Digital natives, better learners? Students' beliefs about how the Internet influenced their ability to learn

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ABSTRACT

In the literature students are sometimes assumed to feel empowered with respect to learning because of their familiarity with and access to ICT. However, after interviewing 25 students from post-elementary schools, it was found that the majority of the students, although they use the Internet and other ICT for school purposes, believed that their generation is not as good at learning as the pre-ICT generation. Several students explained the situation in terms of the school's failure to build on their abilities. Nonetheless, the majority believed that the Internet over-simplifies schoolwork (perceived primarily as the traditional processing of textual sources), which in turn diminishes learning abilities. These results carry important implications regarding school, given that low self-efficacy might make students less likely to apply themselves to learning.

1. Introduction

1.1. The Internet as a mediator of learning practices and values

In many developed countries, most teenagers intensively use digital technology, especially the Internet. In fact, this generation was given many names that emphasize its affinity and tendency to use digital technology, such as *Clickerati* (Harel-Caperton, 2003), *digital natives* (Prensky, 2001), the *Net Generation* (Tapscott, 1998), and *Screenagers* (Rushkof, 2006). These names are aligned with supporting evidence in many developed countries that shows that students have high access to the Internet and use it extensively for school work and leisure (e.g., the OECD report, 2006; Levin & Arafeh, 2002, in the US; Livingstone, 2005, in the UK; Lemish & Ribak, 2006, in Israel).

According to Wertsch (1998), when we are introduced to a new tool, our sense of its affordance and constraints gradually evolves, and our goals and actions in the context of the tool (as well as our interpretation of the context) are transformed. Tools are in this sense meditational means. However, actions usually result from multiple, often-conflicting goals, some of which are associated with our history with the tool and the context of its use (as well as our history in general), some with power and authority, and some with a combination of these factors.

Wertsch (1998) points out that:

[T]he introduction of a new mediational means creates a kind of imbalance in the systemic organization of mediated action, an imbalance that sets off changes in other elements such as the agent and changes in mediated actions in general. Indeed in some cases an entirely new mediated action appears (p. 43)

This conceptualization suggests that the Internet does not merely influence students by enabling an additional means to perform school assignments. Rather, like other ICT, the Internet transforms students and other users' actions and values. Specifically, it is argued that the Internet, among other digital technologies, shifts the way we learn as well as our values regarding learning, namely, what is deemed good, appropriate, and efficient in this respect (Brown, 2000; Turkle & Papert, 1991).

Turkle asserts that computer and Internet technology made bricolage legitimate or even necessary. Bricolage, or tinkering, "can be taken to mean 'trial-and-error,' learning by poking around, trying this or that until you eventually figure it out" (Papert, 1996). Bricolage is also about "the abilities to find something – an object, tool, document, a piece of code – and to use it to build something you deem important" (Brown, 2000, p. 14). Children, like other computer users, "have moved in the direction of accepting the postmodern values of opacity, playful experimentation, and navigation of surface as privileged ways of knowing" (Turkle, 1995, p. 267). According to Brown (2000), life with the Internet brought about a shift in what is considered as valid reasoning, from the linear, deductive, abstract style of the book generation to bricolage.

Similarly, Bruns (2007) points out the emergence of what he termed 'produsaging' – a new hybrid form of simultaneous production and usage – amidst today's generation. ICT users are thus engaged in collaborative and continuous building and extending of existing content in pursuit of further improvement (e.g., Wikipedia). Bonk (2009) claims that ICT encourage and legitimize

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sharing. In the same spirit, Harel-Caperton (2003) refers to today's children as the *three X's generation,* emphasizing their learning through bricolage by eXploring, eXpressing, and eXchanging ideas using technological means.

In contrast to these primarily positive views of the changes in learning practices and values in today's generation, some scholars think that ICT dis-empowers students in terms of learning. Bauerlein (2008), for example, claims that the technology stupefies this generation, by contracting their horizons to themselves and enabling them easy detours that exempt them from practicing intellectual skills. According to Twenge (2006), Twenge (2009) the generation born after 1970, which she terms *Generation Me*, is more self-focused, to the point of narcissism, and less motivated to learn something unless its immediate benefits are clear. Those who are part of this generation read fewer books and are less likely to use textbooks in comparison to previous generations. Furthermore, while more assertive, students in this generation are less self-reliant.

1.2. ICT use in-schools

There have been great expectations for ICT to create a change in pedagogy (Kozma, 2003). ICT can serve as a useful means to realize innovative constructivist pedagogies (Bonk, 2009; Salomon, 1998). Moreover, today's students live in a rapidly changing, globalized and digital world, making the establishment of successful human–computer interactions necessary. Technology can, for example, free one from low-order mental activities, enabling concentrated effort on higher mental functions. It can also form a synergy with humans to tackle difficult problems, for example in the case of text mining.

In the past decade, ICT, including the Internet, has been increasingly available in-schools (see, for example, the surveys by the Organisation for Economic Co-operation, 2004, 2006). Moreover, many Western countries have tried to provide teachers with adequate preparation for dealing with ICT (see, for example, the work and review by Ertmer, 2003; Ertmer, 2005, and the report by the US National Center for Educational Statistics, 2002).

Much effort has been put into the development and refinement of pedagogies that encourage collaborative knowledge creation utilizing ICT (e.g., the Knowledge Building pedagogy and tools, by Bereiter and Scardamalia (2006), and the review on CSCL pedagogies and tools by Lehtinen (2003)).

