Contradictions of time in collaborative school research

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Abstract   The sustainability of research-based innovations in schools is constrained not only by systemic institutional barriers and inherent contradictions between schooling and research, but also by the related issue of time. This case study suggests that relative timescales, e.g., the collective activity of schooling over decades versus the individual actions of researchers over semesters or years, hinder the coordination and synchronization of schooling and research processes. Using cultural–historical activity theory and heterochrony, this analysis of data from a 4-year collaborative school-university research and development project suggests that, in spite of active support from school personnel, temporal conflicts undermined research activity and the sustainability of the innovation. At the same time, when researchers aligned their actions with the actions and timescales of school personnel, core elements of the innovation were appropriated into school practice.

Keywords   Cultural–historical activity theory · Educational change ·
Heterochrony · Sustainability · Timescales

After the 3rd year of a 4-year university-school research and innovation project, the school's principal noted that the research innovation, an after-school literacy and technology club, was very positive for the school and its children:

> You know you've created sort of a collegiality of a group of kids that look forward to it and the days that you didn't have it or we cancelled it or whatever… There was definite disappointment. Those kids really looked forward to being in there and having it every week.

This quote illustrates that even collaboratively supported educational innovations are subject to time conflicts. The principal alludes to both the school and university partners not making the club available to children at its regularly scheduled time. The cancellations of the club occurred on the scales of the weekly meeting time, the day the club met, and the hour at which children normally appeared at the library, where the club took place. These

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time-related conflicts occurred on the relatively short timescales. On a different level, Reese (1999) points out that educational researchers historically have been present in schools on a part-time basis at best, operating on a timescale that diminishes the relevance of educational research for practitioners, whose presence at the school is, on average, much longer. In this article, I argue that the issue of timescales is key to the work of those who seek to sustain educational change.

Timescales, activities, actions and heterochrony

"Timescale" refers to the measurement of time in relation to specific perspectives on developmental trajectories, e.g., hours, days, academic years, that emerge due to our relative positioning to processes or particular events (Diriwächter 2006). Adam (2006) argues that the machine or clock time valued by modern society rationalizes and commodifies time in linear units that do not support the synchronization of the multiple timescales that characterize the "temporalities of existence (p. 123)." Similarly, Hargreaves' (1994) contrasts monochronic, linear, Western notions of time as a resource and means to an end, and polychronic timeframes that are sensitive to context, oriented to relationships, and non-linear. Hargreaves argues that often what is perceived as resistance to educational change is a contradiction between the monochronic timescales of administrators (I would add, educational researchers) and the polychronic timescales of teachers.

The concept of a polychronic timescale which allows that multiple things can be going on at once, each with its own sense of time related to positioning and perspective, is compatible with cultural–historical activity theory (CHAT) (Lemke 2001; Roth 2001). CHAT assumes that social phenomena are complex, collective, and contextualized in historical time, space, and culture. The primary unit of analysis in CHAT is human activity. Joint or collective human activities are social practices oriented at objects. An entity becomes an object of activity when it can meet a human need. As a potential response to this need, the object gains motivating force that gives shape and direction to the activity. The object, or motive, of an activity both determines the horizon of possible actions and serves to organize actions within the framework of the activity (Engeström 1987).

For Engeström (1990), "activity manifests itself in the form of goal-oriented individual *actions* in which the subject is consciously aware of what he or she is trying to accomplish" (pp. 172–173). For example, the activity of formal education (schooling) is driven by the complex motive of educating the young, which includes reproducing culture and social relations and providing students with tools to participate in society. People who work in schools have different roles and personal goals for their actions, but the collective activity of schooling organizes those actions. The activity of schooling has been comprised of the individual actions of teachers and administrators over decades. The collective activity of educational change research has been comprised of the individual actions of researchers over weeks, semesters, and years.

Roth's work explores patterns of goal-directed individual actions that simultaneously occur at multiple levels of human activity. Lemke (2000) uses the concept of heterochrony—long timescale processes that produce effects in much shorter timescale actions—in analysis of social phenomena on at least three levels because the timescales related to those different levels determine the probability of interdependence that enables the coordination of the processes related to different activities or actions. Actions, relative to activities, are accomplished by individuals or groups on the timescales of day-to-day

interactions. These day-to-day actions comprise the longer timescale activities, which are historically robust.

