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What makes learning “stick?”

The impact and sustainability of professional learning in schools.

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Professional learning is regarded by many as a means by which teachers can improve their pedagogic skills, in doing so improving teacher quality and positively impacting on student learning in classrooms (Ladwig & Gore, 2006; New South Wales Department of Education and Training, 2003). In this paper, I add to the critical debate on whether collaborative professional learning changes teachers’ practice and what sustains the learning over the longer term in schools. The question of the sustainability of teacher professional learning has been addressed in prior research studies in the short term (Aubusson, Brady, & Dinham, 2005); Hoban, Ewing, Kervin, Anderson, & Smith, 2005; Ingvarson, 2005) but to a lesser degree in terms of longer term sustainability (Barber, 2005; Wright, Konza, Hearne, & Okely, 2008). This paper is premised on the view that sustainability needs to be examined over a longer period in order to clearly identify the enabling conditions that are in place in schools where changes associated with professional learning have been embedded and adopted (Fullan, 2005; Wright, et al., 2008).

“Collaborative professional learning” is defined for the purposes of this paper as a range of professional learning activities that involve teachers working together in collegial groups to improve their practice. Collaborative professional learning encompasses a wide variety of practices including:

- Mentoring
- Peer coaching
- Critical friends
- Action learning and action research
- Lesson study

(Duncombe & Armour, 2004, p. 4).

In the context of this paper, the longer term is defined as 1- 6 years following the cessation of specific professional learning programs. “Impact” refers to observable changes in classroom practice, school practice and/ or teacher dispositions that may be related to teachers’ involvement in specific professional learning activities (Loucks-Horsley, Stiles, Mundry, Love, & Hewson, 2010), and “sustainability” is defined as the conditions that are evident in schools that support continued learning after professional learning interventions have ceased (Fullan, 2005).

What is the impact of collaborative teacher professional learning on teachers’ practice and are any reported changes sustained over time? In the context of significant government investment, the ways in which the processes and substance of professional learning trialled in a school will be explored in the literature to add to the discussion as to whether any reported changes to teachers’ knowledge, skills and dispositions are sustained in the longer term.

Impact

A search of the literature in the Educational Resources Information Centre [ERIC] computer database using the keywords “teacher professional learning” and “impact” since 2000, identified a number of outstanding themes in the scholarly literature that outline how teachers learn and change their pedagogic practice in relation to their professional learning

experiences. One key theme in the literature is the “range” of professional learning models and their suggested levels of “impact” on student learning (Karagiorgi & Kyriacos, 2006; Shenton & Pagett, 2007; Wright, et al., 2008). Karagiorgi & Charalambous (2006) investigated teacher perceptions of professional learning in “Information and Computer Technologies” [ICT]. They found that flexible training activities that enabled teachers to “pick and mix” activities to increase relevance to their particular local contexts, were regarded more highly by teachers, and the impact on classroom teaching was greater as a result. This finding was confirmed by Berg, Grisham, Jacobs & Mathison (2000), and Shenton & Pagett (2007) who found impact varies in different classrooms in relation to varying levels of teacher expertise and experience. They advocate practitioner based models of professional learning linking theory and practice, using a ‘bottom up’ approach where teachers support each other in their learning, with additional local support from visiting experts who focus on content (Osmundson & Herman, 2005; Shenton & Pagett, 2007). This finding supports an earlier finding attributed to Stanovich (1993) who identified the essential role of teachers’ pedagogical content knowledge in the learning process at school.

The importance of considering the local context when delivering collaborative professional learning is widely recognised (Aubusson, et al., 2005; Borko, 2004; Chung Wei, Darling-Hammond, Andre, Richardson, & Orphanos, 2009; Gerston, Chard, & Baker, 2000).

