

Mistaking the tool for the outcome: Using activity system theory to understand the complexity of teacher technophobia

Margaret Lloyd
QUT, Australia
mm.lloyd@qut.edu.au

Peter Albion
USQ, Australia
albion@usq.edu.au

Abstract: The blame for the reputed failure of schools to embrace information and communication technologies (ICT) and the relegation of new technologies to the periphery of school life is frequently placed directly on the technophobic teacher. In this paper, we question this simplistic and singular placement of blame on such individuals and, in so doing, address the complexity of teacher beliefs and dispositions. In revisiting interview data and mapping against activity system theory, we have discerned a common misconception among technophobic teachers of “othering” technology and believing classroom integration to be concerned with teaching about, rather than with or through, ICT. We cautiously conclude that those perceived as technophobic are in fact mistaking the tool for the outcome and that the problem of teacher technophobia is a misunderstanding of the roles of the components within the activity system.

Introduction

Teachers who are reluctant users of information and communication technologies (ICT) are often labelled as being “technophobe, or too traditional in their teaching style, or reluctant to adopt change” (Watson, 2001, p. 253). Bailey’s (2000) description of teachers as the “rank and file implementers of change” (p. 112) suggests that they are at the centre of school reform. From these observations, it is a simple step to the null hypothesis that if the educational system as a whole has not changed, then it is teachers, particularly reluctant teachers, who are to blame. Adding to the growing body of research into the phenomena of teacher resistance to ICT in education (Eraut, Pearce, Stanley & Steadman, 1991; Gillman, 1989; Maslen, 1995), the review described in this paper questions what has become a somewhat simplistic and singular placement of blame on individuals through the original approach of mapping teacher perceptions to an activity systems framework (Engestrom, 1987). We believed teacher technophobia to be a complex matter worthy of closer scrutiny and agreed with the notion that we “need to examine the life of practicing teachers and develop resources that address reasons and excuses, real or imagined, for slower adoption of ICT” (Backhouse, 2003, paragraph 1).

Categorisation of teacher development

A review of the literature concerning teacher adoption and curricular integration of ICT reveals a number of developmental schemas (Dwyer, 1995; Hall & Hord, 1987; King, 2001; Mevarech, 1997; Russell, 1995). Each extant schema suggests a progression, often in an iterative cycle, and each shares a pattern of increasing confidence and adaptation. Individuals are deemed to begin in an embryonic stage (which Mevarech (1997) referred to as “survival” and others called “awareness” (Hall & Hord, 1987; Russell, 1995)). The final stage in all schemas is one which is typified by a reinvention or creative application. All schemas show an increasing transparency of technology and a shift towards using technology in ways to support broader pedagogical goals. One of the most widely-used schemas emerged from the ACOT (Apple Classrooms of Tomorrow) research and is one which categorises teachers in five steps labelled as entry, adoption, adaptation, appropriation and invention (Dwyer, 1995).

The “stages of concern” schema (Hall & Hord, 1987), seminal in understanding the adoption of new technologies, was developed through rigorous empirical methods with a large sample population of teachers. The “stages” are readily transferable to any study of the acceptance and adoption of ICT in the classroom. This schema has seven levels beginning with Level 0 (Awareness) and culminating at Level 6 (Refocussing). The three subjects (case studies) discussed in this paper have all been deemed as being at Level 0 and will be referred to as Level 0 teachers.

In likening ICT adoption to a “journey of transformation,” King (2001) described the first step as one characterised by fear, uncertainty, disorientation and self-examination. Teachers at this introductory level have elsewhere been described as “neonatal” (Crystal, 2001) which, through its analogy to infancy, carries an implicit determinism for growth. The Level 0 teachers in this paper have consciously or unconsciously resolved not to grow and neither have they undertaken the personal journey of change (King, 2001) implicit in the extant developmental schema. This does not mean however that their students have had no ICT experience as the Level 0 teachers described in this paper have managed to “walk the walk” by adopting alternate subversive strategies to comply with system requirements and sociological pressure. These teachers have not grown or changed because they simply do not want to and their behaviors confirm the contention that to adopt and integrate technology in the classroom “is complex and involves the head and the heart, the personal and the professional” (Day & Roberts-Holmes, 1998, p. 29). In this instance, the metaphorical journey cannot begin without the cooperation and commitment of the traveller.

