Professional Development and Technology Integration

Literature Review

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**Introduction**

The prevalence of computers in schools, increased use of computers in student’s everyday lives, easy access to technology as tools in instructional settings and the push at all levels for technology integration highlight the need to examine the factors that lead to successful integration of technology into teaching and learning. Among the number of variables that affect technology integration, professional development has been found to be important. However, only certain approaches to professional development support technology integration by teachers. Professional development that is teacher driven, long term, incorporating mentors with “just in time” support in authentic classroom situations and that is clearly linked to gains in student learning appear to be the most effective. This paper reviews recent research literature related to professional development and technology integration. It will summarize, critique common themes and gaps identified in this review.

**Key terms:** technology integration, mentors, professional development, teacher education

**Review of Literature**

Meuller, Wood, Willoughby, Ross and Specht’s (2008) survey research “Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration”, examined characteristics that distinguished teachers who integrated technology from those who did not. A survey was administered, through e-mail, to a random sample of 325 elementary and 325 secondary teachers from a school board in a Canadian city. Due to a 49% return rate, a second mailing was sent to an expanded sample of elementary and secondary teachers within the same board. The final participant sample, 185 elementary and 204 secondary teachers, consisted of a combination of participants from the two samplings. Questions were designed to measure computer related issues; comfort levels, computer use/ training and general constructs such as attitudes, efficacy and demographics. Data was analysed separately for elementary and secondary teachers. Teachers at both levels were grouped into low and high integrators.

Results for elementary teachers suggest that attributes with the strongest correlation for successful integration are positive experiences/comfort with computers, teacher beliefs about computers as an instructional tool, personal computer use, attitudes towards work and amount of professional development. Results were similar for secondary teachers. However the attributes of teacher attitude towards work and amount of computer training showed no significant correlation to technology integration for secondary teachers.

While Meuller et al.’s (2008) results identify specific variables and suggest significant correlations between variables that affect successful integration and instructional practices, there are concerns with their methodology and instrument design. The second sampling of the survey to other schools in the same board may have allowed bias to enter this study as teachers within the board may have discussed the survey questions and answers. The data collected was based one survey that was not included in the study. The inclusion of a copy of the survey may help strengthen the validity of this study. Follow up interviews with all participants would have enhanced the findings.

McGrail’s (2005) collective case study, “Teachers, Technology and Change: English Teachers’ Perspectives”, examines teachers’ attitudes towards technology and perceptions about the links between technology and instructional practices. The literature reviewed suggests teachers’ beliefs about teaching and how students learn, personal attitudes towards technology, confidence levels, lack of professional development affect teachers’ perception of technology and its use in classrooms.

McGrail’s (2005) research focuses on two areas; English teachers attitudes towards technology and their view on how technology changes their instructional practice. Through initial contact with principals researchers gained entry to two schools in Eastern United States, ( an urban inner city high school and a suburban middle school). Principals identified one teacher in each school and these teachers introduced the researcher to other teachers in their school. Total participant population was seven. Technology and demographic profiles were completed. Data was collected through in-depth audio interviews using open ended questions with spontaneous probing questions.

McGrail’s results suggest that teacher attitudes play an important role in determining technology use in classroom practices. Teachers were willing to integrate technology into their classroom practices if they could see gains in student learning and enhancements in their own instructional practice.

McGrail’s findings support results found in the literature review. However, the small sample population used would make it difficult to generalize results across other populations. The use of spontaneous probes during interviews is also problematic as these probes may have permitted researcher bias to enter the interviews.

Franklin, Turner, Kariuki and Duran’s (2001) study, “Mentoring overcomes barriers to technology integration” investigates one on one mentoring as a means to help teachers use technology in teaching and learning. The study involved eight instructional technology doctoral students and eight K – 6 teachers in an elementary school in southeastern Ohio. It was conducted over a 21 week period in the 1998 – 1999 school year. An initial survey was administered to teachers to assess their technology professional development needs and was used to match teachers and mentors based on interests and skill levels. Data was collected from a variety of sources including journal notes, focus group interviews, taped discussions and a review of digital documents and field notes of the graduate student mentors and university faculty members. Data was analysed throughout the study, cycling through collection, reflection and analysis and looping back to more data collection.

Results suggest that one to one mentoring helps to overcome some of the obstacles that interfere with technology integration. The use of mentors helped teachers envision how technology could be used and managed in the classroom, gave them access to technical support and supported them in the design and evaluation of digital projects. Technical skill levels and confidence of all teachers improved over the course of the study.

While Franklin et al.’s (2001) results indicate that mentoring addressed barriers to technology use in teaching and learning, there are concerns with the study’s validity. The study does not indicate whether participating teachers/mentors were male or female or the age of the participants. Would results vary depending on the age or sex of the participant/mentor population? Overall sample size was also problematic. The sample was small and this may affect the generalization of results across populations.

