From Kids to Geeks: Consequential Transitions and Mediators of Learning in Computer Gaming

Yong Ming Kow
City University of Hong Kong

Abstract
Previous studies in youth learning have mostly examined practices that were bounded within a predetermined context. But learning is also a lifelong endeavor, in which the learners’ developmental trajectories may be continuously formulated, supported, and cumulative across multiple formal and informal contexts. In this paper, I make use of the concept of consequential transition to examine personalized and long-term learning among 24 “elite” gamers. I conducted in-depth interviews with each of these participants, and asked questions regarding their learning experiences growing up with video games. I identified a series of personally meaningful transitions that had taken place in their homes, in schools, and within communities. I found that long-term consequences of learning go beyond cognitive development and include cultivation of social networks and computing skills. I discuss implications that computing technologies could materialize these consequential transitions for institutional stakeholders.

Keywords: Digital youth; informal learning; games


Copyright: Copyright is held by the authors.

Acknowledgements: We thank the anonymous reviewers who had provided many suggestions which contributed to the writing of this paper. The work described in this paper was partially supported by grants from City University of Hong Kong (Project No. 7004760), and the grant (#1097-572400-USP) from the John D and Catherine T. MacArthur Foundation.

Contact: yongmukow@cityu.edu.hk.

1 Introduction
Media technologies offer unprecedented access for young learners to information, computer-supported activities, and an enlarged pool of like-minded and interest-driven collaborators. There is a sharp increase of interest in examining the associated learning practices that arise, and their impact on these young learners (Ito, M., Baumer, S., Bittani, M., boyd, d., Cody, R., Herr-Stephenson, B., et al., 2009; Lin & Farnham, 2013; Jenkins, 2009; Lemke, Lecusay, Cole, & Michalchik, 2012). In this pursuit, researchers have examined media-rich contexts that appeal to young people; some examples include game modding, amateur music video making, virtual worlds, and popular social media (boyd, 2014; Cloontanom & Nardi, 2012; El-Nasr & Smith, 2006; Gardner & Davis, 2013; Ito, Okabe, & Tsuji, 2012). And in information sciences, a few research studies have examined such youth learning contexts including siblings’ cooperative learning through video games, youth engagement with social media, and cooperative play in virtual worlds (Ballagas, et al., 2013; Go, Ballagas, & Spasojevic, 2012; Lin & Farnham, 2013; Nardi, Ly, & Harris, 2007; Voida, Carpendale, & Greenberg, 2010).

These studies mostly examined social practices clearly bounded within one specific context and within a short period of time (e.g., an instance of engagement within a youth network, or an online community). In this paper, I would like to address a research gap in the missing perspective of learning as a long-term endeavor, in which the learners’ developmental trajectories have to be continuously formulated, supported, and woven across multiple contexts and for a significant period of time for the learners to derive tangible outcomes from their learning experiences (Beach, 1999; Fuhrer, 1993; Ito, et al., 2013). By examining an enlarged ecology that spans multiple systems, and informed by the perspectives of the youth
themselves, we can develop deeper understanding of their learning practices, and thus inform the design of media artifacts in these learning spaces.

Consequential transition is a notion that describes learning that takes place outside of or only partially intersects with school contexts, embedded in purposeful and meaningful activities, with learning outcomes being determined by learners’ own intents (Beach, 1999). The term transition describes learning as a process in which a learner undergoes concrete and personally meaningful transformations in terms of his technical efficacies, social relationships, and social standing (Beach, 1999). Judging from the learner’s own intent, transitions are consequential when “they are consciously reflected on, often struggled with, and the eventual outcome changes one’s sense of self and social positioning” (Beach, 1999, p. 114). While not always directly and immediately measurable by formal academic indicators (e.g., test scores), the notion of consequential transition includes specific attention to activities of cultural, political, and social significance (Beach, 1999).

In this research work, I apply the notion of consequential transition to examine ways online game players, or “geeks,” of StarCraft learn within their sociocultural environments and across years of their lives. I performed a participant observation study of some of its “elites,” or highly accomplished players and contributors. I use the common term geeks to denote young learners whose upbringing and environments have inculcated particularly technological or intellectually oriented interests. I conducted a total of 24 in-depth interviews with these participants. I identified a set of common transitions and mediators that accompanied their years of informal learning. While these learning outcomes and experiences are meaningful to the learners, they have remained immaterial beyond the youth’s informal learning contexts, thus leading to questions of whether design can help elevate these practices.