It has long been held that computers and related ICT are not like other machines – they exert a unique power over us and change irrevocably the environments they mediate (Postman, 1995; Turkle, 1984, 1996). Technologies are said to change our definition of who we are and how we relate to others (Abbott, 2001; Bolter, 1996). Given this, it is not enough to see the integration of ICT in classrooms as being about skill acquisition or superficial changes in teacher practice, we need to address the issue as an intriguing complex of teacher identity, beliefs and mental models (Albion, 1999). This paper aims to take a closer (arguably more personal and sympathetic) look at the Level 0 teacher who is more usually described pejoratively as a “middle-aged technophobe” (Maslen, 1995, p. 112) or laggard and compared unfavorably with early adopters.

Method

This paper revisits three case studies from two previous research projects (Lloyd & McRobbie, 2003; Lloyd & Yelland, 2003) both concerned with the adoption and integration of ICT in the classroom. Each of the case studies (here referred to as Teacher A, B and C respectively) were individuals identified as Level 0 teachers. Interview data and field notes relating to these three subjects were re-assessed in terms of Activity Systems Theory (Engestrom, 1987) and, through this process, have revealed new insights into the beliefs and perceptions of the Level 0 teacher.

Subjects

The subjects for this review are three primary (P-7) school teachers (Teacher A, B and C) who could be categorised as Level 0 in their limited experience and restricted adoption of ICT in the classroom. Each was of a similar age (50-55 years) and each was a career teacher having begun teaching around age 20. All had worked within the state educational system since graduation (with some breaks related to family rearing for the females) and all had been at their current school for a lengthy period (each in excess of 12 years). All were thought to be “good” teachers and were respected within the school and local community. Each presented as a warm, caring, dedicated but somewhat “old-fashioned” teacher. Each was articulate and empathetic. Table 1 provides additional details related to their characteristics and current schooling responsibilities.

Identifier	Gender	School location	Level of Schooling Taught	Data Source
Teacher A	Female	Urban	Upper Primary (Year 7)	Lloyd & Yelland (2003)
Teacher B	Female	Regional Town	Early-Middle Years (Year 3-4)	Lloyd & McRobbie (2003)
Teacher C	Male	Rural Town	Early Years (Year 3)	Lloyd & McRobbie (2003)

Table 1: Details of subjects

The schools (referred to as Schools A, B and C) were very different in the culture of innovation and collegiality they displayed. They similarly differed in the emotional and technical support offered to teachers, particularly beginning teachers and those at Level 0. The most positive was School C where vibrant leadership saw highly innovative practices being adopted in the design of learning spaces and in the encouragement given to students to manage their own learning (assisted by technology). Schools A and B were more conservative with School B having some isolated instances of teachers adopting innovative practice in their own classrooms. In Schools A and B, little was shared and there was little discernible leadership or evidence of collaboration between teachers.

Data analysis

The data for this review, as previously noted, was taken from interview transcripts and field notes from two previous studies (Lloyd & McRobbie, 2003; Lloyd & Yelland, 2003). This data was mapped against an activity systems

framework (Engestrom, 1987) which proved effective in providing us with new insights into the Level 0 teacher. Activity Systems Theory is of particular use in analysing interactions within workplaces (activity systems) where a common goal is shared but in which individuals hold differing contributory roles. Romeo and Walker (2001) used Activity Systems Theory to investigate the implementation of ICTE in a Victorian primary school where the school setting was the activity system under review. The “activity” within the activity system is the carrying out of socially-formulated, goal-directed actions with the help of mediating tools (Wertsch, 1981). In the analysis in this review, the activity is teaching and the activity system is a classroom or the teacher’s individual practice.