Nonetheless, in many schools in the Western world the situation is one of high access and low use of this technology (e.g., Cuban, 2001). The OECD report (2004), based on research in 40 countries, asserts:

> Major investment outlays over the past 20 years have brought modern Information and Communications Technologies (ICT) into nearly all schools in the most advanced OECD countries, but the extent to which computers are in day-to-day use in these schools remains disappointing. (p. 1)

Similarly, the OECD report of 2006 portrays a reality of high use at home and low use at school: "In most OECD countries and in some partner countries in the PISA 2003 survey, the great majority of 15-year-old students have ready access to computers, at home and at school" (p.102), and yet, "even though access to computers is more universal at school than at home, 15-year-old students use their computers at home more frequently" (ibid, p. 106). According to the report, students mostly use the computer for Internet searches, word processing, and games, and are confident in their Internet abilities and their ability to learn new technological procedures.

In Israel, where this study was conducted, students face a similar reality. According to a survey on e-readiness carried out for the Ministry of Finance (Mizrachi, Bar, Katsernov, & Nachman, 2005) nine out of 10 households with teenagers have at least one computer connected to the Internet. This survey also pointed out that teenagers have high e-readiness, i.e., they are able to benefit from digital technology. These students also face a situation whereby the Internet is highly used at home (Lemish & Ribak, 2006), but seldom used at school.

Moreover, although there are exceptions (Becker, 2000; Cuban, 2001; Ertmer, 2003), when ICT is used in-schools at the post-primary level, it is typically not used to change the school's agenda. Rather, it generally preserves the core teacher-centered, information-focused, traditional practices of teaching and learning or is aimed at enriching the existing school curriculum (Cuban, 2001).

1.3. Students' intellectual partnership with the internet and school learning: different value systems?

As described above, ICT and its use at home encourage and facilitate learning through bricolage, sharing, and 'produsaging'. In-school, however, students interact less with ICT. Moreover, schools commonly advocate different learning values, what Perkins (1992) referred to as 'person-solo' learning.

The main value incorporated in 'Person-solo' learning is that "it is the person solo who should acquire knowledge and skills... it is the person solo who should have all the knowledge and skills in his or her hands rather than tucked away in easily accessible sources" (p. 132). According to Shaffer and Clinton (2006), these values bring about discomfort among educators when facing students' tendency to use ICT, a "panic that our children are no longer learning how to think" (p. 297).

In line with the above, with some exceptions, teachers are described in the literature as being ambivalent towards students' use of digital technology. They recognize the potential of the technology to support learning, but are concerned about the implications of its (ab)use. This description is based on empirical evidence (e.g., in Hong Kong, Katyal & Evers, 2004; in Israel, Lemish & Ribak, 2006; in the UK, Livingstone, 2005). Li (2007) examined the attitude of secondary-school mathematics and science teachers and their students towards the use of computers and the Internet and found that the teachers were far less enthusiastic than their students regarding the benefits of such use.

It may be said, then, that the students are receiving mixed messages regarding the use of ICT and its appropriateness. On the one hand, they are constantly using ICT at home, their schools are typically equipped with computers, and the potential of ICT for learning is recognized in their school environment. On the other hand, the school's learning culture is 'person solo' oriented, there is low use of computers at school, and concerns are voiced regarding possible negative effects of ICT use.

This situation raised a debate in the literature. Some believe that students are empowered and/or perceive themselves as empowered by their experience with ICT and thus might consider themselves to be better learners than the pre-ICT generation (and, implicitly, their learning values to be better than those currently reflected in-school). For example, Prensky (2005) described students (or, as he termed them, digital natives), as "empowered in so many ways outside their schools" because "their lives are surrounded by digital tools." Moreover, he believes that "educating or evaluating students without these tools makes no more sense to them than educating or evaluating a plumber without his or her wrench" (p. 12). Papert (1998) believes that students will try to make the school adapt to their form of learning. He calls them 'an army for change': "We have an army. It's this army of children, of kids coming into the school with a better image of learning and with the technical knowledge to implement that better image of learning" (Papert, 1998).

Both Prensky and Papert view students as feeling empowered by their ICT experiences outside of school, enough so that the current school learning practices and values are no longer deemed

suitable in their eyes. The results of the work by Levin and Arafeh (2002) support a similar view. Based on a survey conducted in the United States, they claim that students "are frustrated and increasingly dissatisfied by the digital disconnect they are experiencing at school", and expect the school to change accordingly. Katyal and Evers (2004), who studied students in Hong Kong, found that they were enthusiastic about the possibilities of studying opened up by the Internet, viewed their out-of-school learning experience as preeminent and marginalized the value of school as a learning-to-learn institution.

In contrast with the view of dissatisfied students as a force for change within the school, Shor (1992) claims that students gradually acculturate into school values. Hence, it is less reasonable that students would consider changing school learning practices and values. Bennett, Maton, and Kervin (2008) and Selwyn (2008), Selwyn (2009) support this view, suggesting that students see school as a valuable learning environment, despite the low use of ICT.

1.4. Rationale and research goals

The question of the students' perceptions regarding their use of ICT and their evaluation of their own learning and school learning values has been the subject of previous studies by the author of this paper. In a previous study (Ben-David Kolikant, 2009a), 74 students from three classes filled out a questionnaire about their after-school use of the Internet for schoolwork and their perceptions of its influence on their learning and ability to study.