Giordano’s (2007) qualitative, quantitative study, “A professional development model to promote internet integration into p-12 teachers’ practice: a mixed methods study”, investigates the effects of a three year PD model, Project REFLECT (Realizing Education’s Future: Learning through Evolving Cyber Technologies) on the instructional practices, teacher attitudes towards technology and teacher perceptions of the PD model. The focus of this study was on teacher integration of the internet into teaching and learning situations. This PD model is based on the premise that teachers progress through a series of stages over time before fully embracing pedagogical change.

Forty four p – 12 schools participated in the project during the 2000 – 2001 school year. Two lead teachers were identified in each of the schools by school administrators and were trained over an eight week period to integrate the internet into teaching practices. The teams of teachers then returned to their schools, planned and implemented internet instruction to students and professional development for teachers. Data was collected through multiple sources; Stages of Concerns Questionnaire (SoCQ) surveys and interviews, to ensure reliability of the results. The SoCQ is a 35 – item paper/pencil questionnaire developed in the early 1970s to give a quick measure of concerns related to innovations. Surveys were administered three times throughout the professional development, prior to beginning, at the end of the PD and three years after completion. Forty- four of the eighty participants completed the follow-up survey for a 55% return rate. Semi structured interviews were conducted with a representative sample of 10 participants. Information from the follow-up survey was used to form the basis for the interview questions.

Results suggest that changes in teachers’ practices did occur and that some of the changes persisted. Interview results suggest that factors which contribute to these changes were support for the use of internet applications, PD that incorporated authentic experiences, promoted collaboration between teachers, and was applicable to a wide range of educational disciplines and teaching philosophies.

Giordano(2007) used a mixed methods approach and triangulated the data through using multiple sources, but flaws in the study’s validity still exist. The description of the participants was very brief and the make-up of the participant sample for the interviews was not included. Giordano gives an in-depth description of the survey tool, however administration of the tool is not described. Teachers may have compared answers or filled out surveys together which further weakens the validity of results.

Sugar’s (2005) research study, “Instructional technologist as a coach: impact of a situated professional development program on teacher’s technology use” investigates whether technology coaching programs would be an effective professional development model to educate teachers about technology integration. The literature contained in the study suggests that traditional professional development needs to be revised to meet the technology needs of individual teachers. The correlation between isolated workshops and technology implementation is not evident.

Sugar’s (2005) technology coach program study was originally piloted over a six week period during the 2000 – 2001 school year, involving five high school teachers and one technology coach. The program was extended to include two elementary and two middle school teachers from the same school district. The participant sample included six female teachers and three male teachers from diverse curricular areas. Teacher selection was based on three factors; content areas, experience with specific technology and gender. Data was collected from multiple sources over the course of the project. Surveys were administered in the third month, at the end of the project and seven months after the project was finished. As well, school principals’ completed surveys about their staff’s experiences with the coach project. Ninety minute semi structured, taped interviews were conducted with all technology coach participants. Technology coaches kept journals and handouts, student projects and teacher lesson plans were collected. Data was analysed using a comparison technique, making comparisons of the data across all data sources looking for patterns, which were then sorted and coded.

Sugar’s (2005) results show that that eight of the teachers worked on a total of 53 projects and 94% rated fifty of these projects as being effective or very effective and were undecided on the three remaining projects. Principals also rated the coaching project as effective to very effective. All participants felt the technology coach project should continue.

Sugar’s (2005) results indicate a high level of satisfaction for the hands on approach and just in time response to individual teacher needs. The use of multiple sources of data helps strengthen the validity of the results. However the inclusion of the surveys used and more explanation of how surveys were administered would have further strengthened this study’s validity.

Glazer, Hannafin, Polly and Rich’s (2009) study, “Factors and interactions influencing technology integration during situated professional development in an elementary school”, examines factors related to technology integration and collaborative apprenticeships and interactions that influence teacher efforts to integrate technology. The literature reviewed in the study suggests that successful technology training programs include on site, just in time support that addresses individual teacher needs and incorporates ongoing classroom support.

Glazer et al.’s (2009) six month study involved nine fifth grade teachers and two teacher leaders in a suburban elementary school in the southeastern United States. The participant sample was chosen because they had experience with collaboration, a shared repertoire of teaching and learning opportunities and expertise in working on shared goals. The PD was based on the Collaborative Apprenticeship model. PD using this model involves 3 phases; an introduction phase where teacher leaders model activities, a developmental phase where activities are developed collaboratively and finally the proficiency phase where peer teachers design activities. The role of the teacher leaders shifted as teachers moved through the phases from a direct modelling role to one of support and evaluation of performance to encourage individual teacher and community learning connected to technology enhanced curriculum and instruction. Data was collected from a variety of sources including interviews, field notes and reflective journals. Informal interviews were carried out throughout the study in response to teacher needs.