The components of an activity system are subject, rules, tools, community, division of labor, and object. The object has a direct link to the outcome or over-arching goal. The operations and interactions, that is, the activity of the activity system is viewed from the perception of the subject and, in most instances, the responses of each subject are recorded in turn as multiple case studies. The analysis of an activity system emerges from the mediation of one component by another and the multiple relations within the triangular structure of activity (See Figure 1).

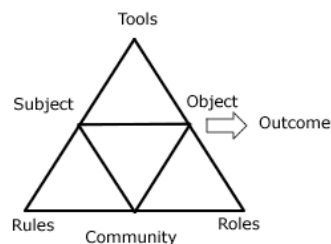


Figure 1: An activity system (after University of Finland, 2001)

Findings

For the purposes of this paper, the findings of our review will be grouped under a discussion of the components of an activity system, that is, subject, rules, tools, community, division of labor, and object.

Subject

In an activity system, the “subject” is the individual or sub-group whose agency is chosen as the point of view in the analysis. As previously noted, the subjects of this review are three Level 0 teachers recalled from previous studies (Teachers A, B and C). Subjects always view the components of an activity system in different, personalized, partially overlapping and partially conflicting ways.

The common characteristics of the subjects were that, despite being neither incompetent nor inexperienced, they:

1. shared a mental model of a teacher as someone who was expert. Teacher A reported her discomfiture to her Principal “that the children knew what to do and she did not” (Lloyd & Yelland, 2003, p. 90). Teacher B (in interview) offered that “before I do anything with the kids, I have to be confident that, if something goes wrong, there’s a chance I can fix it. If I don’t have that confidence, then I don’t put myself in that position.”
2. shared a mental model of a student as someone who was inexpert. Teacher B was alarmed at the freedom and independence given to students in other schools asking “Isn’t this expensive stuff? I’m just blown away by [teachers] just letting them use it!” Teacher C believed that his Year 3 students lacked the reading and comprehension skills needed to use the Internet and forcefully added “Let’s face it! The way these kids use computers, they’re likely to end up with it crashing.” Teacher A hinted at the potential for malicious damage in speaking disparagingly of “the type of child in my class.”
3. shared a mental model of ICT as being restricted to a desktop computer and simple peripherals (such as keyboard, mouse and printer) and ICT to be word processing. Teacher B explained that her students did “a lot of word processing. ... cut and paste ... changing fonts ... getting the capital letter there.” Teacher C spoke of word processing and basic file management. No specialist educational software was used in Teacher A, B or C’s classroom. No students were involved in image processing as there was no use of any paint, drawing, animation or presentation programs. Neither were they involved in the construction or use of either open or closed information systems. Each Level 0 teacher was dismissive of students’ ICT experiences outside of the classroom (particularly of computer games and the notion of playing). Teacher C could not accept that there was anything unique to ICT processes arguing that “the only thing I think that’s unique to a computer is [that] it’s faster” and “it is a convenience product.”

4. shared a mental model of schooling as being the achievement of purposeful outcomes. Teacher B offered that “they don’t get games in my room. It’s purpose stuff” derisively adding that “my teaching partner does games” (with “games” here being mathematics software applications). Teacher C expressed concern about students’ uncritically copying and pasting digital content but this was unlikely in his class as his students were word processing simple documents such as invitations. Teacher A’s students had to prepare emails as handwritten texts before being word-processed and then pasted into an email client. ICT did not fit what these Level 0 teachers held to be the normative and conservative functions of schooling (Hodas, 1997).
5. were not familiar with the notion of a connected or technology-rich classroom with Teacher B offering that she “would not know what it looked like.” This is despite her having recently returned from a 3-day intensive practicum in a technology-rich school where she made classroom observations and there being instances of innovative practice in her own school.
6. were dismissive of constructivist practices and/or discovery learning, particularly in comparison with instructivist practice or a focus on operational skills. Teacher B offered that:

... I was just blown away with ... [a] statement made ... [during a practicum program] ...and I just thought - isn’t that all backwards? ... Along the lines of - just sort of ‘throw them in the deep end and it will be all right’ and I’m thinking ‘Gee! What about your keyboarding skills?’ You’re turning the thing on, you’re turning it off, you’re saving your work because if the kids can’t save their work. It was a waste of time them sitting there, not total waste, they would have picked up some skills hopefully, but they’ve got nothing to show for it at the end of the time.”
7. were “digitally homeless” (Negroponte, 1995) with Teacher A overtly technophobic (having been previously reported as evidencing a physiological and “genuinely neurotic reaction to technology” (Lloyd & Yelland, 2003, p. 88)), Teacher B using only word processing and email in supervised spaces such as her husband’s office and school, and Teacher C not seeing any use for computing in his work practices or home activities. None had a computer at home.
8. did not believe that ICT is a necessary component of education. Teacher C offered two spurious arguments against the use of ICT. These were that ICT in schools (a) cannot be vocationally sound as students will be taking jobs which “haven’t been invented yet,” and (b) not effective in meeting student needs, asking “Why do these kids need to know how to use a computer? If they don’t have one at home, it’s pointless, a waste of time because they won’t get enough time on the target here at school.”
9. felt an abiding sense of mandation and subsequent resentment about having to use ICT in their classrooms (see Bailey, 2000). Teacher C offered, in also alluding to a lack of curriculum guidance, that “the Department [is] simply telling us here are the computers, use them in your classroom, you figure out how to use them and you figure out what the kids will do.”
10. were threatened and defensive and appeared, in differing degrees, to see the questions about their practice as personal. The issue was elided into one of identity (as noted in Gergen, 1991; Jonscher, 2000; Turkle, 1984, 1996).
11. held the view that technology was outside what was done in their classroom with Teacher C aligning it to other specialist teaching areas such as Music or Physical Education which are taught by specialist teachers in designated areas, that is, not the general classroom. Technology was “othered.”
12. had not lacked opportunity. Teacher B spoke of a Commodore 64 laboratory (of 14 machines) being in the school in the previous decade and she listed various past and ongoing support initiatives within the school. Teachers B and C were known to have participated in an intensive practicum just prior to interview and Teacher A attended the same introductory sessions as her students. The School B Principal was conducting 1:1 training sessions with Teacher B on a regular (weekly) basis.
13. felt a perceived lack of support with Teacher A accusing the ICT Coordinator of deliberately withholding information and stockpiling resources and Teacher B complaining of delays in receiving technical support.
14. rationalized their lack of involvement with ICT with each offering the plausible excuses recurrent in the literature (see Davis & Eslinger, 2001). The defenses raised by the subjects in this review included:
 - a lack of practical models to follow – with Teacher B offering that “until you see it actually working, it’s still a mind block.”
 - equity issues – with Teacher B offering that “if I can’t find a way for every child to access something, then it tends to be [offered to] no child.”
 - issues of reliability – with Teacher B referring to computers as “frustrating things” and expressing annoyance at “when the damn things don’t work ... they’re ‘down’ as often as they are ‘up’” and Teacher C referring to the computers in his room as “6 year old stuff that’s on its last legs.”