All students reported that they used the Internet for schoolwork in the past year. However, students' response to statements that suggested that the Internet has a positive influence on their ability to learn was far from clamorous agreement. Specifically, 63% of the students disagreed with the statement "I believe that my generation knows how to learn better than the generation that did not have computers" ($N = 74$, $M = 2.31$, $SD = 1.033$, on a scale of 1–4, where 1 represents strong disagreement and 4 represents strong agreement). A repeated measurement in different schools gave similar results ($N = 262$, $M = 2.29$, $SD = 0.976$, Ben-David Kolikant, 2009b).

This result raised interesting questions – if indeed students feel empowered by their partnership with computers and the Internet, as some scholars assume, should they not believe that they are better learners than the pre-ICT generation? Why then did most of the students disagree with this statement? Do they perceive their partnership with computers and the Internet as irrelevant to their schooling and hence their ability to learn as no better (and not necessarily worse) than that of the pre-ICT generation? Or do they think that they aren't as good at learning, *because* of their affinity to the computer and Internet technology? In the study reported herein, a sample of the student population of the previous study was interviewed, in order to gain insight about these questions. The current study has two foci: (a) students' considerations for using (or not using) the Internet for school purposes; and (b) their perceptions of themselves in terms of learning, and the Internet's role in this respect (if any).

2. Methods

2.1. Participants

The current study revisited 25 of the students who participated in a previous study (Ben-David Kolikant, 2009a). As mentioned above, 74 students from three different classes participated in that study. The three classes, A, B and C, were carefully chosen to capture different characteristics of schools, including grade levels, whether or not students would take matriculation exams in the current school year, and topics taught. Class A was an eleventh-grade class in a well-re-

garded school, comprising 26 students. Like most eleventh-graders in Israeli public schools, these students were scheduled to take the summer matriculation exams that year. Class B consisted of 29 eighth-graders in a well-regarded public school. This class did not have to take any matriculation exams that year.

Observations in these classes and conversation with two teachers from each class and their students revealed that instruction was teacher-centered and that exams (and quizzes) were the dominant evaluation tools.

Class C, in contrast, was sampled from a school that advocates a learner-centered approach and in which student projects are a common practice. Admission to this elite boarding school is selective and based on students' intellectual abilities. Class C was a tenth-grade class, comprising 19 students in their first year in the school.

In the current study, about a third of the students in each class were interviewed: 10, nine, and six interviewees from class A, B, and C, respectively, amounting to a total of 11 boys and 14 girls. The students were chosen randomly from those who filled in the questionnaires in the abovementioned previous study (Ben-David Kolikant, 2009a). Each student was asked by a teacher whether he or she wanted to participate and if so, his or her identity was revealed to us and he or she was approached for an interview. No incentives were given.

All interviewees reported having high access to Internet technology at home and low use at school. In-school, they had Internet access in the school library and computer lab(s), but there were no computers in their classrooms. During the interviews, they said that no in-school activity involved computers and the Internet, though the teachers do not prohibit using the Internet after school for school purposes. Conversations with two teachers who teach each class confirmed this. The one exception was that Class C received a 90-min lesson regarding how to search the Internet by one of the school teachers, which focused on university library catalogs.

2.2. Interviews

Face-to-face interviews were conducted with each student by one of three researchers (randomly assigned). The interviews, which lasted for an average of about 45 min, were semi-structured and had two focal points. One focal point was students' use of the Internet after school for school purposes, and their reasons for using it. To this end, students were asked to describe their after-school assignments and to describe and explain the process by which they accomplish them, especially how and why they use the Internet, if at all. The second focal point was students' self-perceptions regarding their ability to learn. As part of the interview, the students were asked the following question: "Do you think that today's generation is better than, worse than, or as good at learning as the generations that did not have computers, Internet or any digital technology?" The students were also asked to explain their answers (e.g., "could you please explain why?"), and in some cases were asked clarification questions.

2.3. Analysis

The interviews were analyzed separately by two researchers (one of which is the author of this paper), using an iterative constant-comparison method (Strauss and Corbin, 1998). First, the data were analyzed separately by the two researchers according to conventional qualitative methods (Mason, 1996; Silverman, 1993), looking for patterns and relevant themes, which were then coded to allow for further analysis. The researchers then met to discuss the coding scheme that each of them had devised in order to assess how prior expectations or theoretical inclinations influenced the schemes and to discuss the hypotheses by using negative case analysis. Through this discussion an agreed-upon coding

Table 1
Students' perceptions of the Internet and books with respect to schoolwork, N = 25.

	Theme	f	%
	Themes regarding the Internet		
1.1	I use Internet for schoolwork	25	100
1.2	The Internet is fun/convenient/easy/interesting	19	76
1.3	The Internet shares the load (or busywork) with you	8	32
1.4	I am used to the Internet (more than I am to books)	10	40
	Themes regarding books		
2.1	Books are boring/tedious/energy consuming	16	64
2.2	I do not prefer books/ I do not connect with books well	9	36
2.3	Books require (busy)work that is not directly about processing the information	10	40
2.4	(Because books are more reliable and detailed) books are best for serious (or important) work whereas Internet is best for unserious work	11	44

scheme was devised. A second reading of all the recorded materials enabled a systematic reduction in the number of categories by combining similar terms and eliminating redundant ones. In case of conflict, agreement between the coders was reached after extensive discussions (Glassner & Loughlin, 1987).

The analysis had two foci in accordance with the foci of the interviews. One was students' perceptions on the usefulness of the Internet for schoolwork. The students often replied to the relevant question by comparing the Internet and computers with books. Therefore, the results were analyzed accordingly and refer also to books. A list of the themes and the frequencies of their appearance in the interviews are presented in Table 1).