2 Related Work

Learning trajectories and their social supports can be interpreted differently based on what we understand is the intended outcome of learning. Perhaps the most intuitive notion of learning outcome is that of a form of knowledge “transfer” (e.g., using knowledge learned in the classroom in a future workplace), even though this notion is as old as Plato’s philosophy and may not be entirely appropriate in media-rich and peer-driven learning contexts (Beach, 1999). The notion has its roots in assuming that human cognition is made up of “representational generalization, analogy, and the derivation of schemas” (Beach, 1999, p. 102). Thus when a transfer happens, cognitive components previously built (i.e., learned) can be reused in a new situation. According to Beach (1999), the notion of transfer is especially welcomed by policymakers, not because it can be effectively demonstrated in the real world, but because it is compatible with how our society has compartmentalized education into institutional silos.

The notion of knowledge transfer in learning has also been used in information science studies, many of which have examined learning in games and informal contexts in a single site, and within a short duration. Studies of siblings’ engagement were examined during a brief period of joint play (Ballagas, et al., 2013; Go, Ballagas, & Spasojevic, 2012); and a study examining teens’ use of social media was conducted using interviews examining recent events (Lin & Farnham, 2013). A study conducted by Voids, Carpendale, and Greenberg (2010) examined learning discourses of console gaming among gamers who were tasked to play both collaborative games (players collaborating to win as a group) and competitive games (players competing with each other). They found that within competitive games, discourses tend to emphasize individuals, rather than promoting group dynamics (Voids, Carpendale, & Greenberg, 2010). The problem is that distinct social practices observed within isolated incidents of play can say little about the continuity of learners’ experiences (Scribner & Cole, 1973).

There is an alternate view of learning outcomes: not that of transferring cognitive processes from one activity to another, but that of a learner transitioning continuously and in practical ways by developing operational skills (including language and use of artifacts), establishing new relationships, shifting to new
responsibilities and roles, and also migrating to new social contexts in every step in, as well as out of, school contexts (Beach, 1999). This new concept, known as consequential transition, marks the ways that learning in reality is not necessarily a change in our cognitive processes, but rather indicates how we modify our social circumstances and tools such that they grant us practical advantages in our ongoing endeavors (Beach, 1999). Thus, learning is a process in which we improve our future opportunities not merely by supplementing our cognitive resources, but also by improving our social and technological resources and access, in significant ways inseparable from our day-to-day experiences (Beach, 1999).

From the perspective of consequential transition, we view learning outcomes as defined from the learner’s perspective (Beach, 1999; Lemke, Lecusay, Cole, & Michalchik, 2012). Rather than letting educational cultures (e.g., those that simply focus on languages, mathematics, and science subjects) dictate what young people should learn, an alternative is to let the learners’ own peers measure their development and achievements (Lemke, Lecusay, Cole, & Michalchik, 2012). While video games may lack direct relevance to common measures used in school (e.g., test scores), many game players take gaming seriously, and are invested in logical analysis and theory crafting to levels comparable with professional activities (Choontanom & Nardi, 2012). This approach has an added incentive, in that activities like video gaming are already powerful magnets to galvanize youth participation in technological and intellectual pursuits, so we know these are activities that youth will engage with wholeheartedly. For example, while StarCraft is a competitive game, its players are extremely helpful on online forums outside of their match play. Thus, it is important to examine youth’s long-term trajectories—beyond the attachment to a single site—that are anchored in the learners’ own experiences and meanings.

3 StarCraft as a Learning Context

StarCraft is a multiplayer online and real-time strategy game played by many youth and young adults. It is a war game typically played between two competing players, with a battle scene in a futuristic military sci-fi setting, much akin to the movie Starship Troopers (1997). Despite being a “game,” players learning StarCraft often find themselves challenged to identify patterns among a complex web of relationships between combat units (like the Marines) and production facilities, and to map terrains in real time. In a match, players also have to craft strategies amidst the extremely rapid pace of the game. As Alice, founder of the college league known as the Collegiate Starleague, describes it, “It’s complex and people can reach heights—you can never be a master of StarCraft.”