In the sections below, I present a case study in which the historical and long-term timescales of the activities of schooling and university research undermined the integration of a research-driven educational innovation into the ongoing activity of schooling in a particular school. Incompatibility in the timescales associated with schooling and research subverted the synchronization of the activities that organized the actions of both researchers and school personnel, who shared an interest in changing school practice through the integration of the educational innovation. I will also show that when the actions of researchers were coordinated in time with the actions of teachers some elements of the educational innovation were sustained.

Methodology and research design

This case study, conducted between August 2002 and May 2006 in an urban public elementary school in the USA, used participant observation. Research team involvement included collaborative design, with school personnel, of a technology and literacy after-school club, based on a curriculum and pedagogical model described below. The researchers systematically collected field notes, documents, pictures, and interviews connected to the educational innovation and related research projects. Data analysis included the development of time matrices to track change over time based on chronologies of actions and events. Data were analyzed with specific attention to disruptions, miscommunications, and underlying contradictions as well as emerging synchrony (Puonti 2004).

El Águila's Club

Most children who attend Happy Mountain Elementary are Latino and from low-income households. About half speak Spanish as their native language. In spite of poverty and relatively high levels of crime and violence in the neighborhood, Happy Mountain is known in the district for its cohesive and caring teachers and staff. Teachers tend to stay, some for 15–20 years. The principal has been there for 14 years. Parents who attended the school now send their children.

Happy Mountain is a professional development school, which has entered into a formal agreement with a university to serve as a training site for new teachers. The university assigns a site professor to the school. I served as site professor there from fall 2002 through spring 2006.

One or two days per week, I visited classrooms, attended meetings, and "hung out." In spring 2003, I began informal discussions with the principal about developing a research-based learning environment at Happy Mountain that would introduce and conduct research on innovative uses of technology in an after-school club, co-designed with school personnel. The principal said the school had been "burned" by researchers in the past who wrote about the teachers in ways they found negative. She approved starting the research, if it focused on literacy.

Together with the school's literacy coaches, I began development of an innovation that came to be called El Águila's Club. Based on the Fifth Dimension (5D) model (Nilsson and Nocon 2005; Cole and Distributed Literacy Consortium 2006), the club used computing as

a flexible learning/teaching tool, mixed age groups of children, and engaged adult guides who differentiated instruction and modeled learning for the children. In addition to individualized learning opportunities mediated by technology, a core element of the 5D and El Águila's Club was a collective focus on the children's potential. The main goal of the club, based on the principal's concerns, was literacy development. The adult guides were preservice teachers, or teacher candidates (TCs). Their participation in the 5D was a requirement of their internships.

Each semester, the club design was modified with significant input from teachers, school leaders, and new and returning TCs. Over 4 years, writing remained the focus. In 2003–2004, the primary tasks in the club involved bringing writing from the classroom and using word processing software to produce final products. In 2004–2005, children were encouraged to use typing software to improve their keyboarding skills and produce illustrated stories or books. In 2005–2006, these options were still available, while practice with test preparation software was added. In May 2006, I left the school and El Águila's Club ceased operating.

Growing collaborative school-university research

The 5D club was piloted for a 6-week period in spring 2003. The research aspects of the club, in deference to the principal's reticence about research, specifically addressed the viability of the club itself as well as descriptive analysis of children's writing practices in the club. Based on interviews with teachers, TCs, children, and administrators, we concluded that the club was sufficiently successful to continue on a regular basis the following year. As work with the club progressed, researcher involvement expanded into other arenas in the school, as illustrated in Fig. 1.