The other focus was students' explanations as to why they think their generation is better, worse, or as good at learning as the pre-ICT generation. To this end, students' answers were divided into groups according to their answers. One consisted of students who considered their generation to be better learners. The second group included those students who considered their generation to be worse learners than the pre-ICT generation. None of the interviewees thought that their generation is equal to the pre-ICT generation in terms of learning. For each group, the themes that emerged in students' explanations were analyzed. This analysis highlighted that second group consisted of two distinctive subgroups: those who ascribed the responsibility to school and those who ascribed the responsibility to students (and their partnership with digital technology). The themes that emerged are presented in Table 2.

3. Results

This section begins with a presentation of students' considerations regarding the use of the Internet after school for school purposes, followed by students' responses regarding whether their generation is better, worse, or as good at learning as the pre-ICT generation, and their explanations. There was no significant trend that characterized any class. Therefore, the results obtained from the three classes are all presented together. For each excerpt, the name of the student cited as well as his or her class (A, B, or C) are denoted.

3.1. Perceptions regarding the relative use of the Internet (and books) for schoolwork

The common themes that emerged regarding students' perceptions of the Internet and books with respect to schoolwork are presented in Table 1. All students, when asked whether they use the Internet after school for schoolwork, responded affirmatively (Theme 1.1). For example:

Arik(A): Of course. Whenever I see something [that requires pursuit of information] in the homework, I go to Google, write down what I need and usually I'll find it there, and if it is not there then I'll find it on other sites

Internet use was ascribed positive qualities by 76% of the interviewees, who referred to it as "fun," "interesting," and "easy" (Theme 1.2). A related theme (Theme 1.3) was that the Internet shares the workload with the students. For example, according to Barbara (C), "On the computer you just type and press Enter and you get lots of options." Additionally, electronic sources can be edited with a word processor. Nevertheless, 40% of the students explained that their use of the Internet for schoolwork stems from their familiarity and proficiency with it, gained in other contexts (Theme 1.4): "I use it a lot and I'm better acquainted with it than

Table 2
Students' perceptions of their generation's learning in comparison to pre-ICT generation, N = 25.

	Theme	f	%
	Themes supporting the claim that this generations is better at learning than the pre-ICT generation	8	32
3.1	ICT eases the search for and processing of information	8	32
3.2	The easy process encourages/facilitates curiosity/thinking	5	20
	Themes supporting the claim that this generation is worse at learning than the pre-ICT generation	17	68
4.1	School should change to accommodate our different abilities and work habits/the changes in the world	5	20
4.1.1	We think faster (used to innovative tools), school needs to adjust instruction	2	8
4.1.2	The world has changed, but school did not change	3	12
4.2	The partnership with Internet/other digital technologies diminishes learning	12	48
4.2.1	Internet enables shortcuts and detours and students abuse this opportunities	9	36
4.2.2	Today's generation is lazier (because of the ease enabled by the Internet)	8	32
	Themes regarding the pre-ICT generation[a]		
5.1	The previous generation studied for hours /was willing and able to invest time and effort	6	24
5.2	The previous generation could deal with books	5	20
5.3	Books allow no shortcuts	7	28
5.4	The previous generation lived in a world with fewer temptations	5	20

[a] The students primarily referred to their own parents, despite the generality of the question.

with my encyclopedia. I'm more proficient in using it. I think anyone would prefer something he's mastered over something he's less familiar with" (Gil(B)).

Work with books was perceived by 64% of the interviewees as associated with boredom and annoyance and using up a lot of energy (Theme 2.1). For example, Teresa(B) said: "If I have the energy I'll use the encyclopedia; usually I'll use the Internet." A related theme was that students prefer using the Internet over books, finding it easier to relate to (Theme 2.2, mentioned by 36% of the interviewees). Some mentioned the work required to find and process information when using a book (Theme 2.3, mentioned by 40% of the interviewees). This is demonstrated in the following quote from Barbara (C): "it [book use] is more difficult, you physically pick up the book [slowing down her speech], open it, turn the pages, and search". A fifth of the students explicitly indicated that they considered this busywork.

Nonetheless, 44% of the interviewees believed that when a "serious" or "important" (their words) work process is required – such as when they are assigned a graded paper project, their work process should involve the use of books. Using solely the Internet for this was perceived by them as cursory (Theme 2.4): "If it's a more *serious* assignment, you should check an encyclopedia and books, but if it's an assignment amounting to just a few pages, then the Internet is sufficient" (Anna (A)). Books were considered better sources for serious work than the Internet, because they were perceived as more reliable and detailed than Internet sources. As Nadia (C) asserted: "You could learn stuff from the Internet, but it's less professional. It's not like books. Books are more reliable, more professional. They're more detailed and better." Gary (C), who does not use books, described his work as not serious: "[When] you just want to do more or less okay, but not much more, then you go to the Internet."

3.2. Students' self-perceptions of the influence of the Internet on their learning capabilities

Thirty-two percent of the interviewees believed that their generation is better at learning than the pre-ICT generation, whereas 68% thought that their generation was worse in this respect. This sample therefore aligns with the results of the current author's previous studies in these schools and in other schools (Ben-David Kolikant, 2009a, b), in which the majority of the students disagreed with the statement "I believe that my generation knows how to learn better than the generation that did not have computers". Moreover, none of the interviewees thought that the generations were equal in this respect. Rather, they all referred to the partnership of their generation with the Internet either as empowering, as a minority of the interviewees thought, or as diminishing school learning capabilities, as the majority thought.

