Teachers can make a difference: Professional development as a policy option for improving student learning with ICT[1]

Ron Owston, PhD
Director, Institute for Research on Learning Technologies
York University, Toronto, Canada

One of the best investments a government can make to improve student learning is to invest in teacher professional development. Any policy put into place to infuse ICT into schools that does not have a strong teacher professional development and support strategy will only lead to disappointing results. To support this position, I will argue from the existing literature base that teacher expertise is one of the most influential factors in determining student achievement and that professional development is the best option to develop needed expertise. Then I will illustrate how critical professional development is to support teacher innovation and student learning with ICT. To do this I will draw on a sub-study that I conducted within the Second Information Technology in Education Study – Module 2 (SITES-M2) which examined innovative pedagogical uses of technology in 28 countries. I will conclude with a model for professional development that derives from research linking student achievement with teacher professional development.

Teacher expertise and student achievement

Teachers do make a difference. This is something that parents have known for generations when they ask to have their child moved from one teacher to another because the child cannot learn in the former teacher's class. However, only within the last 10 to 15 years have researchers been able to quantify the magnitude of the effect teachers have on student achievement. This has been done using two different research strategies. The first compares teacher expertise to a host of other socio-economic factors influencing achievement; the second compares the achievement of students in classes of high and low performing teachers.

Two significant studies that compared teacher expertise to other socio-economic factors are: Ferguson's (1991) study of over 2.4 million students in 900 school districts in Texas; and Greenwald, Hedges, and Laine's (1996) meta-analysis of 60 primary research studies on student achievement and a variety of school factors. Ferguson's (1991) analysis showed that teacher expertise is the largest single factor affecting student achievement scores, accounting for 43% of the variance. Teacher expertise was measured by amount of education, scores on a teacher licensing exam, and experience. Other significant factors were a combination of home and school factors, including parent income, language background, race, and location, (49% of the variance) and class and school size (8% of the variance). Greenwald, Hedges, and Laine's (1996) findings were similar, only they expressed them in terms of the effectiveness of spending on a variety of factors.

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They found that for every $500 spent per student, gains of 0.22 test units occurred for increasing teacher education. Lesser amounts were found for increasing teacher experience (0.18), increasing teachers' salaries (0.16), and lowering pupil teacher ratios (0.04).

Sanders and Rivers (1996) carried out in Tennessee one of the most significant studies comparing achievement scores of students in classes of high and low performing teachers. They examined achievement of grade 3 students who were placed in classrooms of highly effective teachers with those in classrooms of the least effective teachers. (Effectiveness was determined simply by looking at the track record of the teachers e.g., whether in the past their students scored consistently high or consistently low.) After just one year students in classes of effective teachers scored 40 percentile points higher than their counterparts on the Tennessee mathematics proficiency tests. Additionally, the Tennessee data show slightly smaller but significant differences for middle and high-achieving groups of students. When the researchers looked at the data longitudinally, by the end of grade 5 students with effective teachers were scoring 50 percentile points higher in mathematics than those in the least effective teachers' classes. As the researchers point out, differences of this magnitude can represent the difference between students being placed in remedial or accelerated school tracks. Other studies conducted in Dallas and Boston show similar longitudinal results and that the effect occurs at the secondary school level as well (Haycock, 1998).

Further evidence of the effect of teacher expertise comes from Darling-Hammond and Ball (1998) who examined teacher education requirements and in-service support of teachers in countries scoring higher than the U.S. on the Third International Mathematics and Science Study (TIMSS). They concluded that in those countries achieving higher than the U.S. "teaching is not only better supported, but it is guided more thoughtfully and adapted more consciously to students' learning needs" (p. 11).