Results suggest that the use of a Collaborative Apprenticeship model supports individual teachers learning and collective community learning. Five of the teacher participants reached proficiency or mastery levels, two teachers reached developmental levels and two teachers remained at the introductory level at the end of the study.

Glazer et al.’s use of multiple sources of data and submitting findings for a member check helps strengthen this study’s validity. The inclusion of a copy of the interview questions may help further strengthen the validity of the study.

Brinkerhoff’s (2006) study, “Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices”, evaluates the effectiveness of a long duration technology professional development academy on the barriers which affect technology integration. In the literature reviewed, four barriers were identified; resources, institutional and administrative barriers, training and experience, and attitude and personality factors.

The professional development academy took place from June 2003 to May 2005 at a large southwestern university. The PD sessions were delivered by Brinkerhoff and a technology instructor in four separate blocks; fifteen day sessions in the summer 2003 and 2004, five individual in-service days in the 2003 – 2004 and the 2004 – 2005 school year. Participants were recruited from school districts throughout New Mexico by applications sent to all district schools. All applicants had to include a letter of recommendation from administrators or colleagues and a description of their experience. Participant sample consisted of 24 females and one male teacher from elementary and middle schools. Six participants dropped out by the end of the first year and were replaced by six females. The professional development sessions were designed to address one identified technology barrier at a time. By the end of the final session all barriers had been addressed. Data was collected through surveys administered on the first and last days of the 2003 summer session and last day of the academy, and a representative sample of six teachers were given audio - taped interviews.

Results suggest that this approach was successful in addressing teachers’ technology skills, computer self efficacy and teacher beliefs. However, no significant change occurred for technology integration.

Although Brinkerhoff limited data analysis to participants who had completed all three surveys, the study has some flaws which weaken its validity. The percentage of male and female participants and elementary versus middle school teachers was not equal. This inequality may have skewed results.

**Synthesis of the Literature**

The collection of studies reviewed used a variety of research methods to investigate the professional development approaches and their effect on technology integration into classroom practices. While all studies need to strengthen validity of results, some significant conclusions can be drawn from the literature.

Professional development that leads to successful technology integration is a complicated, multifaceted process. No single factor in and of itself will lead to teachers fully integrating technology into teaching and learning in classrooms.

According to Giordano (2007) “The teacher is the gatekeeper of change in the classroom, and professional development designed to change teacher practice must be guided by and integrated with teachers’ existing values, valences, knowledge and behaviours”. (p. 123)

As a whole, this set of articles underlines the importance for teachers to recognize and value technology as a tool that will improve instructional practice and enhance student learning of outcomes. Teacher opportunities to view successful technology integration in authentic classroom situations, time to plan, share and brainstorm lessons and access to ongoing, just in time support may enable teachers to realize the value of the use of technology as instructional tools and lead to successful integration.

McGrail(2005) and Meuller et al.(2008) and Giordano (2007) highlight the need for positive experiences with the integration of technology in the context of authentic instructional practice. Time commitment on the part of teachers to practice technologies is another prevalent theme in the literature. Franklin et al.(2001), Glazer et. al.(2009), Sugar(2005), Brinkerhoff (2006) and Giordano (2007) all suggest that the use of mentors in technology professional development address the individual technology needs of teachers in a just in time fashion and leads to positive change in teachers use of technology in teaching and learning situations. Brinkerhoff (2006) results did not support my thesis that long term professional development will impact technology integration. Although the professional development in the study took place over two years actual professional development sessions took place in isolated fifteen day and five day chunks outside of the school setting. Franklin et al.(2001), Glazer et. al.(2009), Sugar(2005) and Giordano (2007) all highlight the importance of mentors being on site, providing just in time support, to help teachers in their technology integration endeavours.

**Conclusion**

Technology integration is an active process defined by individual teacher qualities, levels of technology competency, technology professional development and school contexts. The integration of technology into the teaching and learning that occurs in the classroom is not a simple task. Just providing teachers with technology and PD that addresses how to use the technology does not ensure that it will be used to enhance teaching and learning. Whether teachers fully integrate technology is based on a myriad of variables, with professional development being a key factor. Further research on the effectiveness of technology professional development and technology integration is important considering the prevalence of technology in our classrooms and the impetus for teachers to integrate these technologies in teaching and learning situations. A study of professional development that incorporates the factors identified in the literature as impacting technology integration such as the use of on-site technology mentors and a clear definition of how technology tools are linked to student learning would be helpful. The use of rigorous research standards in future studies would help ensure the validity of the results.

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technology skills, computer self-efficacy, and technology integration beliefs and practices.

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