The most common themes that emerged in the interviewees' explanations are presented in Table 2. It was evident from the analysis of the explanations that those who thought that their generation is worse at learning than the pre-ICT generation (68% of the interviewees) were divided into two distinctive groups: five students (20% out of the 25 interviewees) perceived the school as responsible for this situation, whereas the remaining 12 students (48%) perceived the students and their affinity to ICT as the cause.

3.2.1. The student–Internet partnership as empowering, easing and encouraging learning

All eight students who thought that their generation learns better than previous generations based their explanations on their easier access to and processing of information (Theme 3.1). They all explained that, because the Internet makes information accessible, the task of searching for information is easier. For example, Alex(B) stated the following: "It [the computer] helps. It is easier:

easier to type, to write, to enter. Not too easy, you [still have to] read. You're more [pause]. It is easier to read."

Five of these students also believed that the ease of searching for information has added value with respect to learning (Theme 3.2). One advantage mentioned as a result was that learners' time is freed to learn more: "You find right away what you want. It is less tiresome than when sitting with 70,000 books and searching and searching and searching and searching and searching. You do [find something] within minutes. You have time for different things, to browse, to check more, to search for more details" (Nina(C)). Another advantage mentioned was that the ease of searching and processing information with the help of the Internet encourages curiosity and thereby motivates learning. In the words of Barbara(C): "Because we—our generation—is exposed to a lot more than they [the previous generation] were when they were young, and I think it very much increases one's curiosity and then you want [to know] more". In contrast, their parents' generation was discouraged from learning because of the vast efforts needed to access the desired information, or in Avi's(C) words: "I assume it was onerous to study then." Internet thus was perceived as easing and encouraging learning.

3.2.2. The student–Internet partnership as dis-empowering because of school

Of the 68% who believed that their generation is worse at learning than previous generations, five students (which constituted 20% of the total of the interviewees) explained that the reason that they are worse learners than the previous generation is because school is not adjusted to today's world (Theme 4.1). Of them, two students assumed that today's generation of students differs from the previous generations in mental abilities – for example, today's students think faster (Theme 4.1.1):

> Yair (A): My doctor has a theory that kids today grasp information much more quickly. Students, mostly kids, see things on the computer screen; the computer screen means pictures that run fast. [You get used to] catching onto things quickly. According to his theory, teachers go too slowly. That creates boredom, which in turn leads to students not listening.... I kind of agree with him

The remaining three students explained that the world has changed, but school did not (Theme 4.1.2):

> Gil (B): Computers are [characterizing] our generation. Soon, we'll even be able to do shopping of grocery through the Internet, so why not schooling, which is the most fundamental thing? How come we don't study with it?

These five students, hence, judged their partnership with the Internet as positive and blamed the educational system for not attuning itself to accommodate their abilities.

3.2.3. The student–Internet partnership as dis-empowering in itself

Almost half of the students interviewed (48%), judged their partnership with the Internet as dis-empowering. The Internet was thought to make schooling too easy, exempting students from the need to "really" study (Theme 4.2.1):

> Dafna (A): [Learning] is really easy now, not like in the past when you really needed to study. The value of learning declined, simply declined, because [information] is more accessible. It's a shame

Another aspect of this ease in students' work process is that the Internet enables them to take shortcuts in their school assignments, which in turn hinders their development of study skills:

Tanya(A): Even I, when I do projects, I avoid dealing with … difficult bits. I prefer switching to things written by students or really simple stuff. That shows that I merely work in a cursory way. I'm always looking for simpler stuff instead of trying to challenge myself. I think this is true for all my friends.…When you deal with a book, then you have to struggle much more – you need to read because – really, I feel that with the Internet I "mark" the sentence, easily, cut it, easily. And with books I need to read, to check, maybe this way, maybe that

Note that Tanya's negative judgment focuses on her relationship with the Internet and not on school: it is she who works in a cursory way (by using the Internet), thereby missing the learning opportunities provided by school. Had she worked with books, she would have "struggled" more, which is perceived as a positive goal in itself.

Negative judgment towards the student–Internet partnership was also reflected in students' claim that today one can "cheat" easily because of the Internet: "you can spend an entire year getting good grades but not learn anything; you download, memorize a bit, but do not really think profoundly about the material, not really learn, and [still] get grades" (Ellen (B)). Other students cautioned that sometimes over-reliance on the Internet leads to poor grades. Arik (A) described such a scenario: "Students come to class planning not to study there because they have the Internet. Eventually they fail because the Internet is comprehensive but it has its limits."

A related theme was the judgment of this generation as lazy (Theme 4.2.2). Eight students judged their generation as lazy because of the use of the Internet: "This generation is lazier. You ask [students in this generation] for a summary and they go to the Internet", whereas in the past "they read more because there was no computer" (Sheena (B)).

3.2.4. The myth of the pre-Internet generation's greatness

A prominent theme (Theme 5.1, mentioned by 24% of the students) was that the older generation was better at (school-related) learning than today's students. The previous generation "sat and studied for hours and days. Really, they just sat there [in the library] and studied" (Ellen (A)). Furthermore, school and learning were more important to the older generation, who presumably "spent less time going out [to have fun]. Instead, they studied more and made more effort. That's what was important for them. Today you want to enjoy your childhood, in addition to doing well in school" (Oren (B)).