- preference for/defense of print over digital resources – with Teacher B saying “I’d rather read a book. You can read a book anywhere. You can take a book out fishing, you know” and Teacher C advocating the need for print literacy to be taught before digital literacy
- a lack of time – Teacher C argued that teachers were mostly concerned with “survival, getting through the day, getting through the term, what is the next big stress point” and did not have time to come to terms with integrating ICT in the curriculum.
- no curriculum guidance – Teacher C, in alluding to the carrot/stick analogy of reward and punishment, argued that:
 No. No. ICT ... is all sticks. ... they didn’t say exactly what they wanted the children to be able to know and do. ... We’re in an outcomes-based environment and what we get with ICT is a lack of outcomes. Here are the computers, use them ... okay if that’s the outcome, most teachers could tick with a big tick with confidence [that they] were using them. And then, they ‘Oh No No! We want you to -.’ Where is that written - we want you to do this with your kids, it’s not there!
- the lack of physical space in traditional classrooms

There was an interesting irony in Teacher B’s final aside that her arguments were “all cop outs.” Teacher C off-handedly offered his intention to make more use of ICT, particularly digital cameras, but vaguely qualified this as “I haven’t done it yet,” “it’s in the back of my head,” and “I should be using them.” These comments lacked conviction particularly when compared with his strongly-worded complaint that the school did not have a scope and sequence document and that the state system had failed to provide him with clearly stated goals and directions.

It would have been simple to dismiss these subjects as technophobic and attribute their reluctance to their age but they seemed more unaware and unconcerned than showing any irrationality or fear. The reference to age was deemed to be coincidental and our own observations have shown that reluctance and age are not interdependent variables. Support for this may also be found in the study by Oliver (1994) who found that 75% of beginning teachers in Western Australia were not using ICT even in settings with good access to hardware and software. Interestingly, none of the Level 0 teachers used their age as an excuse for their lack of use of ICT in their classrooms. In fact, no excuse was offered as each maintained a delusion that they were meeting student needs and system demands. This is consonant with the view that there is an “insular culture of self-congratulation that attempts to reassure them [teachers] that they are competent and selfless professionals, that their social and institutional function is to develop the very best qualities in the children they serve” (Hodas, 1997, paragraph 36).

Rules

The “rules” in an activity system refer to the explicit and implicit regulations, norms and conventions that constrain its actions and interactions. In the instance of the review presented in this paper, rules include those imposed by the state system (particularly regarding Internet use) and the school community (regarding computer access). As noted, Teacher B was demonstrably unhappy about what she perceived to be a lack of rules (abnegation of responsibility) when it came to seemingly uncontrolled student access to equipment. A natural “rule” for all teachers is duty of care. This is the implicit and explicit responsibility each teacher has for the well-being and protection of those in his or her care. In School A, the computer connected to the Internet was in the library and students needed to walk the short distance from their classroom. For Teacher A, this represented a duty of care issue both in their moving between the work areas and in working without direct supervision. For Teachers B and C, this was being unable to directly supervise the students in her classroom using computers because they had been positioned behind a partition, and conversely being unable to supervise the rest of the class if giving direct instruction to those using the computers. Teacher B then went on to suggest that she could not make use of volunteers to help the students because of unexplained “confidentiality issues.”

The “rules” of concern to the Level 0 teachers were those relating to their own competence. The systemic demands for certification of competence were perturbing to these teachers as it called their professional worth into question. For these respected teachers, this was affronting. Because they did not believe that ICT was integral to education, the need for compliance was unreasonable.

Tools

“Tools” can be perceived as mediating between subjects and object. In the case of integration of ICT in the classroom, the tools are the technologies (ICT) through/with which students learn. Each of the Level 0 teachers saw the tools as the object of study. When asked what were the students learning when they used the school’s

computers, Teacher B offered that “they’re just learning how to manipulate text.” Teacher C said that his students were learning “keyboarding.” The tool was the object rather than representing a process or mindtool (Jonassen, 1996). For Teacher B, the tool/object was quite specifically the functions within Microsoft Word.

The contention of teachers mistaking the tool as the object might help to explain the change in the behaviors and beliefs of teachers in the Cognitively Guided Instruction (CGI) project where, following a period of four years, teachers moved from “demonstrating procedures and telling children how to think to ... [a practice] that stresses helping children develop their mathematical knowledge through creating learning environments, posing problems, questioning children about their problems solutions and using children’s thinking to guide instructional decisions” (Putnam & Borko, 2000, p. 7). The former is a tool and the latter is an object. To establish the distinction between them and to convert it into real practice took sustained effort over time (through workshops, mentoring, and opportunities for observation and reflection). This process and identification of distinction has patently not occurred spontaneously within the three Level 0 teachers discussed in this paper.