On the left is a chronology based on academic semesters. The columns, to the right, viewed horizontally, illustrate the deepening involvement of the site professor and graduate students in the day-to-day life of the school. From the 5D, research team members moved over time into the school, providing ESL services, guidance in math instruction, and, particularly, guidance in the use of technology. The second and third columns show these
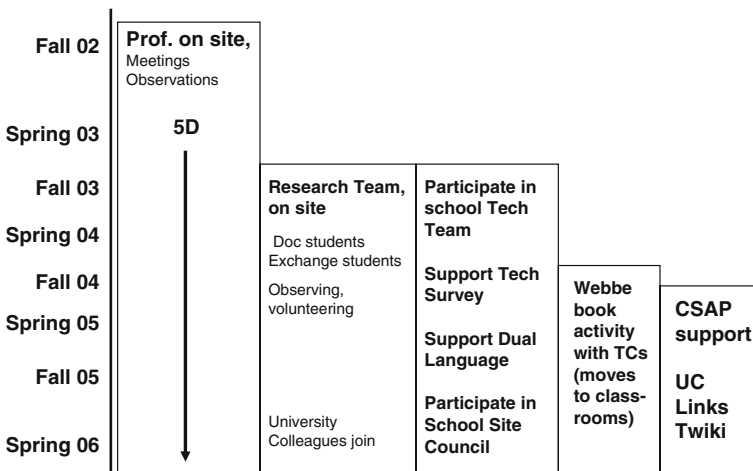

Fig. 1 Researcher involvement at Happy Mountain

Fall 02	Spring 03	Fall 03	Spring 04	Fall 04	Spring 05	Fall 05	Spring 06
Action research	*5D Sustain*	**5D Lit & Sustain**	**5D Lit, Sustain, Tech**	**5D Lit, Sustain, Tech**	**5D Lit, Sustain, Tech**	**5D Lit, Sustain, Tech**	**5D Lit, Sustain, Tech**
	5D Lit	*Tech 5D*					
		Tech School	**Tech Integration 5D & School**	**Tech Integration 5D & School**	**Tech Integration 5D & School**	**Tech Integration 5D & School**	**Tech Integration 5D & School**
				TC Design	**TC Design**	**TC Design/ Community**	**TC Design/ Community**
				Teacher Mentoring	*Teacher Mentoring*	**Dual Lang Math**	**Dual Lang Math**
					Dual Lang Math	*Teacher Mentoring*	*Teacher Mentoring*

Site Prof initiated research

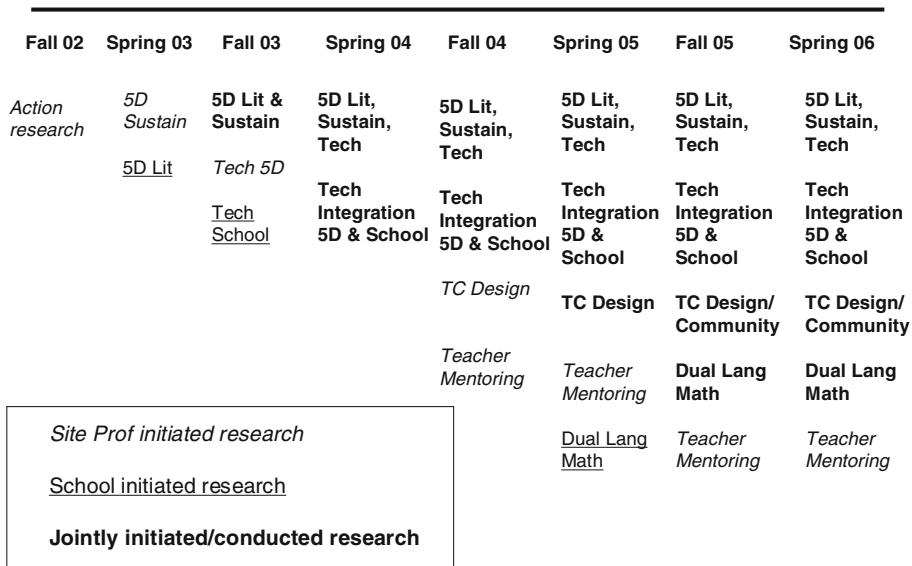School initiated research

Jointly initiated/conducted research

Fig. 2 Timeline of university-school research at Happy Mountain

researcher actions. The fourth column mentions Webbe books, a program started in the 5D that moved into school practice.[1] The fifth column indicates use of test preparation software and linkage of El Águila's Club to other 5Ds around the world through a password protected web space.