Another theme (Theme 5.2, mentioned by 20% of the students) was that the students of the previous generation "could deal with books" (Barbara (C)) and were capable of doing a lot of reading. A related theme (Theme 5.3, mentioned by 28% of the students) was that books forced the students of the previous generation to study, that there was no way around it. In the words of Erez (B): "You had no choice. You had to read and summarize what you read. Today, kids just search the Internet and copy. Maybe they read a little just to make sure that the stuff isn't totally irrelevant."

Additionally, five students mentioned that the older generation lived in a world with fewer temptations than today's children (Theme 5.4). According to Emma(B), for example, people "were simply bored so they studied.… They didn't have computers so they didn't spend many hours playing games. They didn't have a TV set to sit in front of for hours."[1]

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[1] Israeli Television was launched in the mid-1960s. Until the early 1990s, Israel had only one television channel. Mornings and early afternoons were devoted to educational programs, and children's programming was allocated only an hour and a half in the afternoons.

4. Discussion

4.1. Life within two value systems

All the students interviewed for this study reported using the Internet after school for school purposes. A prominent theme was that the Internet is user friendly, fun, easy, and facilitates quick access to and retrieval of information. Nevertheless, when a "serious" and "important" assignment was at stake, such as a term paper project, almost half of the interviewees thought that they should incorporate books into their work process, because using only the Internet seemed to reflect a cursory job.

Only a third of the interviewees believed that their generation is empowered by technology, in terms of learning. The majority of the students, however, thought that their generation was worse at learning than the pre-ICT generation. Some of them attributed the problem to their schools' "book-orientation". According to them, schools did not undergo the change required given the influence of digitalism on life. These students fit Papert's description of an 'army of change,' students who believe that they have a better viewpoint regarding learning and think that schools should change to accommodate their ideas. However, about a half of the interviewees perceived their relationship with the Internet as diminishing their learning skills by enabling easy shortcuts, and worse still, as encouraging laziness. In contrast, books were perceived as allowing no shortcuts, and this is one of the reasons that the students of the pre-ICT generation were considered better students.

Why is the Internet considered less appropriate for "serious" schoolwork than books, despite its perceived advantages for this purpose? Is it because of those very same perceived advantages? A related question is has to do with the reason(s) for the interviewees attributions regarding their perceived inferior learning abilities (compared to the pre-ICT generation). Why do some of view the school as responsible, whereas others see themselves and their partnership with ICT as responsible?

It may be that today's students live within two value systems regarding the Internet, computers, ICT, etc. and their usefulness and appropriateness for learning purposes. Outside school, students are used to interacting with information through collaboration and bricolage: "Today's kids get on the Web and link, lurk, and watch how other people are doing things, then try it themselves" (Brown, 2000, p. 14). 'Produsaging' (Bonk, 2009) and sharing (Bonk, 2009) are typical to and considered acceptable by ICT users. They can legitimately "find something – an object, tool, document, a piece of code – and [use] it to build something [they] deem important." (Brown, 2000, p. 14). For example, they can prepare (and upload) a summary about a certain topic taken from other summaries downloaded from the Internet. Thus, the Internet encourages and facilitates a culture of sharing. Simply attempting to hold information in your head is not valued, but rather being able to navigate and find what was needed and meliorate it, e.g., use it in innovative way (Passig, 2003; Passig, 2007).

In contrast, in-school students encounter 'person-solo' learning (Perkins, 1992), operating under the assumption that knowing means having knowledge in one's head (Shaffer & Clinton, 2006). Therefore, a partnership with others and/or information technology is legitimate, but only for the sake of the learning process, i.e., the process of knowledge acquisition (or building). Exams, important events in students' lives, demonstrate these assumptions. In the classes studied, as well as in many other schools, students are most commonly assessed individually with closed books, and certainly not with the Internet. Another example of this value system is the long debate whether, when and how to allow the use of calculators in math classes (Dick, 1988; Ellington, 2003; Reynolds, 1993).

Those of the students who judged their Internet-related practices negatively in the interviews probably adopted their schools' 'person-solo' learning values. This is implied by the negative qualities they ascribe to their generation, such as superficiality and laziness. The myth of the greatness of the parent generation and the earnestness attributed to a work process that includes the use of books also align with these values.

4.2. Perceived low self-efficacy regarding information processing in the school context

While the relatively small number of interviewees in this study (25 in total) does not allow for generalization, the results reported herein are of importance to the broader education community. About a half of the students perceived themselves as inferior to the pre-ICT generation when it comes to performing information processing actions in the school context. This finding implies that the students' perceived self-efficacy in this respect is relatively low. Perceived self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Perceived self-efficacy might influence these students' schooling, since research has shown a high correlation between efficacy judgments and subsequent performance. People are not likely to engage in certain activities if they believe that they do not have sufficient abilities to do so, even if they hold positive attitudes toward these activities (Bandura, 1986, 1997; Schunk, 1981; Zimmerman, 2000).

Some of the students ascribed their low perceived learning capabilities to their acquaintance with and affinity for the Internet. On the one hand, the Internet was perceived as providing an easier, quicker way to perform school tasks. On the other hand, however, for this very reason, the students felt that they missed learning opportunities and thus viewed themselves as less developed or less successful learners than those who did not have these "shortcuts".

Thus, despite the low use of the Internet within schools, this technology indeed influences students' (perceptions of) learning. More work is required, however, in order to further understand the relationship between students' use of the Internet and their perceived self-efficacy in performing school activities involving information processing.