Bantwani (2009) outlines a professional learning model used in South Africa to implement a natural science curriculum. Due to the lack of consideration for the local context, the external professional learning model used impacted negatively on the implementation of the new curriculum. It is generally agreed professional learning models that address local contexts, with external support, are more likely to positively impact on teacher learning and classroom practice (Chung Wei, et al., 2009; Ewing, et al., 2010; Hargreaves, Fullan, Senge, &

Robinson, 2007; Yendol Hoppey & Fichtman, 2010). Wright, Konza, Hearne and Okely (2008), researched the impact of the Gold Medal Fitness Program in NSW schools, as a model for teacher change. An action research “Quality Teaching and Learning Materials” model was used that included workshops for teachers, in- school support and materials designed to improve teachers’ skills and knowledge. Students’ levels of fitness improved and teachers expressed increased confidence in teaching physical education as a result of their involvement in the program. In the short term, the model was identified as a successful mode of professional learning, however it was acknowledged in this study “impact” was difficult to determine in the longer term.

A major factor of school success is the quality of teaching that is provided to students (Ewing, et al., 2010; Gore & Ladwig, 2006; Thomas, 2005). It is increasingly challenging for teachers to find a workable balance between providing quality teaching with varied and rich curriculum when they are feeling pressured to prepare students for narrowly focused external examinations. It is generally accepted effective professional learning improves outcomes for students, yet improved student outcomes are not always reflected in external test data. The contentious link between the use of data to inform teaching and the impact of professional learning is outlined in the literature (Boardman & Woodruff, 2004; Davies, 2010; Mitchell, 2007). Schools and districts that place great emphasis on external assessment data results may negatively impact on what is actually taught in classrooms as teachers, due to political pressure, increasingly focus on teaching ‘to the test’, which assesses only a narrow section of the curriculum. Using ‘high stakes’ assessment to evaluate classroom teaching does not always align with quality teaching and assessment practices (Boardman & Woodruff, 2004) However, sometimes the political context can provide a catalyst for an improved focus in a particular area. Bailey (2010) found a school wide effort to improve mathematics in response

to the United States government “No Child Left Behind” mandate resulted in improvements in teacher knowledge, skills and dispositions and significantly improved student learning outcomes. Davies (2010) and Boardman et al.,(2004) questioned whether “measuring impact” of professional learning programs using narrow data was valid as other unrelated influences may have been responsible for increased student performance and/ or improved teacher attitudes. Schools that sustain their learning, have built into their culture the regular analysis of a range of school based and external data during professional learning, to aid planning, and inform teaching (Bailey, 2010; Mitchell, 2007; Smith, 2006). Through this iterative process, professional learning communities are formed that support and empower teachers to change their practice, to accommodate the ongoing identified needs of students (Smith, 2006). According to Little (2005), “academic achievement is greater in schools where teachers report high levels of collective responsibility for student learning” (p. 238), a view supported in the literature by Kruse & Louis (2009), and Aubusson, Ewing and Hoban (2009) who acknowledge the importance of all teachers “owning” the responsibility and accountability for student learning if it is to be sustained.

The importance of addressing teacher dispositions in professional learning is a prominent theme in the “Impact of Professional Learning” literature. Teacher dispositions are those implicit attitudes, values and beliefs that underpin teachers work (Ritchhart, 2001; Sunley & Locke, 2010; Thornton, 2006). Bobis (2004) investigated teacher beliefs and perceptions in relation to the Count Me In Too [CMIT] Mathematics professional development program that was implemented in various forms across NSW primary schools from 1996, and across New Zealand from 2001 (Bobis, 2004; Thomas, 2005). The CMIT model focuses on long term classroom based learning through the establishment of communities of learners. In this study, the teachers identified the most effective aspects of the program were the focus on content,

assessments, support from external sources and the opportunities to share ideas with interested colleagues. A number of concerns were also identified in the study. These concerns were based around a lack of time and resources to implement the program, classroom management issues related to group work and teacher feelings of “information overload”. Irrespective of the identified concerns, teachers strongly indicated they would continue with CMIT in their classrooms because they believed the program ultimately benefitted their students. Improved student outcomes data supported their views (Bobis 2004, Thomas & Ward 2001), which further supported and rewarded teachers’ high efficacy perceptions of the program.