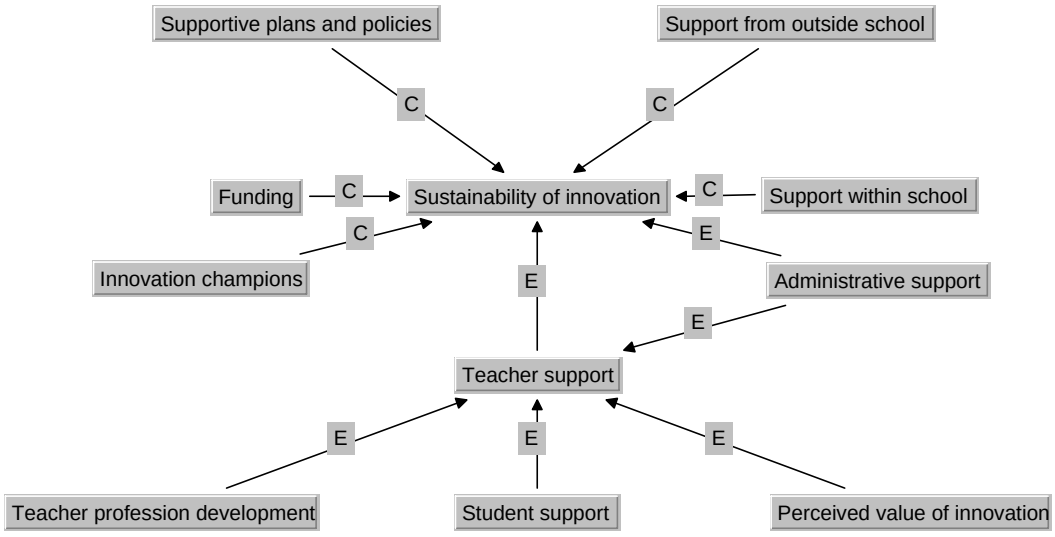
The above studies demonstrate the significance of the influence teacher expertise has on student achievement. Moreover, the effect appears to be cumulative, so that students who do not have strong teachers early on may never recover from this deficit. Teacher expertise may be acquired in many ways: through formal academic education, teacher education courses, and informal learning; however, in-service professional development is an area in which governments can directly invest. Professional development, when structured in specific ways and focusing on areas of the curriculum where students are having difficulties, can have a direct impact on student achievement (Cohen & Hill, 2001; Hiebert, Gallimore, & Stigler, 2002). The structuring of effective professional development will be described in the final section. Before doing so, I will discuss how central a role professional development plays in supporting teacher innovation in the classroom using ICT.

Professional development and teacher innovation using ICT

The SITES-M2 study of innovative pedagogical uses of technology examined 174 schools in North and South America, Africa, Europe, Asia, and Australia. Overall, the schools in the study report a substantial positive impact of their innovation on students:

62% reported increased subject matter acquisition; 68% of schools reported increased student positive attitudes toward learning; and 63% improved collaborative skills (Kozma, 2003). Central to these outcomes was the classroom teacher who—depending on the particular school—designed, implemented, and led the innovation.

I conducted a sub-study of the SITES-M2 data to identify underlying factors that led to some teachers being able to sustain their classroom innovation and others not (Owston, 2003, 2007). From the set of 174 schools, I identified 59 that were able to sustain their innovation beyond two years. The case write-ups of these schools became my data source for the sub-study. Through a qualitative analysis of these data, two sets of factors emerged that explained why these innovations were sustainable—one set labeled *essential*, the other *contributing*. Essential factors were defined as those that my analysis found were necessary, but not sufficient, for innovations to be sustained. Evidence of these factors was found in *all cases* in the sample. Contributing factors were those that appeared in *50% or more* of the cases. These are represented by "E" and "C" respectively in the figure below that shows the factors and their relationships.



Most fundamental to sustaining an innovation is teacher support, for without this, the innovation simply cannot occur. The model posits that when teachers see that students are supportive of the innovation and that it benefits their learning, they tend to invest more time and effort into ensuring its success. As they invest more into the innovation, teachers find that they need to learn more about the pedagogical approach they are using (e.g., project based learning) and the technology itself. This learning came from a variety of sources including formal professional development courses, learning in informal groups with colleagues, or self-study. The model does not distinguish among these types of learning. Indeed, there was evidence of all types of professional learning occurring in the cases I studied. The salient point is that ongoing teacher learning or professional development is essential for classroom innovation to succeed and for students to benefit from ICT.