Figure 2 shows how research activity at the school contributed over time to changes in the school's engagement in research. Looking at Fig. 2 chronologically, i.e., from left to right, we see that, as time passes, the number of active research projects increases. Looking at where projects initiated (Italics, site professor; Underline, school; Bold, jointly initiated), we see movement from site professor initiated projects to school initiated projects and then to projects that were initiated jointly. For example, in spring 2003, the site professor used the 5D club for research on sustainability. The literacy issue was initiated by school personnel, but taken up by the site professor in fall 2003. Also in fall 2003, the site professor and the university-based research team initiated the study of technology integration in the club. This coincided temporally with the school Tech Team's initiation of research on technology integration in the school. Members of the university research team joined the school Tech Team and over the next year, the study of technology integration in both the club and the school became a joint research focus (Doughty 2007).

Other joint projects emerged as well, including collaborative design of the school's dual language program and support for teachers who were challenged to teach math in the children's second language. In this process, research team members acted on teachers' and school leaders' concerns as they arose, attending math classes, literacy blocks, and preparation periods according to the teachers' schedules, i.e., timescales.

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[1] Webbe books are illustrated paper books produced using word processing software and a template (See http://www.realebooks.com/).

Teacher time versus researcher time

In spite of great good will and shared resources among the university and school people, El Águila's Club did not persist after I left the school. A number of temporal conflicts contributed to its end. One recurrent temporal conflict involved different university and school calendars. The university's semesters were shorter, making it difficult to get university students to run the club from the beginning to the end of the school's semesters. This disappointed teachers and students. Related conflicts involved meetings and events, including school planning and testing days, when no children were present. Additionally, certain meetings pre-empted the 5D and took over the library space.

Another temporal conflict resulted from different university and school cycles. As noted above, the principal and most of the teachers had been at Happy Mountain for a number of years. Similarly, most of the children and families remained for years. Though I was site professor for 4 years, graduate students participated for semesters. The TCs were on many cycles, starting in fall or spring in 1-year or 18-month programs. Overall, university people were at the school for shorter times than school people.

Competition for teachers' time prevented most teachers from being in the club or interacting with researchers. There were exceptions. Ms. C., regularly came to school early and stayed late to tutor children. She saw the club as a social and learning setting for the children she tutored to get extra attention and help. She referred and brought children to the club, and regularly visited. Another teacher, Ms. M., came to the club asking for help in using computers in her class. A pre-doctoral researcher began to work closely with both Ms. C. and Ms. M. soon began referring children to the club.

Due to limited computers and mandated curricula, children only spent 1 hour per week (in two 30-minute sessions) in the library/media center. Different from the focused, individualized pedagogical use of computing in the club, computing during this time was mainly play with arcade type games. El Águila's Club researchers purchased keyboarding software and modeled in the club how it could be used productively in short sessions. This pedagogical approach was appropriated by the library/media specialist, moved into the school day, and has persisted. Similarly, the production of illustrated books and stories moved from club to classrooms.

In separate interviews conducted in May 2005, the school librarian, the principal, and the assistant principal validated the success of the club in engaging children in literacy development work. They also attributed changes in school practice to the club, including more teachers using technology in classrooms, adoption of keyboarding and book and story production in the computer "specials," and use of Webbe books in classrooms. In particular, the interviewees talked about the success of the Thursday morning club session, as noted by the librarian:

> They kids are really excited though, especially the Thursday morning group… The Wed. group are kids that are looking for something to do …it's some place to go and hang out, and the morning kids…are more focused on the writing projects, instead of going out, they want to be here.

The success of the Thursday morning session was dependent on the presence of TCs as guides who worked closely with the children. Ironically, the assistant principal noted in her interview that one thing she might

> change a little bit is the requirement of the TCs to staff it in the mornings, especially at the end of their program as they took on more of the responsibility for planning

and implementation of instruction within the classrooms, they felt pretty pulled on those mornings to be there at Águila…

This particular conflict, indicative of a temporal contradiction between the activities of research on the educational innovation and schooling, ultimately contributed to the demise of El Águila's Club. In the first excerpt, the Thursday morning club appears to meet school personnel's goals. However, the school leaders suggest not having the TCs act as guides on Thursday mornings, because the TCs were pulled between being in the club (research) and the classroom (schooling), where mentoring teachers wanted them to prepare for the school day. Honoring this teacher need resulted in a decision to stop the Thursday morning session in 2005–2006, as the doctoral students were not available in the mornings either. A similar conflict ultimately led to minimal TC participation in the afternoons as well. As the TCs spent less time in the club, the 5D curricular and pedagogical elements of the innovation diminished.