Teacher dispositions impact on teachers’ professional practice, and must be addressed if professional learning is to be embedded and sustained (Ainscow, 2005; Borko, 2004; Sunley & Locke, 2010). Okhee, Buxton & Shaver (2007) investigated teacher beliefs and practices in relation to the importance of cultural diversity and language in the teaching of elementary science. After a two year intervention, it was found that although teacher beliefs in relation to the importance of integrating students’ home languages in the teaching of science showed positive changes, there was no evidence to suggest teachers had changed their in- class practices. Reasons for the limited success of the professional learning program were offered by Okhee et al.,(2007). Firstly, teacher beliefs are complex and deep. Recognising the importance of infusing students’ language and culture into science instruction requires a variety of supportive structures that may not have been adequately covered in the project. The intervention was not sufficient to affect a major change in teacher dispositions. Additionally, it was found many of the teachers in the project were not confident in their Science content knowledge, so expecting them to address language and cultural experiences in addition to implementing the science curriculum was a task they were not adequately equipped to

address. Thirdly, the intervention was a school wide one. The researchers questioned whether the structures were in place at the school level to sustain the learning. Insufficient designated time for teachers to reflect and plan learning activities together, and limited support from the school leadership were identified issues that contributed to the lack of impact of the program. Unless teachers have the opportunity to investigate their patterns of thinking in relation to what they are learning, and have opportunities to question their core beliefs, the professional learning is unlikely to change teachers' classroom practice (Ritchhart, 2001).

It is difficult to attribute an improvement in student learning to specific professional learning programs as schools are complex systems. Many factors can impact on student and teacher learning. However, some large scale empirical studies have attempted to establish a link between student learning and teachers' involvement in professional learning, with varying levels of success. (Barber, 2005; Joyce & Calhoun, 2010; Little, 1999). Gore and Ladwig (2006) reported on the impact of professional learning on pedagogy, as part of the 'Systemic Implications of Pedagogy and Achievement in NSW Public Schools' (SIPA) Study, a four year longitudinal study that "investigated the relationships between teachers' professional learning, the quality of pedagogy and student achievement" (Ladwig, Smith, Gore, Amosa, & Griffiths, 2007 p. 5) in NSW state schools. Findings from this study indicated that links between professional learning and pedagogy were not particularly strong. Several possible explanations were provided for this finding. Reasons were:

1. The quality of the professional learning was weak. This may have been due to the fidelity of implementation of professional learning resources related to the reform at the school level, including the range of expertise of presenters. As a result, teachers

did not regard the professional learning as effective, and it was not sustained over time.

2. There was a degree of resistance to the reform. Teachers expressed concern the model could potentially be used to “judge their teaching” (Gore & Ladwig, 2006, p. 19), and were reluctant to engage with it as a result. Greater focus on teacher dispositions during the implementation phase may have ensured teachers were more open to adopting the change.
3. Many definitions of teacher dispositions abound, but in terms of the implementation of the program and lack of engagement by some teachers, the definition put forward by Thornton (2006) is relevant. She states dispositions are “the values and commitments that define teachers performance” (p.54). To be effective and sustained, professional learning needs to encompass three aspects of teacher learning. They are knowledge, practice and dispositions (Sunley & Locke, 2010; Thornton, 2006; Ainscow 2005).
4. System support was not strong enough to ensure all schools deeply engaged with the reform. For serious engagement to occur, systems and school leaders need to continue to focus on, and support teachers in improving the quality of their pedagogy over time. In SIPA, teachers expressed the view from an historical perspective systems change is rarely sustained, and this sceptical view prevented teachers from deeply engaging with the project.
5. Data were collected a short time after the professional learning support materials were distributed to schools. It was reported that the system may have been at the beginning of a change process. Not enough time had elapsed from the time of implementation of the project for the professional learning to impact on classroom practice and be sustained. (Gore & Ladwig, 2006 p. 18- 21)