Important to note for the present discussion is that in the above model supportive policies and plans are a contributing factor for sustainable innovation, rather than an essential one. The SITES-M2 study as a whole reported that 63% of cases were linked to a school ICT plan or policy, 73% to a national ICT policy, and 62% to a national education policy (Kozma, 2003). That a gap exists between national policies and classroom practices which they are intended to influence is not unexpected. The key to closing this gap and increasing student achievement appears to lie with building systemic capacity for change (Fullan, 2005). Centrally informed and prescribed strategies for change can carry a reform initiative only so far and eventually a leveling off of improvement is seen, as witnessed in England's recent national initiative to boost literacy and numeracy achievement (Barber, 2002). In order to move beyond this plateau effect, Barber (2002) believes that reform efforts need to move from an era of "informed prescription" to an era of "informed professional judgment." Characteristics of this era would include removing demands on teachers that are not central to teaching and learning, and providing teachers with more time to engage in professional development and collaborative preparation and assessment.

Effective professional learning strategies

Given the centrality of teacher professional development in promoting student achievement, with or without ICT, the question remains as to what kinds of professional learning strategies are most effective in this pursuit. Research on the relationship between professional development practices and student achievement is now unequivocal: professional development must be long-termed, collaborative, and grounded in the program teachers are teaching and the standards and assessments that they use (Cohen & Hill, 2001; Darling-Hammond & Ball, 1998; Hawley & Valli, 2000). The term PD*LEARN serves as a guide to all of the elements which must be included in professional learning programs for them to have impact on student achievement.

P(ermanent): Professional learning is not an activity that is carried out only several times per year: it must be an ongoing, permanent part of a teacher's professional responsibilities.

D(riven) Professional learning must be driven or guided by an analysis of the gap between student learning expectations and students' actual performance.

L(earning) Consistent with adult learning principles, professional learning must involve teachers in decisions about their own learning. This will increase teacher motivation to learn and decrease cynicism and detachment.

E(mbedded) Professional learning must be "job-embedded" i.e., part of a teacher's everyday job. This principle does not deny out-of-school learning, but emphasizes that the most powerful learning opportunities are those linked to authentic and immediate problems in the classroom.

A(ssessed) Professional learning programs should be assessed to determine their impact on teachers and, ideally, on their impact on student learning. Not

only does this improve accountability of program expenditures, assessment provides feedback on design of future learning programs.

R(elevant) Professional learning must be relevant to their needs by focusing on the subject matter they will be teaching. Information about general instructional strategies (e.g., cooperative learning) or unrelated content enrichment is not effective.

N(etworked) While professional learning should relate to individual needs, it should also involve collaboration or networking with other teachers. When teachers work together they can break down isolation and create a shared understanding of good practice within a school.

ICT fits into this model in two ways. First, when an analysis is undertaken of the gap between where students are in terms of their actual learning and expectations, teachers should give careful thought to how ICT can be used to address this gap. Too often ICT is used indiscriminately in classrooms with no serious consideration given to whether it will help achieve learning objectives (Cuban, 2001). Therefore, teachers should use ICT only if they believe that it will advance student learning effectively toward their goals. Second, ICT can be used to foster teacher learning through online professional learning communities (Dede, 2006). Fully online communities are difficult to implement successfully; consequently a blended approach that combines online experience with face-to-face components offers greater likelihood of developing strong social cohesion and of developing a collective momentum for implementing meaningful change in teaching practices (Wideman, Owston, & Sinitskya, 2007).

Summary and conclusion

There is now compelling research evidence to suggest that teacher expertise can have an immediate as well as a long-lasting effect on student achievement. Moreover, teacher expertise is the single most significant factor, after the combined effects of school and home, that affects student performance. Teacher expertise also plays a critical role in successfully implementing and sustaining classroom pedagogical innovation using ICT. Teachers may acquire expertise in many ways; however the supporting of professional development is one strategy that governments can use to help teachers increase their expertise. To be effective this support must be directed toward implementing professional learning programs that are on-going, school-based, and focused on areas of the curriculum in which students are having difficulties. Governments that invest in teacher learning of this kind will benefit from improved student achievement and ultimately a better educated citizenry.

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