Teacher B offered that “my main problem with computers is ‘how do I let every kid sit there until they’ve developed the skills they need to have.’” This statement is revelatory of this collapsing of tools and object into one entity.

Community

The “community” is made up of the multiple individuals and/or sub-groups who share the same general object and who construct themselves as distinct from other communities. The community in this review could be seen to be parents, students and systemic authorities who are representative of the implicit and explicit pressures to make use of ICT in teaching practice. Teacher B thought that the system employer, Education Queensland (through its mandatory teacher requirements) was saying “Give me the clouds. Obviously the department has to come up with an ideal. It’s an ideal. It’s not practical.” The administrators of all three schools (Schools A, B and C) were proactive in attempting to meet system expectations..

Division of Labor

A “division of labor” is both the horizontal division of tasks between the members of the community and to the vertical division of power and status. “Division of labor” here refers to the roles and responsibilities of individuals within each school, particularly in relation to ICT integration. The Level 0 teachers described in this review have all taken advantage of others to meet system expectations without engaging personally with the technology.

Teacher A was the most ingenious in that she set up student peer teaching routines to enable students to take part in a telecommunications project. The students were unaware of her resistance. Teacher B relied on a teaching partner and, as noted, Teacher C sent his students to a specialist class conducted by the school’s teacher aide and system technician. Teacher C revealed only a passing understanding of what the students were experiencing in their specialist lessons, adding, as an afterthought the comment that “Oh they’ve actually started the Net down there with them.” In each instance, the responsibility was “othered” and students were not denied access to ICT. We would have to add a criticism of this in that, while it ostensibly allowed these teachers to meet responsibilities, the model of ICT presented to students was poor and the experiences were narrow and non-authentic. The students did not see their teachers engaging with technology and could therefore relegate it to an optional or add-on activity. The distancing of the teacher and the ICT was obvious in Teacher C’s inclusion of the terms “down there” and “with them” emphasizing both a physical and human distance.

Object

An “object” is the ‘raw material’ or ‘problem space’ at which the activity is directed and which is transformed into outcomes with the help of physical and symbolic, external and internal mediating tools. The object in this review was effective teaching and learning. We concluded that the Level 0 teachers we were reviewing were unilaterally mistaking the tool for the object. This had the consequence:

- (a) of effectively leaving the “tools” component of the activity system void, giving them no processes to meet changing system needs and downgrading the object to one of skill set attainment, and/or
- (b) of so misaligning the “object” that there was a gap between what was being done and the achievement of broader educational goals (the “outcome”).

This misapprehension is fundamental and critical and, we feel, lies at the heart of the issue of apparent teacher resistance. The collapsed tools-object entity is also self-fulfilling and does not foster the achievement of broader outcomes.

Outcome

Within a school, the shared object is the student with his/her aptitudes and abilities. The outcome is an achievement of learning and personal goals; perhaps as specified with a school's mission statement or a student's individual education plan. Within a state or federal education system, the outcome could be the broad achievement of prescribed benchmarks or the holistic achievement of a literate and informed society. In this review, the outcome is (a) intended, such as the demonstrated attainment of curricular objectives, and (b) unintended, as in the modeling of ICT as peripheral to learning and an object of study in its own right removed from other student activities.

When asked how she would like to see ICT used in her classroom, Teacher B candidly responded that "I honestly don't know. I don't know what would work. I really don't." It is important to note that Teacher B seemed to be replicating the way that she is being taught by her school Principal who, as noted, was conducting 1:1 skills sessions with her on a weekly basis. The interview with Teacher C was interesting as he said that it represented the only real conversation he had ever had about the purpose of ICT in the classroom. Early in the interview, he had offered that the outcome was:

Yes, yes well it's keyboarding. It would be good if we had a good program for keyboarding - and multiple computers to work on would be really good and actually teach the kids how to type from Year 1. I could see that would be the most, or one of the most, important things that we could do. 'Cause otherwise they're just here henpecking, you know. It takes so much time but, yeah, they type, save to the group file and print if it's a program and that's basically it. It's not very elaborate but it's about all we've got time for.