Although a causal link has been suggested between professional learning and improved student outcomes (Guskey, 2002; Ingvarson, Meiers, & Beavis, 2005), the SIPA study findings suggest one does not necessarily lead to the other (Gore & Ladwig 2006). Improved student outcomes are powerful indicators of the success of professional learning programs, however the impact of professional learning on teacher knowledge and classroom practice is also important, as teacher learning outcomes support student learning (Chung Wei, et al., 2009). Overall, few studies have attempted to establish the link between professional learning and improved student outcomes in the literature (Chung Wei, et al., 2009; Saxe, Gearheart, & Nasir, 2001).

Sustainability

Studies throughout the world have attempted to determine what makes professional learning ‘stick’ in the longer term. In relation to professional learning in schools, “sustainability” refers to the conditions that make the learning continue to exist after the initial intervention has ceased. What sustains professional learning and how can schools ensure outcomes achieved are sustained over the longer term? A search of the professional learning literature over the past ten years using the ERIC database retrieved scholarly articles that included the keywords “teacher professional learning and sustainability”.

An overarching theme of the literature is the documented success of teachers learning together in groups being a powerful form of professional learning, commonly referred to as “professional learning communities” (Goos, Dole, & Makar, 2007; Hipp, Huffman, Pankake, & Oliver, 2008; Wood, 2007). This literature indicates collegial support provided through the existence of professional learning communities in schools is a major determinant as to whether improvements that resulted from professional learning are sustained.

Saunders et al.,(2009) investigated schools that used a professional learning community model of professional learning in comparison to schools that used more traditional forms of professional learning across a school district over 5 years, and compared student outcomes in the form of state and national testing results between the two groups of schools. It was found there was no significant difference between the two groups of schools for the first two years, but a positive impact was evident in schools that focused on collaborative models of professional learning for the next three years, suggesting it takes time for change to be adopted and implemented in schools.

Hipp, Huffman, Pankake & Oliver (2009) examined the relationship between professional learning communities and school culture. They investigated the two most successful schools that built and sustained professional learning communities, identified in a larger federal project entitled “Creating Communities of Continuous Inquiry and Improvement”, from 1998- 2000. It was found reculturing schools as professional learning communities involved schools moving through Fullan’s three levels of change, from initiation to implementation to institutionalization or sustainability (Fullan, 2005; Stoll, Bolam, Wallace, & Thomas, 2006). Although school contexts differ, successful strategies have been identified across schools that may assist others in developing professional learning communities. These are:

- Change must be embedded into the day to day learning of the school and
- Collaboration is clearly focused on linking instructional practice to student outcomes.

School leaders have a crucial role in supporting collaborative professional learning in schools. Hipp, Huffman, Pankake and Oliver (2009) identify the importance of “distributed leadership” – leadership distributed across the school as well as leaders being actively

involved in the change effort. These findings are supported by Reeves (2009); Timperley et al.,(2007); Du Four et al., (2010); Hord (1997) and Lave & Wenger (1991) who all identify active leadership in professional learning as an essential and identifying attribute of professional learning communities in schools.

The investigation of finite collaborative learning projects offer insights into whether reform efforts are sustained, either by individual teachers, or the degree to which the learning results in whole school change. Kilbane(2009) investigated factors in sustaining professional learning communities through schools that received government funding for a reform effort in Indiana, USA, four years previously (it was a retrospective study). Kilbane found elements of reform interventions in a school must be complimentary to provide the coherence necessary to sustain change. Coherence is required between school, district and state level reform and is dependent on the elements of professional learning, professional culture, school environment, leadership and school goals all working together to support the change in the school (Fullan, 2008; Kilbane, 2009; Taylor, Pearson, Peterson, & Rodriguez, 2005).