4.3. Illuminating the digital native debate: a historical perspective

This study contributes to the "digital native" debate, especially to the question of whether the students of the digital age are notably different from previous generations due to their exposure to ICT. Much work that attempts to address this question is focused on various comparisons between the generations regarding the quality, ease, and frequency of their use of digital technology (see the review by Selwyn (2009)).

The results of this study suggest that the definition of 'digital native' should not focus solely on technical skills and usage. Rather, it should be noted that this generation was born to a different world, a world immersed with digitalism, in which the rules of the game have changed, especially as far as working with information is concerned. The main question in this respect isn't whether this generation uses ICT more frequently or in a better way, but rather what their related *history* and *values* are concerning technology, books, information, and their interrelations. Many of those born in the 1970s (or even earlier) are proficient with computers and use them frequently both at work and at home (Selwyn, 2009). However, the related history and values of the 'digital native' generation are different than theirs, as is the way they perceive their partnership with ICT. The students interviewed for this study appeared to be living within two different value systems

in this respect, influencing their perceptions of school and learning – and not for the better.

5. Conclusions

Interviews with 25 students from post-preliminary schools, who reported using the Internet for school purposes after school, revealed that the majority of them believed that their generation is not as good at learning as the pre-ICT generation. Of these, the majority perceived their partnership with the Internet as dis-empowering with respect to school learning, whereas books – despite of, or perhaps *because of* their lack of user friendliness – were perceived as empowering.

The diversity in students' perceptions of their learning capabilities in comparison to the pre-ICT generation was explained as an outcome of students' "double life" with respect to (a) Internet – high use of Internet after school and no (or little) use of Internet at school and (b) learning, collaborative bricolage outside school and 'person solo' values and practices advocated by school. This situation seems to nurture students' low perceived self-efficacy regarding school-based learning. Further work is required to fine-tune the assessment of students' perceived performance of school activities and the factors that nurture these perceptions.

Finally, it seems that students' attributions regarding the mismatch between the two ICT-related value systems they live in do not serve them well. Students who perceived partnership with the Internet as dis-empowering in itself (with regard to school-work) might miss the learning opportunities advantages inherent to a fertile partnership with ICT (Bonk, 2009). Those who perceived partnership with the internet as dis-empowering because of school being irrelevant and lagging behind technology, might not apply themselves to their studies and thus damage their future.

The tension between the value systems must therefore be resolved, and it is this author's belief that schools should assume the responsibility for this. This does not mean that the school should adapt itself to the students' value system, or that it should more successfully adapt the students' value system to a 'person solo' perspective. Rather, the school should explicitly acknowledge the existence of these separate value systems and the relative advantages and disadvantages of both, helping students to consciously and selectively use different and sometimes contradictory values and practices for their learning purposes.

References

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bauerlein, M. (2008). *The dumbest generation: How the digital age stupefies young Americans and jeopardizes our future (or, Don't trust anyone under 30).* New York: Jeremy P. Tarcher/Penguin.

Becker, H. J. (2000). *Findings from the teaching, learning, and computing survey: Is Larry Cuban right?* [PDF file]. Center for Research on Information Technology and Organizations. <http://www.crito.uci.edu/tlc/findings/ccsso.pdf>. Retrieved April 2010.

Ben-David Kolikant, Y. (2009a). Digital students in a book-oriented school: Students' perceptions of school and the usability of digital technology in schools. *Educational Technology & Society, 12*(2), 131–143.

Ben-David Kolikant, Y. (2009b). Students' perceptions of the appropriateness and usefulness of the internet for schoolwork and the value of school. *Journal of Educational Computing Research, 41*(4), 407–429.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775–786.

Bereiter, C., & Scardamalia, M. (2006). Education for the knowledge age: Design-centered models of teaching and instruction. In P. A. Alexander & P. H. Winne

(Eds.), *Handbook of educational psychology* (2nd ed., pp. 695–713). Mahwah, NJ: Lawrence Erlbaum Associates.

Bonk, C. (2009). *The world is open: how Web technology is revolutionizing education.* San Francisco: Jossey-Bass.

Brown, J. S. (2000). Growing up digital: How the Web changes work, education, and the ways people learn. *Change,* March/April, 10–20.

Bruns, A. (2007). Produsage: Towards a broader framework for user-led content creation. In *Paper presented at Creativity & Cognition* (Vol. 6), Washington, DC, 13–15 June 2007.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom.* Cambridge, MA: Harvard University Press.

Dick, T. (1988). The continuing calculator controversy. *Arithmetic Teacher, 35*(8), 37–41.

Ellington, A. E. (2003). A meta-analysis of the effects of calculators on students' achievement and attitude levels in precollege mathematics classes. *Journal for Research in Mathematics Education, 34*(5), 433–463.

Ertmer, P. A. (2003). Transforming teacher education: Visions and strategies. *Educational Technology Research and Development, 51*(1), 124–128.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25–39.

Glassner, B., & Loughlin, J. (1987). *Drugs in adolescent worlds: Burnouts to straights.* New York: St. Martin's Press.

Harel-Caperton, I. (2003). *Clickerati kids: Who are they?* <http://www.mamamedia. com/areas/grownups/new/21_learning/main.html> Retrieved .03.09.

Katyal, K. R., & Evers, C. W. (2004). Teacher leadership and autonomous student learning: Adjusting to the new realities. *International Journal of Educational Research, 41,* 367–382.

Kozma, R. (Ed.). (2003). *Technology, innovation, and educational change: A global perspective Eugene.* OR: International Society for Educational Technology.