An electronic sport, or esport, is organized as a set of leagues that “compete through networked games and related activities” (Jin, 2010). The inexhaustible levels of challenges posted by StarCraft propel the game into one of the most popular esport today. This process first happened in South Korea in 1999. At that time, StarCraft was so popular that Korean youth gathered after school at the many Internet cafes across the country to play the game. This movement attracted the attention of Western players and became transnational. Most of the earliest English-speaking players congregated at Teamliquid.net, which is still an active online forum today.

On Teamliquid.net, esports news and discussions are foregrounded in its discourses. Behind these discourses, Teamliquid.net also hosts subgroups conducting associated activities. For example, Collegiate Starleague and High School Starleague are national leagues organized primarily by American students to promote the game in campus and school contexts.

Since 1999, many players, now in their 20s and 30s, have already become young IT professionals. These professionals often also appear in gaming conventions and other events as sponsors and attendees. In the community, they participate as peers—at an equitable level with the younger participants. The involvement of these matured players provides opportunities to younger players who may need advice, resources, or encouragement.
By examining these participants—students and young professionals—we can identify the trajectories of their own learning as they grew up with StarCraft. Importantly, these individuals did not become pillars of the StarCraft community through one-off incidents, inborn talents, or sheer personal effort. Taking in factors such as family upbringing, education, and social influence, their successes in the community were seeded in early life and nurtured through years of geeking out at home, in school, and other social contexts.

Finally, I use the term geek based on a definition provided by Merriam-Webster, as “a person who is very interested in and knows a lot about a particular field or activity.” Here, this interest or field is StarCraft. StarCraft geeks need not only engage in playing the game, but also pursue activities such as article writing, organizing events, making commentaries, video production, and modding. As they perform different activities, what makes these participants geeks are the ways they devote themselves to mastery of their particular subfields.

4 Method

I performed observation of StarCraft participants through in-depth interviews, in-situ observations at onsite and online tournaments, and on Teamliquid.net. I conducted 24 interviews with professional gamers, casters, amateur league players, Teamliquid.net editors, tournament organizers, and community leaders. These interviewees were snowball sampled from a key member of the StarCraft community who also happened to be a student at a U.S. university. We should note that by the nature of my selection, I am interviewing the “elites” in StarCraft—the highly engaged participants, the volunteers, the contributors, and top players. I asked questions such as: When did you come across video games? How did you come to like StarCraft? How did you sustain your interest? And why did you decide to contribute to the community?

In a way, my sampling method was preselecting gamers who were already successful, and thus retrospectively examining their learning experiences. There are pros and cons to this sampling approach. The advantage is that we may identify common transitions and mediators within well-trodden learning trajectories. This method is also more efficient than, and may act as a guide for, future longitudinal studies of video-gaming children and youth growing up (e.g., Hart & Risley, 2003). One disadvantage is that, since the interviews were retrospective, informants were likely to report salient memories of their learning experiences. This is not an issue, however, since I am looking for generalizable features of consequential transitions and to identify their design needs. The second disadvantage is that while the reported trajectories were effective learning routes for ascending the StarCraft geek ladder, I may miss critical learning obstacles that already filtered out less successful players from our sample. Therefore, while our method is efficient, it is not a perfect substitute for a multi-year longitudinal investigation, which should be considered as an option for follow-up research work.

Skype is the de facto standard form of voice chat medium used in the StarCraft community. Twenty-one of our interviews were conducted over Skype, with the rest in person or on the phone. Our interviewees ranged between 15 and 30 years old, with an average age of 21.8. There were 21 males and three females. There were four professional gamers, among whom three were retired from professional gaming, but still actively involved in other community roles. There were 11 working adults, one graduate student, four college students, and seven high school students. One interviewee did not disclose his work or school status. All interviews were audio-recorded and transcribed. All names reported in the paper are pseudonyms, except for two adult public figures whose identities are already easily traceable using social media, so we reported their real names with their consent.
5 Findings

5.1 Childhood: Interests, Computing Knowledge, and Gaming Vocabulary

5.1.1 Developing interests through bonding

All my informants reported that when they were young, they did not take gaming seriously—it was mostly an activity engaged in to bond with someone they liked. As acts of fun, they enjoyed killing aliens, messing around with the keyboard, and cheating against their opponents (such as using a hack). And they reportedly cycled through many different games quite casually, including a variety of consoles (e.g., N64, Game Cube, and Game Boy) and PC games.