Although the exception, some collaborative professional learning projects have resulted in long term sustainability. Erickson, Brandes, Mitchell & Mitchell (2005) reported on two collaborative action research projects implemented in Australia and Canada in the 1990s. The Australian project was called the “Australian Project for Enhanced Effective Learning” [PEEL] and the Canadian project was called the “Learning Strategies Group” [LSG]. Both projects focused on building sustainable school and university partnerships. The principle underpinning the PEEL and LSG projects was the need for teachers to generate educational theory by investigating their practice in context in order to make sense of what they do. The

projects involved interested teachers meeting regularly to solve classroom based issues related to student learning. The project's driver was regarded by teacher participants as highly credible as he worked across schools and university in a dual teaching role. The projects were voluntary and unfunded, at the specific request of the teachers involved. They believed by accepting external funding they would be accountable to an external body and would forfeit their autonomy (Erickson et al., 2007).

PEEL has operated successfully for more than 25 years, is now self funded through the production and sale of resource materials for teachers, and local versions of the program have been established in Denmark, Sweden, China and Mongolia (Mitchell, personal communication, February 2, 2011). The original LSG project in Canada ceased after 5 years due to the original organisers moving to other institutions and programs, however the professional learning model used for the LSG project has been the basis of other collaborative professional learning programs in Canada and China (Erickson, personal communication, 5 February, 2011). The long term sustainability of PEEL attests to the fact that professional learning is most meaningful when teachers have responsibility for the design and implementation of their own learning, and when the learning is closely connected to their everyday work in classrooms.

Although the model of teachers working collaboratively in groups for professional learning is identified in the recent literature as potentially one of the most powerful forms of professional learning, it does not necessarily lead to teacher learning and student improvement. Brownell et al.,(2006) demonstrated that teachers benefit from collaboration to varying degrees. They determined that teachers whose views differed markedly from the group were least likely to

benefit from collaboration, emphasising the importance of initially creating a shared theoretical and knowledge base among the group. Knowledge, skills and beliefs work together to enable teachers to adopt change that leads to improved student learning. Brownell et al., determined that personal qualities do play a role in teachers acquiring and using practices adopted in collaborative professional learning activities and this has implications for structuring learning so all teachers and their students benefit. Stoll et al., (2006) refer to this phenomenon as “an individual’s orientation to change” (p. 226) and state “attention needs to be paid to factors that inhibit or facilitate learning” (p. 244) for individual members of professional learning communities in order them to be successfully sustained in schools.

In the U.K., Barber (2002) investigated the sustainability of professional learning through the government “Literacy and Numeracy Strategy” initiative after 6 years. For the first 4 years of the project, proficiency in literacy and numeracy increased markedly across the country from 60 to 70%. After the initial significant improvement, results plateaued and remained the same for the next three years, even though the intervention became more intensive. Some research suggests for learning to be sustained, it has to be deep, engaging and significant (Bereiter, 2002; Claxton, 2002; Earl et al., 2003). Fullan (2005) supports this view of what sustains change, and adds that when learning is heavily centrally driven it is generally not sustained. According to Fullan, successful collaborative professional learning projects that are overseen centrally but managed and implemented locally, result in the greater sustained improvements in classroom practice.

Conclusion

Knowledge in relation to what sustains professional learning is expanding but is by no means complete (Gerston, et al., 2000). Collaborative professional learning has the potential to

improve teacher quality and positively impact on student learning, and there are lessons that can be learned from the literature that schools and systems can adopt to maximize the impact and sustainability of collaborative professional learning- making the learning 'stick' in the longer term. All schools strive to provide effective professional learning for teachers because it is widely acknowledged effective teacher professional learning leads to improved learning outcomes for students. The key indicator of effective professional learning, however is whether it changes teachers' practice in the classroom, where it ultimately counts.