For these Level 0 teachers, the outcome was simple. It was defined by their own limitations and restricted experience of computing. It was all about text – there were no images, no interactive simulations, no telecommunications, no information systems. The outcome was typing. The tool was typing. The circle was closed.

Conclusion

Together the components of an activity system form a dynamic of action achieved through their combinative interactions. In the cases presented in this review, we have noted that activity systems become dysfunctional when components are misapprehended or poorly understood. Being at Level 0 and unable to progress may have more to do with a problem of perception of roles rather than technophobia or other neurotic reactions. What we observed as common to the three Level 0 teachers was that they appeared to make the fundamental error in seeing the tool as the object. Teacher A, B and C all thought that what they were doing was teaching the students how to use a computer. This sentence ends too soon. By this we mean that they needed to go on to say that they "were teaching the students to use a computer to achieve specific desired learning outcomes." The computer, because of the teachers' own limited experience and narrow perceptions became a typewriter and an end rather than a means to an end.

Guskey (1986) argued that belief follows behaviour. But the problem for Level 0 teachers was that the behaviour was at such a low level, there was little ground for belief, particularly in the transformative power of ICT. As a corollary to the Guskey tenet, there was little chance of a change in belief when the teachers had not incorporated ICT into their own lives or set of social practices. There was arguably no pedagogical use of ICT in their classrooms because there was no belief, and there was no belief because there was no (worthwhile) use.

The circle had closed around a closed use rather than veering into a spiral which would eventually encompass more transformative models. It was self-fulfilling and had its own inertia. It had closed around an older paradigm which described integration as being teaching about computing rather than teaching with or through or effecting any school change or reform. The computer was the object of instruction not merely the medium. It also closed on a mental model of computing as being about business or productivity applications and the world was confined to typing and the only input device is a keyboard. The tool had become the object removing process from the activity system and thereby adversely affecting other possible interactions. The circle had also closed on the Level 0 teachers' concept of themselves and their unshaken belief in their dedication and service to their students.

This paper cautiously argues that the way to encourage Level 0 teachers to begin on their own personal journeys may be to show them what is possible. What they are (or are not) doing makes perfect sense when you come to understand their worldview and see the lenses with which they view their activity systems and when you understand their logical flaw in collapsing tool into object and leaving them with no processes to enact change, and no clear view as to where they are heading.