Concurrently, several things happened to encourage integration of curricular and pedagogical elements of the club in the school's practice. First, some TCs, who had participated in the club, continued to use techniques and tools from the club in their classrooms when hired by the school as full-time teachers. Secondly, Ms. M. and other teachers continued to build linkages between classroom instructional content and computing, in the library and in their classrooms. Finally, the use of keyboarding software and attention to keyboarding became part of the school's practice, as did the use of educational websites, and the production of illustrated texts.

Discussion

The case of El Águila's Club is another example of an unsustained educational innovation. From a CHAT perspective, it appears that the long term cultural–historical activities of schooling and university educational change research could not be coordinated, or synchronized. At the same time, educational change research approached at the level and timescales of day-to-day actions, where people live and where they build their relationships, appears, in this case, to have contributed to educational changes on a less ambitious scale. This less ambitious approach, consistent with Tyack and Cuban's "gradual and incremental—tinkering with the system" (1995, p. 5) may, in the long term, be the most productive approach to effecting sustainable school change.

The change research in this study was not initiated from the perspective of tinkering with the system. The author sought to introduce an educational innovation, the El Águila's Club 5D, in order to have it be appropriated into the school's practice. This did not happen. However, involvement by research team members in the day-to-day actions of the teachers did result in elements (e.g., pedagogical uses of computing) of the innovation being appropriated. In Roth's (2001) and Sannino's (2008) terms, certain actions (e.g., using keyboarding software, developing Webbe books) were incorporated into the activity of schooling in this setting. The library media specialist and Mrs. M. experienced change in their personal practice through the incorporation of new technologies to which they had gained access through the El Águila's Club.

The appropriation of the innovation itself was thwarted by temporal conflicts on many levels. At the level of activity, as Reese (1999) suggests, the part-time presence of researchers was in contradiction with the long term presence of school personnel. Four years in the university research world of publish or perish was arguably a long time. In the world of teachers who love their school and students, 4 years was not long enough. Where this temporal

contradiction appears to have been mitigated was in the day-to-day actions coordinated by researchers to the actions of teachers and the timescales of schooling. Drawing on Lemke's (2001) use of heterochrony, attending to change at the level of action facilitated coordination of the processes (activities) of change research and schooling on the timescales at which those actions occurred. Through the coordinated, and coordinating, actions of the researchers, teachers learned to use different software programs and approaches to computing.

Given the level of appropriation in this case, in spite of the clear change in school culture in terms of openness to research, one must ask whether it is reasonable to look for the sustainability of an educational innovation. If change occurs in complex ways mediated by the actions and interactions of individuals, is the level of institutional change the appropriate place to be looking for evidence of educational change? I have argued elsewhere (Nocon 2004) and the present case supports the argument that sustainability is a process that cannot be controlled or expected at the activity or institutional levels, an argument supported by the CHAT perspective that activity is complex, collective, and at once, historically robust and continuously emergent. In other words, the institution, or historical activity we seek to change is a constantly moving target operating at a longer timescale than our individual actions. A more productive approach involves engaging the timescales and goal-directed actions that constitute that historical activity and ultimately contribute to its long-term change over time.

Conclusion

This case study suggests that the longer timescale of traditional schooling activity tended to diminish the impact of the relatively shorter timescales of educational change research activity, undermining the appropriation by school personnel of a desirable educational innovation. While the number of shared research projects and the collaborative quality of these projects changed in productive ways over the 4-year period, the educational innovation (El Águila's Club) co-designed and implemented in the interest of effecting school change was not sustained. Temporal conflicts associated with activities of schooling and research occurred on the timescales of weeks (other school clubs and extra-curricular activities competed for space and time with the innovation), days (university students were expected or required to be in classrooms at times of day that conflicted with their participation in the club), and the school year (the school calendar and the university calendar did not coordinate). However, while El Águila's Club was not sustained, elements of the innovation were integrated into school practice. This process of appropriation of elements was related to the involvement of university researchers in actions and timescales that were organized by schooling activity, e.g., providing tutoring, supporting technology use, and contributing to program design. This suggests that an approach to school change that seeks the sustainability of elements of educational innovations through coordinated actions of researchers and school personnel on the day-to-day timescales of schooling provides a more productive lens from which to consider educational change processes than does the appropriation of wholesale innovations.

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