Having fun was important, for it mediated our informants’ first transition; that is, it helped them develop long-term interest in PC gaming. Interestingly, all of these “elite” gamers had started playing games no later than 12 years old, with some being introduced to these activities as early as five (see Table 1).

In most homes, the gamer’s interest development was mediated by an older sibling, or an older cousin. This person would be an ever-present activity partner, confidant, or even a role model. Duran, the Chief Executive Officer of Collegiate Starleague, an intercollege StarCraft league for U.S. and European colleges, told us the reason he played StarCraft for a remarkably long period of time:

What got me involved was my cousin. I remember he called me one day, when I was ten, and he told me that he got a new game... From there, I would go to his house every weekend and we’d play StarCraft together in the basement of his house. I bought the game as well. Because it was online, it allowed me to play and talk to my cousin all the time. It was that bond between my cousin and I that really got me interested in the game.

Because informants had frequent contact with these persons, and they looked up to them, their relationships motivated our informants into computer gaming. And there were also cases where neighbors were indirect sources of social reinforcement. There were rare cases among our informants in which their parents are actually technologically savvy. When these parents participated in their children’s game play, the kids took further interest in these activities.

5.1.2 Developing Computing Knowledge and Gaming Vocabulary

For our informants, gaming at a young age was vital for them to master keyboard interactions early, as well as developing computer skills.

An advantage of PC gaming is to introduce its player to the keyboard. Alice, cofounder of the Collegiate Starleague, discussed how gamers had often built up familiarity with the keyboard early:

[Non-gamers] have issues with basic mechanics like left clicking. This stuff is not intuitive to them. And because it’s not intuitive, it’s incredibly difficult for them to even get into watching the game or observe the game at any basic level. So it really helps, at an early age or the early stages, to get used to what is WASD [keyboard keys W, A, S, and D, which are commonly used as directional control buttons in PC Games].

In this case, frequent uses of WASD helps gamers develop fine left-hand finger skills that are easily transferrable among PC games.

The PC is a powerful and modifiable machine (e.g., in comparison with console games). In order to improve their gaming experiences, our informants were motivated to learn to alter system components and peripheral devices, and to practice performing Internet searches for information (e.g., a gaming video). As shown in Table 1, many such skills were mentioned in my interviews, including: learning about graphic processing component hardware, surfing the web for game videos, setting up the broadband Internet, typing in a command prompt (in old operating systems), connecting many PCs together to set up a multi-player
LAN party, performing mischief like “stealing” a neighbor’s CD key, and cheating (or hacking) with the use of command codes and programming scripts. A few of them, who got this far, found ways to play with strangers online, and first experienced the thrill of chatting with an online friend whom they had never met.

Through frequent game play, our informants picked up a great deal of vocabulary—intelligible to gamers but nonsensical to others—that became vital to development of peer groups in their teenage years. Sean described the ways he and his brother could not wait to tell his mother (even though she did not understand anything they said) delightful facts he had learned in StarCraft:

You know how all kids do like, “Momma, Momma, memorize the names to these Pokemon.” But for us it wasn’t about Pokemon it was pro gamers. Like [professional gamer 1] and [professional gamer 2]. Talking about who they were and stuff.

These vocabularies were made up of game titles, virtual items, celebrities within esports, names of famous strategies, and even geeky slang. These transitions, which will in the future feel second nature to gamers, were just beginning to acquaint our informants with new notions of technicalities, bodily practices, and languages of geeking out.

<table>
<thead>
<tr>
<th>Childhood (-5-12)</th>
<th>Teenage (-13-16)</th>
<th>Young Adulthood (-17-30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motives</strong></td>
<td><strong>Competition and friendship</strong></td>
<td><strong>Contribution and reputation</strong></td>
</tr>
<tr>
<td>Transitions</td>
<td>Developing interest in PC games, practicing keyboard skills, setting up computer hardware, networking the computer, using computer command lines, learning lingo in PC gaming</td>
<td>Organizing LAN parties and competitions with friends, researching game strategies, acquiring gaming friends, acquiring awareness of a community</td>
</tr>
<tr>
<td>Cumulative Learning</td>
<td>Interest in PC games, keyboard skills, computer hardware skills, computer networking skills, knowledge of computer scripting, expertise in gaming lingo</td>
<td></td>
</tr>
<tr>
<td>People</td>
<td>Parents, older siblings, older cousins, adults in extended family, neighbors</td>
<td>School friends</td>
</tr>
<tr>
<td>Settings</td>
<td>Home: Family gatherings, family time, meeting neighbors</td>
<td>Middle schools and high schools: Magnet programs, chess clubs, robotics clubs</td>
</tr>
<tr>
<td>Artifacts</td>
<td>PC games, console games (in addition to previous artifacts) Multiplayer games, online games, board games, modding tools</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Consequential Transitions and Mediators Collected in our Data
Note. Indicated age ranges are rough estimates. I used age transition points (e.g., between teenage and young adulthood) that correspond to our informants’ transitions between learning environments (e.g., moving from more structured high schools to less structured colleges), instead of say neurological development stages, in order to reflect the ways people and settings have influenced our informants’ learning. Also, our informants’ learning experiences varied more widely as they got older (i.e., transition points were more similar when our informants were younger, but became dissimilar as they aged). For example, a few informants were already participating in the community before the age of 16.