References

- Abbott, C. (2001). *ICT: Changing education*. London: Routledge Falmer.
- Albion, P. (1999). Self-efficacy beliefs as an indicator of teachers' preparedness for teaching with technology. *Technology and Teacher Education Annual 1999, (Society for Information Technology & Teacher Education)*. (CD ROM edition).
- Backhouse, B. (2003). Information and communication technology integration: Beyond the early adopters. *TechTrends*, 47(3), 5-9.
- Bailey, B. (2000). The impact of mandated change on teachers. In N. Bascia & A. Hargreaves (Eds.), *The sharp edge of educational change* (pp. 112-128). London: Routledge Falmer.
- Beavers, D. (2001). Professional development: Outside the workshop box. *Principal Leadership (High School Ed)*, 1(9), pp. 43-46.
- Bolter, J. D. (1996). Virtual reality and the redefinition of self. In L. Strate (Ed.), *Communications in cyberspace* (pp. 105-120). Cresskill, NJ: Hampton Press.
- Crystal, J. (2001). Building from within: Two professional development models that work. *Technology & Learning*, 22 (2), pp. 62-66.
- Davis, M., & Eslinger, D. (2001). Acquisition of computer skills and practices by K-8 classroom teachers. *Contemporary Education*, 72(2), 5-10.
- Day, C., & Roberts-Holmes, G. (1998). The best of times, the worst of times: Stories of change and professional development in England. *Change: Transformations in Education*, 1(1), 15-31.
- Dwyer, D. (1995). *Changing the conversation about teaching, learning and technology: A report on 10 years of ACOT research*. Cupertino, CA: Apple Computer.
- Engestrom, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orieta-Konsultit.
- Eraut, M., Pearce, J., Stanley, A., & Steadman, S. (1991). *Whole school IT development*. Kent IT in Schools Support Team, Sittingbourne.
- Gergen, K.L. (1991). *The saturated self: Dilemmas of identity in contemporary life*. New York: Harper Collins.
- Gillman, T. (1989). *Change in public education: A technological perspective* (Trends and Issues Series 1). ERIC Clearing House on Educational Management, University of Oregon, Eugene, Oregon.
- Guskey, T.R. (1986). Staff development and the process of teacher change. *Educational Researcher*, 15, 5-12.
- Hall, G. & Hord, S. (1987). *Change in schools: Facilitating the process*. Albany, NY: State University of New York Press.
- Hodas, S. (1997). Technology refusal and the organizational culture of schools. Retrieved March 9, 2002 from <http://olam.ed.asu.edu/epaa/v1n10.html>.
- Jonasen, D. (1996). *Computers in the classroom: Mindtools for critical thinking*. Englewood Cliffs, NJ: Merrill.
- Jonscher, C. (2000). *Wiredlife: Who are we in the digital age?* London: Anchor.
- King, K. (2002) A journey of transformation: A model of educators' learning experiences in educational technology. Paper presented at the Adult Education Research Conference, Raleigh NC, May. ED 472069.
- Lloyd, M., & McRobbie, C. (2003). *Investigation of the practicum model of professional development of teachers in ICT at Kawungan LDC-ICT*. Commissioned Report, Education Queensland.
- Lloyd, M., & Yelland, N. (2003, May). Adaptation and avoidance: Observations of teachers' reactions to information and communications technology in the classroom. *Change: Transformation in Education*, 6(1), 81-96.
- Maslen, G. (1995, August 8). Information rich, information poor. *The Bulletin*, pp. 12-15.
- Mevarech, Z.. (1997). The U-Curve process that trainee teaches experience in integrating computers into the curriculum. In D. Passey & B. Samways (Eds.), *Information technology: Supporting change through teacher education* (pp. 46-51). London: Chapman & Hall.
- Negroponce, N. (1995). *Being digital*. Sydney, Australia: Hodder & Stoughton.
- Oliver, R. (1994). Factors influencing beginning teachers' uptake of computers. *Journal of Technology and Teacher Education*, 2(1), 71-89.
- Postman, N. (1995). *The end of education: Redefining the value of education*. New York: Vintage.
- Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, 29(1), 4-15.
- Romeo, G., & Walker, I. (2001). Using Activity Theory to investigate the implementation of ICTE in a primary school. Paper presented at WCCE2001, Copenhagen, August 2001.
- Russell, A. (1995). Stages in learning new technology: Naïve adult email users. *Computer education*, 25(4), 173-178.
- Turkle, S. (1984). *The second self: Computers and the human spirit*. London: Granada.
- Turkle, S. (1996). *Life on the screen: Identity in the age of the Internet*. London: Weidenfeld & Nicolson.
- University of Helsinki. (2001). *Center for activity theory and developmental work research*. Retrieved September 28, 2001 from <http://www.edu.helsinki.fi/activity>.
- Watson, D. (2001). Pedagogy before technology: Re-thinking the relationship between ICT and teaching. *Education and Information technologies*, 6(4), 251-266.
- Wertsch, J. (1981) (Ed.). *The concept of activity in Soviet psychology*. White Plains, NY: M. Sharpe.