References

- Ainscow, M. (2005). *The next big challenge: inclusive school improvement*. Paper presented at the Conference of School Effectiveness and Improvement. Barcelona, Spain: University of Manchester.
- Aubusson, P., Brady, L., & Dinham, S. (2005). *Action Learning: What works?* Retrieved 30 January, 2009 from www.qtp.nsw.edu.au
- Aubusson, P., Ewing, R., Hoban, G. (2009) *Action Learning in Schools- reframing teachers' professional learning and development*. NY: Routledge.
- Bailey, L. (2010). Impact of sustained, standards based professional learning on second and third grade teachers' content and pedagogical knowledge in integrated mathematics *Early Childhood Education Journal*, 38(2), 123-132.
- Bantwini, B. (2009). District professional development models as a way to introduce primary school teachers to natural science curriculum reforms in one district in South Africa. *Journal of Education for Teaching: International Research and Pedagogy*, 35(2), 169-183.

- Barber, M. (2002). *From good to great: large scale reform in England*. Paper presented at the Futures of Education Conference. Zurich: University of Zurich.
- Barber, M. (2005). National strategies for educational reform: lessons from the British experience since 1988,. In M. Fullan (Ed.), *Fundamental Change: International Handbook of Educational Change*, (p. 73- 97). The Netherlands: Springer.
- Bereiter, C. (2002). *Education and Mind in the Knowledge Age*. Mahwah, JH: Laurence Erlbaum.
- Berg, M., Grisham, D., Jacobs, V., & Mathison, C. (2000). *Can a professional development school have a lasting impact on teachers beliefs and practices?* Paper presented at the American Educational Research Association Annual Conference. New Orleans: American Education Research Association.
- Boardman, A., & Woodruff, A. (2004). Teacher change and “high-stakes” assessment: what happens to professional development? *Teaching and Teacher Education*, 20(6), 545-557.
- Bobis, J. (2004). *For the Sake of the Children: maintaining the momentum of a professional development program*. Paper presented at the Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 2004.
Retrieved 10 January 2011, from http://www-sbras.ict.nsk.su/EMIS/proceedings/PME28/RR/RR029_Bobis.pdf
- Borko, H. (2004). Professional development and teacher learning: mapping the terrain. *Educational Researcher*, 33(8), 1- 49.
- Brownell, M., Adams, A., Sindelar, P., Waldron, N., & Vanhover, S. (2006). Learning from collaboration: the role of teacher qualities. *Exceptional Children*, 72(2), 169-185.
- Chung Wei, R., Darling-Hammond, L., Andre, A., Richardson, N., & Orphanos, S. (2009). *Professional Learning in the Learning Profession: a status report on teacher*

development in the United states and abroad. National Staff Development Council.
Dallas, TX: NSDC.

Claxton, G. (2002). *Building learning power.* Bristol, UK: Henleaze House.

Davies, D. (2010). What's changed? Issues of impact and evaluation in primary science professional development. *Professional Development in Education, 36*(3), 511-524.

Du Four, R., Du Four, R., & Eaker, R. (2010). *Recurring themes of professional learning communities and the assumptions they challenge.* New York: Hawker- Brownlow.

Duncombe, R., & Armour, K. (2004). Collaborative professional learning: from theory to practice. *Journal of Inservice Education, 30*(1), 141-166.

Earl L., Watson N., Levin B., Leithwood K., Fullan M., & Torrence, N. (2003). *Final Report of the external evaluation of England's national literacy and numeracy strategy.* Ontario: University of Toronto.

Erickson, G., Brandes, G., Mitchell, I., & Mitchell, J. (2005). Collaborative teacher learning: findings from two professional development projects. *Teaching and Teacher Education, 21*, 787- 798.

Ewing, R., Groundwater- Smith, S., Mockler, N., Loughland, T., Simpson, A., Smith, D., et al. (2010). *Meta Analysis of Quality Teaching Action Learning Project.* Sydney: University of Sydney.