5.2 Teenage: First Peer-Driven Social Networks

5.2.1 Finding geeky friends through gaming and competition

During teenage years, the first transition was for our informants to move away from gaming primarily with family members, cousins, and neighbors, to begin gaming and competing with peers.

Regarding whether a middle school or high school can offer the right environment for these gamers to develop peer groups, an important factor was the availability of educational programs that attracted teenagers bearing common interests. And the nexus of gaming practices might transition from home to school, if the school contained like-minded people. For example, Alice had always been keen in following his elder brother’s gaming interests, anything from PC games, console games, and even Yu Gi Oh! But her trajectory included a transition around high school:

But, what really interested me about StarCraft, that kept me going, was when I started playing competitively, or trying to play competitively. We had these three girls in my high school who started challenging these four guys. We would play three v. four and we would beat them. And then, we would always try to find out, how can we play even better?

When this happened, themes of gaming with siblings or cousins would fade into the background of their narratives, and were replaced by scenes of gaming clubs and school teams, of school friends making inside jokes around video game elements, showing off a new game to others, watching professional games together, organizing LAN parties, and passing notes about games (to the teachers’ dismay) during class time (see Table 1).

These school-based peer groups were not devoted only to video games, but notably, operated around a constellation of intellectually challenging interests. As Eddy described, “We actually tried to get a StarCraft club, but I think the school didn’t approve of it or something... Yes, so we decided to just make a Facebook group thing... Oh, there is a chess club, yes.” Within the “chess club,” other activities they shared include Yu Gi Oh!, Magic the Gathering, and robotics.

5.2.2 Discovering the community

The second important transition that happened to most of our informants during their middle or high school days was the discovery of the community, which consisted of adult participants and existed outside of their own peer groups.

At one point while gaming with peers, Garry, a high school student who participated in the HSL, accidentally discovered the presence of an esport scene. Garry said:

I remember [the screencaster’s] face comes on the screen, we pause it, we’re waiting for the load and I remember, ‘Wow, this idiot actually plays video games for a living. What a no-life.’... but then [I finished watching] Day[9] Daily #100 [a video about the StarCraft professional scene] and I’m like, wow. You can really—it’s no longer just a game. This is an industry and a business that at the time, looking back now, has seemed very successful. So that really was the moment and I was instantly hooked from that point on.
While watching esports online is often a private affair, it was through this activity that these teenagers became cognizant of the existence of an esports scene. At this stage, most of our high school informants were not interested in meeting public members yet. As Henry described, “kid gamers [socializing] with adult gamers is an awkward situation.”

But as they developed social networks, and learned about the existence of the community, these transitions prepared our informants to become engaged gamers.

5.3 Young Adulthood: Achievements and Reputation

5.3.1 From peer groups to community
As our informants entered adulthood, many of them exhibited a visible change to embody a more participatory and achievement-oriented outlook. Their motivation shifted from the desire to compete with peers to contributing to the community (see Table 1). In return, they would gladly receive recognition, and reputation.

The college context, in which there are more students as well as video game clubs, offers a rich environment for gamers to identify more activity partners. Alice of the Collegiate Starleague only started the organization incidentally when she was at Princeton University. Like Jack and others, she had actively participated in playing PC games at high school, even though these were informal events conducted with “friends of friends, or friends of acquaintances.” When she entered Princeton, she cofounded a video game club on campus. Alice also liaised with a friend who was studying at MIT to organize a StarCraft match between the teams of the two universities. The match was publicized on TeamLiquid.net, and Alice received overwhelming responses from other colleges:

After that, people started emailing us. We did most of this through Team Liquid. People were like, “Hey, we want to play too.” At first, we were just going to do show matches every week, and I would try to organize them. But eventually we got so many signups that we got 26 people in the first season, so we ran a really short first season... and now we’re at 250.