Lehtinen, E. (2003). Computer supported collaborative learning environments: An approach to powerful learning environments. In E. De Corte, L. Verschaffel, N. Entwistle, & J. van Merriëboer (Eds.), *Powerful learning environment: Unraveling basic components and dimensions.* New York: Pergamon Press.

Lemish, D., & Ribak, R. (2006). *Israeli children go online.* <http://www.niis.tau.ac.il/ page.aspx?pid=179&cid=0&menu=27> (Hebrew) Retrieved .03.09.

Levin, D., & Arafeh, S. (2002). *The digital disconnect: The widening gap between Internet-savvy students and their schools.* PEW Internet and American Life Project. <www.pewinternet.org/PPF/r/67/report_display.asp> Retrieved 15.03.09.

Li, Q. (2007). Student and teacher views about technology: A tale of two cities? *Journal of Research on Technology in Education, 39*(4), 377–397.

Livingstone, S. (2005). *UK children go online.* <http://www.york.ac.uk/res/e-society/ projects/1/UKCGOExecSummary.pdf> Retrieved 15.03.09.

Mason, J. (1996). *Qualitative researching.* London: Sage.

Mizrachi, Y., Bar, N., Katsernov, I., & Nachman, O. (Eds.). (2005). *E-readiness and digital divide survey, Israel 2005.* Jerusalem, Israel: Ministry of Finance. <http:// www.maor.gov.il/Maor/Docs/HE/DigitalSurvey/digital3.pdf>. Retrieved April 2010.

US National Center for Educational Statistics. (2002). *Teachers' tools for the 21st century: A report on teachers' use of technology* (Report No. NCES 2000-102). Washington, D.C.: U.S. Department of Education, National Center for Education Statistics.

Organisation for Economic Co-operation and Development (OECD). (2004). *OECD identifies "disappointing" use of ICT in upper secondary schools.* <http://

www.oecd.org/document/18/0,2340,en_2649_37455_26302546_1_1_1_37455, 00.htm> Retrieved 09.08.09.

Organisation for Economic Co-operation and Development (OECD). (2006). *Are students ready for a technology-rich world? What PISA studies tell us.* <http:// www.oecd.org/document/31/0,3343,en_32252351_32236173_35995743_1_1_ 1_1,00.html> Retrieved 09.08.09.

Papert, S. (1996). *The connected family: Bridging the digital generation gap.* Atlanta, GA: Longstreet Press.

Papert, S. (1998). *Child power: Keys to the new learning of the digital century. Eleventh Colin Cherry memorial lecture on communication, June 2, 1998, at the Imperial College in London.* <http://www.papert.org/articles/Childpower.html>. Retrieved 15.03.09.

Passig, D. (2003). A taxonomy of future thinking skills. *Informatics in Education, 2*(1), 79–92.

Passig, D. (2007). Melioration as a higher thinking skill of future intelligence. *Teacher College Record, 109*(1), 24–50.

Perkins, D. N. (1992). *Smart schools: From training memories to educating minds.* New York: Free Press.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1–6.

Prensky, M. (2005). Listen to the natives. *Educational Leadership, 63*(4), 8–13.

Reynolds, B. E. (1993). The algorists vs. the abacists: an ancient controversy on the use of calculators. *The College Mathematics Journal, 24*(3), 218–223.

Rushkof, D. (2006). *Screenagers: Lessons in Chaos from Digital Kids.* Incorporated: Hampton Press.

Salomon (1998). Novel constructivist learning environments and novel technologies: some issues to be concerned with. *Learning & Instruction, 8*(1), 3–12.

Schunk, D. H. (1981). Modeling and attributional feedback effects on children's achievement: A self-efficacy analysis. *Journal of Educational Psychology, 74,* 93–105.

Selwyn, N. (2008). Exploring the 'digital disconnect' between net-savvy students and their schools. *Learning, Media and Technology, 31*(1), 5–17.

Selwyn, N. (2009). The digital native-myth and reality. *Aslib Proceedings: New Information Perspectives, 61*(4), 364–379.

Shaffer, D. W., & Clinton, K. A. (2006). Toolforthoughts: Reexamining thinking in the digital age. *Mind, Culture &Activity, 13*(4), 283–300.

Shor, I. (1992). *Empowering education: Critical teaching for social change.* Chicago: University of Chicago Press.

Silverman, D. (1993). *Interpreting qualitative data.* London: Sage.

Strauss, A. L., & Corbin, J. M. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, CA: Sage.

Tapscott, D. (1998). *Growing up digital: The rise of the Net Generation.* New York: McGraw-Hill.

Turkle, S. (1995). *Life on the screen: Identity in the age of the Internet.* New York: Simon and Schuster.

Turkle, S., & Papert, S. (1991). Epistemological pluralism and the revaluation of the concrete. In I. Harel & S. Papert (Eds.), *Constructionism: Research reports and essays, 1985–1990* (pp. 161–191). Norwood, NJ: Ablex.

Twenge, J. (2006). *Generation Me: Why today's young Americans are more confident, assertive, entitled – and more miserable than ever before.* New York: Free Press.

Twenge, J. (2009). Generational change and their impact in the classroom: teaching Generation Me. *Medical Education, 43,* 398–405.

Wertsch, J. (1998). *Mind as Action.* NY: Oxford University Press.

Zimmerman, B. J. (2000). Self-efficacy: an essential motive to learn. *Contemporary Educational Psychology, 25,* 82–91.