dimension, the experimental group had higher scores ($M = 4.62$) than the control group ($M = 4.27$). There was statistically significant difference between the

two groups, $F(1, 555) = 5.35$, $MSE = 1.57$, $\eta^2 = .01$, observed power = .63. Again, the small effect size indicated that the difference was small, although statistically significant at .05 level. The result indicated that PBL tended to improve the students' planning of their schoolwork and study.

Study management. The scores tended to be a little higher for the experimental group ($M = 4.83$) than the control group ($M = 4.60$), but the difference was not statistically significant, $F(1, 555) = 2.95$, $MSE = 1.24$. The result indicated that PBL did not improve the students' use of study time and organization of their study timetable to a significant level.

Persistence. There was no statistical difference between the experimental group ($M = 4.89$) and the control group ($M = 4.90$), $F(1, 555) = 0.01$, $MSE = 0.94$. The result indicated that PBL did not improve the students' persistence in their study despite of difficulty or challenges.

In sum, of the nine scales examined in the present study, significant difference was found in four scales (the affective component of school self-concept, parent self-concept, English self-concept, and the adaptive behavioural dimension of planning in student motivation and engagement). The scores for these variables were all high for both groups, and the differences between groups were small although noteworthy. The PBL program seemed to have some small effects on some student psychosocial variables that are believed to be closely associated with learning.

Discussion

The present study aimed to examine the impacts of PBL on self-concept and motivation in learning as academic outcomes. Because academic

self-concept has been shown to be a significant contributing factor to academic success (Craven, Marsh, & Burnett, 2003) and demonstrated to have reciprocal causal relations with academic outcomes (Marsh & Yeung, 1997a, 1997b), any possible measure to facilitate improvement in academic self-concept would be worth developing. Likewise, since students' motivation and engagement in schoolwork tend to influence their interest in learning and subsequently lead to better achievement (Martin, 2007), any intervention that can enhance students' positive motivation and engagement will also be worthwhile.

Hence although the facilitating effects of the PBL system may seem to be small (noting the small effect sizes found in the analysis), the differences between the experimental and control groups in the self-concept and motivation measures are noteworthy. The results showed that in academic self-concept, the students in the PBL schools liked going to school (i.e., the affective component of school self-concept) more than the control students, and they had comparatively higher English self-concept. For the social dimension, students in the PBL group had comparatively higher parent self-concept than the control group. Furthermore, for every measure reported here, the experimental students scored no lower than the control students. That is, although the groups did not differ in the cognitive component of school self-concept (i.e., how good they believed they were doing) and maths self-concept, the scores for both groups were similarly high.

The higher English self-concept for the experimental group was interesting, but it was unclear why the experimental group did better only in English self-concept and not maths self-concept as well. This discrepancy was unexpected as the PBL program did

not have any strong focus on any curriculum-specific improvement and apart from better behaviour as an outcome, there was no expectation of domain-specific enhancement as a function of the program. Intuitively, if academic self-concept could improve as a result of PBL implementation, one would expect maths self-concept to be improved as well. Therefore, further research should delineate the effects of the behaviour management program on various aspects of academic learning.

For parent self-concept, the difference between groups was not as surprising. If the intervention could improve students' behaviours, then it would not be surprising that the relationship between them and people with whom they have frequent contact would also improve significantly. Cushing, Horner, and Barrier (2003) imply that positive student behaviour is associated with positive social climate in the school environment. At home, we may expect that children's improved behaviour would also tend to improve their relationship with their parents. Hence the improvement of students' parent self-concept in the experimental group would be expected. An interesting finding was that the self-concept scores were high for both groups, which may be due to their young age.

Similarly, for motivation, the scores for both groups were high (all > 4 on a 6-point scale). However, the PBL group scored even higher than the control group in the Planning factor. Perhaps the implementation of PBL had provided a safe and secure environment such that students became more focused and were willing to devote more time on thinking about and planning their schoolwork.

Indeed, previous research has shown that behaviour management programs, if effective, may result in improved academic outcomes (e.g.,

Twemlow et al., 2001). In particular, PBIS as a behaviour management program from which PBL was derived has proved to be effective in not only reducing behavioural and discipline problems (McCurdy, Mannella, & Eldridge, 2003; Scott, 2001), but also in other outcomes (Nelson, Martella, & Marchand-Martella, 2002). The present study suggests that these findings may be extended to the enhancement of academic self-concept and motivation that are well established as important psychosocial outcomes that are critical determinants of successful learning. Although such enhancement appears small in the present study, this is likely due to the short duration of implementation.

Nevertheless, the small gain as a consequence of PBL implementation also implies that there is room for improvement. In particular, further investigation is warranted to determine the major elements in the intervention that brought about the improvement found in this study. For this, a qualitative approach would be useful in elucidating how the PBL program had caused positive effects on students' academically related psychosocial constructs, and explicating how the school-wide behaviour management approach had been able to improve learning.

Finally, there are a number of limitations in the study that we need to mention. First, because of the short duration of implementation, the group differences were small, indicating that the effect of PBL may not have been apparent. Further studies should test the effects after a longer period of intervention. Second, the small sample size from only six schools constitutes a major limitation in terms of generalizability. Third, for any intervention to be effective, the schools implementing it should follow every procedure and the staff should be involved and committed to it. As there was no measure of the extent

to which the PBL schools complied with the PBL requirements, we were unable to indicate whether the small effects found here were due to implementation flaws in some of the PBL schools and classes. Hence further research should incorporate a measure of fidelity check for effectiveness of implementation (see Cohen et al., 2007). Fourth, because the scores for each scale used here were consistently high for this sample of primary students, there was little scope for improvement. We may speculate that for secondary schools, these scores would be relatively lower (see Yeung & McInerney, 2005) such that the effects of PBL may be more apparent, if appropriately implemented. Fifth, for further investigation for a longer duration, achievement scores should be examined to elucidate any gain in terms of academic achievement as a function of the intervention. Based on these limitations, we may take the present results as preliminary findings that warrant attention but need further investigation.

In sum, the PBL system derived from the PBIS model seemed to contribute to enhancing students' liking of school, their English self-concept, and their parent self-concept. It also seemed to have enhanced students' planning in academic work. These preliminary findings suggest that the school-wide PBL system has the potential to make a difference in learning outcomes. Further research should use a larger sample of students from various levels (e.g., primary and secondary schools), include achievement data in the analysis (e.g., English and maths grades), and test changes over time using longitudinal causal relations of multiple variables across a longer period (e.g., 1 to 3 years). Qualitative methods should also be included to enable closer, more contextually specific examination of the major elements contributing to the successes and limitations of the intervention. Well-designed research and

collaborative effort between government and schools will help to determine whether the promise of PBL as an effective program for improving not only student behaviour but also academic achievement and related psychosocial outcomes will be realised in the long term.

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Figure 1. CFA model of 9 latent variables