With years of experience gaming with peers, Alice accumulated a vast social network of friends whom she was able to rely on when she was reaching out to other universities. And through social support from other college students, she began to transition into a new role as Collegiate Starleague cofounder.

In cases like that of Alice, the youth’s transitions into leadership roles were mediated by having met, and being encouraged by, other perceivably good, friendly, and supportive geeks. Then, they felt an increasing urge to play more significant roles (see Table 1).

A small number of our informants then continued to transition into full-time careers in the esports industry. In these cases, accumulated social reputation in the community was a critical mediator and currency to obtaining a respectable full-time job. These kids, who first played StarCraft for fun, ascended the peer culture and became notable geeks—the contributors, leaders, and professionals.

6 Discussion
Our informants did not receive instructions to become geeks, but accumulated their learning—consequential transitions—across years of growing up with PC games. From gaming as children, to becoming teenagers, and then young adults, they followed a long-term trajectory that linked up their experiences. From time to time, the informants changed their objectives in gaming, such as social bonding or competition, but they continued to accumulate valuable skills, social networks, and interactions important to future transitions (see Table 1). For example, the internalization of gaming lingo helped them develop peer networks at school.

In the following sections, I discuss consequential transition as a form of cross-boundary learning with tangible consequences for the learner. Finally, I will discuss ways computing technologies can perform
the role of mediator, such as in supporting the socialization of learners into technology activities, and in articulating these achievements to institutional entities.

6.1 A Cross-Boundary Consequentiality that Needs to be Recognized by Institutions

The key contribution of this paper is to illustrate the concept of consequential transition, using the case of computer gaming to describe a personalized view of learning, which cannot be justifiably reduced to cognitive development during a single-sited event, but must be aggregated and rationalized along a long-term trajectory that includes the accumulation of social relationships and situational skills—all acquired during the learner’s day-to-day interactions.

Consequential transitions is a provocative concept (Beach, 1999) which advocates that the notion of learning should expand beyond cognitive transfer of knowledge, in order to also encompass the acquisition of resources a productive citizen needs to succeed in life (Beach, 1999). In any creative endeavors, she will need supportive friends and colleagues, social skills to participate in influential communities, and technical skills to utilize emerging tools and artifacts to perform the required tasks. In our case study, the informants could not have become “elite” gamers without acquiring these resources in early life.

Consequential transition advocates a cultural continuity of learning, it ignores the boundaries of contexts, and follows us through our daily routines (Beach, 1999). Our learning continues regardless of whether we are at home, at work, or commuting. In a way, the concept goes beyond the primary framework of community of practice (i.e., situated learning), in which actors within each situation cultivate their unique and shared practices (Lave & Wenger, 1991). Instead, consequential transition is suggesting a form of cross-boundary learning—a personal learning journey which breaches institutional and social boundaries such that only the learner sees its entire meaning.

Many institutions now recognize and cultivate communities of practice (Wenger, McDermott, & Snyder, 2002). But with cross-boundary learning, there is a risk, if the learner’s meaningful transitions are not expressed in an institutionally recognizable form, that his achievements may never be known apart from himself and his learning partners. Unless educators, researchers, and designers find ways to mediate, capture, and materialize consequential transitions, and relate this outcome to educational practices, such consequential learning experiences will remain an amateurish venture (e.g., Bardzell, 2007). This is another reason the concept of consequential transition is advocated—to provoke a dialogue to “bridge the classroom with productive activities beyond but also give developmental direction to their relation” (Beach, 1999, p. 131). This is a gigantic endeavor being undertaken by initiatives such as Connected Learning, to find a link between informal learning activities (e.g., gaming), and academic and socioeconomic pursuits (Ito, et al., 2013).

Designers can support informal learning in two ways. Designers can develop technologies to directly mediate such activities, for example, by assisting learners’ ability to socialize with their peers, acquire skills, and explore new uses of computing technologies. And designers can develop artifacts as mediating links between informal learning and institutional contexts. I will illustrate these in the next section.