Fullan, M. (2005). *Leadership and Sustainability: system thinkers in action* Thousand Oaks, CAL: Corwin.

Fullan, M. (2008). The Six Secrets of Change. Retrieved 16 December 2010 from www.michaelfullan.ca/resource_assets/.../08_Keynote_US.pdf

Gerston, R., Chard, D., & Baker, S. (2000). Factors enhancing sustained use of research-based instructional practices. *Journal of Learning Disabilities, 33*(5), 445- 457.

- Goos, M., Dole, S., & Makar, K. (2007). Designing Professional Development to Support Teachers' Learning in Complex Environments. *Mathematics Teacher Education and Development*, 8, 23-47.
- Gore, J., & Ladwig, J. (2006). *Professional Development for Pedagogical Impact*. Paper presented at the Australian Association for Research in Education Annual Conference. Retrieved 10 February 2011 from http://www.newcastle.edu.au/staff/research-profile/Jenny_Gore/Publications.html
- Guskey, T. (2002). Professional development and teacher change. *Teachers and teaching: theory and practice*, 8(3/4), 1-11.
- Hargreaves, A., Fullan, M., Senge, P., & Robinson, V. (2007). *The Great Debate*. Paper presented at the New Imagery for Schools and Schooling: challenges, creating and connecting, Sydney.
- Hipp, K., Huffman, J., Pankake, A., & Oliver, D. (2008). Sustaining professional learning communities: Case studies. *Journal of Educational Change*, 9(2), 173-195.
- Hoban, G., Ewing, R., Kervin, L., Anderson, J., & Smith, D. (2005). Final report: evaluative inquiry into the sustainability of professional learning through school based action learning. Retrieved 24 September 2008, from www.dest.gov.au/annualreport/2005/3.htm
- Hord, S. (Ed.). (1997). *Learning together, leading together: changing schools through professional learning communities*. Oxford, Ohio: Teachers College Press.
- Ingvarson, L. (2005). *Getting It Right Symposium- Paper 2*. Paper presented at the ACER Research Conference 2005. Melbourne: ACER.
- Ingvarson, L., Meiers, M., & Beavis, A. (2005). Teaching and learning and leadership professional development for teachers and school leaders: factors affecting the impact

- of professional development programs *Education Policy Analysis Archives*, 13(10).
Retrieved 21 January 2011 from http://research.acer.edu.au/professional_dev/1/
- Joyce, B., & Calhoun, E. (2010). *Models of Professional Development*. Thousand Oaks, CAL: Corwin.
- Karagiorgi, Y., & Kyriacos, C. (2006). ICT inservice training and school practices: in search for the impact. *Journal of Education for Teaching: International Research and Pedagogy*, 32(4), 395-412.
- Kilbane, J. (2009). Factors in sustaining professional learning community. *NASSP Bulletin*, 93(3), 184-205.
- Kruse, S., & Louis, K. (2009). *Building strong school cultures: a guide to leading change*. Thousand Oaks, CA: Corwin.
- Ladwig, J., & Gore, J. (2006). *Professional development for pedagogical impact*. Retrieved 5 November 2010 from http://www.newcastle.edu.au/staff/research-Profile/Jenny_Gore/Publications.html
- Ladwig, J., Smith, M., Gore, J., Amosa, W., & Griffiths, T. (2007). *Quality of pedagogy and student achievement: multi-level replication of authentic pedagogy*. Paper presented at the Australian Association for Research in Education, Fremantle, Western Australia: AARE.
- Lave, J., & Wenger, E. (1991). *Situated Learning: legitimate peripheral participation: learning in doing: social, cognitive and computational perspectives*. Cambridge: Cambridge University Press.
- Little, J. (1999). The Persistence of Privacy: autonomy and initiative in teachers' professional relations., *Teachers College Record*, 91(4), 509- 536.