6.2 Designing to Support Consequential Day-to-Day Learning

Consequential transitions happen in day-to-day interactions of a learner. Thus, the contexts in which these interactions take place become important starting points of technological design. A context’s mediators, including setting, people, and artifacts, can all potentially be negotiated (e.g., modified, replaced, enhanced, or expanded) through design implementations. I provide two examples of how design can lead to materialization of informal learning attributes in these learning contexts.

One, designers can identify ways to mediate key learning supports within a learning context (see Table 1). An example is the use of technologies to support parents nurturing children and youth in computer-related learning. Children’s early exposure to a large volume of spoken words at home will strongly influence their future language learning (Hart & Risley, 2003; Yardi & Bruckman, 2012); our data suggests
that proficiency in computer-related learning may also have to begin at an early age. Considering that children’s learning is primarily structured around play (e.g., language learning often starts with word games like “I spy,” and rhymes), it is fair to consider that computer games (i.e., playing games on computer platforms) may have to be the earliest sites of computer learning. A matter of importance is the degree to which parents—many of whom are already prolific bedtime storytellers—should also accompany and mentor their children’s computer game play.

Family technologies and games are ways of nurturing and facilitating technologically centered discourses between parents and children, siblings, and similar-age kids in a family. Ballagas et al. (2013) designed a multiplayer game for siblings at home, and found evidence of collaborative work and learning during their gaming interactions. But they also found an issue concerning siblings, where those who engage in constant conflict may not work well in co-learning activities (Go, Ballagas, & Spasojevic, 2012). As informed by our findings, cousins and neighbors may also mediate formation of computer gaming interests and activities. Therefore, a solution is to extend such games to similar-age children from the extended family and the neighborhood—while under guidance and encouragement by parents (see also Schoenebeck & Bruckman, 2013). Such activities should aim to foster development of knowledge in technological vocabularies, scripts, computing hardware and software, and, importantly, the ability to socialize into peer groups and communities.

Two, designers can develop mediating links to bridge the gap between informal learning contexts and institutional contexts. An example is the use of digital badges by many learning websites to represent learners’ achievements to potential employers (Walters, 2011). While reputation sustained by a word-of-mouth social system decays rapidly the moment a learner leaves the social network, digital badges are promising ways to forever capture, present, and articulate notable achievements to outsiders (Walters, 2011). For example, Stackexchange.com, a question-and-answer platform, issues “badges” to its contributors based on dozens of easy-to-understand criteria such as: “Question favorited by 25 users.” Thus, these badges represent socially embedded achievements in forms that are not context-specific. In other words, while social reputations are often socially embedded, digital badges could materialize these reputations in cross-boundary formats.

Such badges have been largely used as gamified rewards to augment formal institutional learning (e.g., an online course) (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). When used in institutional contexts, students have tended to view these artifacts as secondary to formal certifications, thus they did not take them seriously (Resnick, 2012; Rughiniç & Matei, 2013). To give institutions the sole privilege to award these badges also contradicts our argument that consequential transitions should be determined by learners themselves (i.e., it is not up to an institution to decide what and when to reward a student). Badge rewards may have to take place within informal learning contexts in order to be meaningful to these learners.

Consequential transitions often happen as day-to-day events: making a new geeky friend, signing up for chess club, or experiencing a eureka moment. These routines are also socially embedded with intents and shared purposes of peers within the same activity. A transition is consequential often because it matters to this group of people. Thus, a design implication for future investigation is to allow peers themselves to propose and create badges fitting to these significant events, which can then be awarded and validated by other peers.

Youth and young adults are investing huge amounts of time and intellectual energy in mastery of activities both in and outside of institutional settings. They are building digital artifacts, organizing events, establishing social relations, and have even developed whole new industries (in our case—esports). But these boundary crossing activities are difficult to accredit. These transitions will be consequential, not just for the learners themselves, but also for our society, only if designers can materialize their “footprints” for future learners to follow (see Fuhrer, 1993).
7 References


Davis, K., & Fullerton, S. (Forthcoming). Connected learning in and after school: Exploring technology’s role in the diverse learning experiences of high school students. The Information Society.


Schoenebeck, S., & Bruckman, A. (2013). If We Build it, Will They Come? Designing a Community-Based Online Site for Parents. *iConference 2013*. Fort Worth, TX: IDEALS open repository.