- Little, J. (2005). Organising schools as learning organisations. In L. Darling- Hammond & G. Sykes (Eds.), *Teaching as the Learning Profession- Handbook of Policy and Practice* (pp. 235-247). San Francisco: Jossey- Bass.
- Loucks-Horsley, S., Stiles, K., Mundry, S., Love, N., & Hewson, P. (2010). *Designing professional development for teachers of science and maths* (3rd ed.): Corwin Press.
- Mitchell, C. (2007). *The use of two professional learning community practices in elementary classrooms and the language arts achievement of California's most at- risk student subgroup in a southern Californian school district.*
- New South Wales Department of Education and Training (2003). *Quality teaching in NSW public schools:discussion paper.* Retrieved 16 March 2010 from www.det.nsw.edu.au/proflearn/areas/qt/resources/htm.
- Okhee, L., Luykx, A., Buxton, C., & Shaver, A. (2007). The challenge of altering elementary school teachers beliefs and practices regarding linguistic and cultural diversity in science instruction. *Journal of Research in Science Teaching*, 44(9), 1269- 1291.
- Osmundson, E., & Herman, J. (2005). Maths and science academy: year 4 evaluation report. Retrieved March19 2011 from <http://www.cse.ucla.edu/products/reports/r648.pdf>
- Reeves, D.(2009). *Leading Change in Your School: How to conquer myths, build commitment, and get results.* Alexandria, VA: ASDC.
- Ritchhart, R. (2001). From IQ to IC: a dispositional view of intelligence. *Roeper Review*, 21(3), 143-150.
- Saunders, W., Goldenberg, C., & Gallimore, R. (2009). Increasing achievement by focusing grade level teams on improving classroom learning: a prospective, quasi experimental study of title 1 schools. *American Educational Research Journal*, 46(4), 1006-1033.

- Saxe, G., Gearheart, M., & Nasir, N. (2001). Enhancing Students' Understanding of Mathematics Teaching: a study of three contrasting approaches to professional support. *The Journal of Mathematics Teacher Education*, 4(1), 55-79.
- Shenton, A., & Pagett, L. (2007). From "bored" to screen: the use of the interactive whiteboard for literacy in six primary classrooms in England. *Literacy*, 41(3), 129-137.
- Smith, J. (2006). What inside track advantage? *Journal of Staff Development*, 27(1), 33-36.
- Stanovich, K. (1993). Romance and Reality *The Reading Teacher*, 47(4), 280-291.
- Stoll, L., Bolam, R., Wallace, M., & Thomas, S. (2006). Professional Learning Communities: a review of the literature. *Journal of Educational Change*, 7(4), 221-258.
- Sunley, R., & Locke, R. (2010). Exploring UK secondary teachers' professional values: an overview of the literature since 2000. *Educational Research*, 52(4), 409-425.
- Taylor, B., Pearson, P., Peterson, D., & Rodriguez, M. (2005). The CIERA School Change Framework: An evidence-based approach to professional development and school reading improvement. *Reading Research Quarterly*, 40(1), 40-69.
- Thomas, S. (2005). Taking Teachers out of the equation: construction of teachers in education policy documents over a ten- year period. *The Australian Educational Researcher*, 32(3), 45- 53.
- Thornton, H. (2006). Dispositions in Action: do dispositions make a difference in practice? *Teacher Education Quarterly*, 33(2), 53-68.
- Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Teacher Professional Learning and Development : Best Evidence Synthesis*. Wellington: University of Auckland.
- Wood, D. (2007). Teachers' learning communities: catalysts for change or a new infrastructure for the status quo? *Teachers College Record*, 109(3), 699-740.

Wright, J., Konza, D., Hearne, D., & Okely, T. (2008). The gold medal fitness program: a model for teacher change. *Physical Education and Sport Pedagogy*, 13(1), 49-64.

Yendol Hoppey, D., & Fichtman Dana, N. (2010). *Powerful Professional Development*. Thousand Oaks, CA: Corwin.