

# STUDENT AND TEACHER USE OF TECHNOLOGY AT THE UNIVERSITY LEVEL

Peter Gobel and Makimi Kano

*Kyoto Sangyo University, Kamigamo, Motoyama, Kita-ku Kyoto Japan 603-8555*

## ABSTRACT

'Digital Native' and 'Digital Immigrant' are terms, popularized by Prensky (2001), to describe those born either before, or in the digital era (i.e. after 1980). In recent years, this dichotomy has been used to raise awareness of differences in technology usage and what these differences may mean for education. The present study examines Japanese university teacher and student use of digital technology in academic settings, as well as their preferences for digital or paper-based educational practices. At a private university in Japan, 337 first-year university students and 170 full-time faculty responded to tailored questionnaires addressing digital technology use. Both questionnaires focused on four areas: technology use, self-efficacy, familiarity, and learning/teaching style preferences. The results showed that there are clear differences in technology use between teachers and students, with teachers using computers more than students. Self-efficacy of students was much lower than teachers, and there were distinct differences in the familiarity with software and web pages between the two groups, with students being much more comfortable with websites and teachers being more familiar with software. Learning/teaching styles of both groups were similar, with a bias towards teacher-centered and paper-based educational practices. These findings suggest that there is a mismatch between institutional goals and the beliefs and practices of both teachers and students regarding the role of technology in the curriculum.

## KEYWORDS

Digital literacy, student attitudes, teacher attitudes, digital native.

## 1. INTRODUCTION

Recently, particularly in the US and Europe, educators are arguing that a new generation of learners is entering higher education, one which has grown up with digital media and technology as an integral part of their everyday lives. It is claimed that this group's use of information and communication technology (ICT) sets them apart from previous generations of students and, in particular, from their teachers. It has been argued that the importance of new technologies within the lives of these young people is so significant, that how and what is taught must fundamentally change to adapt to the new skills and cognitive and social features of these 'digital natives' (Prensky, 2001a; Gibbons, 2007; Underwood, 2007). At the same time, many institutions are rapidly moving towards more digitally based learning, with CALL curriculum and CMS and LMS courseware becoming more and more common. Although the push for more digitally-based learning, and the use of digital technology can be seen in many parts of the world, it should be argued that major changes in teaching and the educational environment need to be carefully balanced with the results of empirical research.

In this paper, we explore this topic in terms of Japanese higher education, providing data in an effort to clearly understand the current state of teachers and students in the Japanese educational system. In addition, we offer a critique against the common conception of the digital native as based purely on generational differences, and show how a clearer understanding of teachers' and students' use of digital technology can be of help to both educators and administrators in higher education.

## **2. REVIEW OF THE LITERATURE**

### **2.1 Digital Native Definition**

Central to the original definition of the digital native is that people born in the last two decades have always been surrounded by, and interacted with, digital technologies.

Prensky refers to people who were born before 1980, as 'digital immigrants', and suggests that they may adopt new technologies but will still have strong connections to the pre-digital past, making them unable to fully understand the natives.

Prensky (2001a, 2001b) argues that one of the consequences of the digital environment is the way that young people think and process information compared to older generations. He argues that this younger generation is used to fast reception and transmission of information, allowing them to parallel process and multi-task. Being brought up on video, DVDs, and gaming, they prefer graphics before text. They expect instant gratification and frequent rewards, as can be seen in video games.

Jukes and Dosaj (2006) have created descriptions of behaviors that they feel differentiate digital native learners from many of their teachers. They argue that digital immigrant teachers prefer a slow and controlled release of information, singular tasking (as opposed to multi-tasking), text over pictures, sound and video, linear and sequential presentation, standardized testing, and delayed rewards. Digital native students, on the other hand, prefer multimedia, parallel processing and multitasking, pictures and video before text, immediate relevance, and instant gratification.

This definition then suggests that the differences between digital natives and the digital immigrant groups have profound implications for education: if young people now have a range of different preferences that do not match current educational practices, then the current pedagogies need to change. In fact, many schools and teachers have not responded to the alleged new ways in which students communicate and access information. Although ICT has allowed university educators to create environments that are more closely aligned with the preferences of digital natives, one downside seen in the US is a gap or 'digital disconnect' between students and teachers (Tapscott, 1997; Underwood, 2007). Teachers and administrators set the tone for ICT use at school, resulting in a gap between how teachers approach ICT use and how students approach it. Prensky (2001a) argues that gap has resulted in the digital natives being taught by digital immigrants who are not talking the same language.

But is this actually the case? Those in support of this digital native/immigrant divide usually assign broad characteristics (e.g. a specific learning style or set of learning preferences as listed above) to an entire generation, and suggest all young people are technology experts (Bennett, Maton, & Kervin, 2008). However, there seems to be significant variation within the young population in how and why they use these new technologies and the effectiveness of that use (e.g. DiMaggio & Hargittai, 2001; Facer & Furlong 2001; Livingstone & Helsper, 2007). Helsper and Eynon (2010) support this argument with a large-scale survey that suggests not only age, but educational level, experience and gender also play a part. These last two studies suggest that if there is indeed a gap between students and teachers, that it is possible to close it. This is an important point, as the majority of evidence in support of the concept of the digital native is based on data related to age and specific use.

### **2.2 Digital Native Research**

Although there are many studies supporting the idea of a digital divide (Kvavik, Caruso & Morgan, 2004), others suggest that young people are far from comfortable with all forms of digital technology (Kennedy, Krause, Judd, Churchward & Gray, 2006). In China, Li and Raniery (2010) reported that 'digital natives' in China are not necessarily digitally competent, with competency depending on educational background (the kind of school) and age. Interestingly, competency was not significantly influenced by PC ownership or Internet access/use.

It must be noted that general ICT use may differ significantly from ICT use for learning purposes. Student use or non-use of technology for learning may be a complex relationship between competency, perceived usefulness, and support. In an effort to uncover factors that predict student use of technology for learning, Lai, Wang and Lei (2012) surveyed Hong Kong undergraduates regarding their ICT use and attitudes towards the use of technology in learning.

The results of their survey study suggested that compatibility between student learning styles and technology, support from peers and teachers, and general attitudes toward technology were predictors of ICT use for learning. In contrast, the students' perception of their own ICT skills and the perceived usefulness of the technology were weaker predictors of student technology use.

## 2.3 Teachers and Technology Acceptance

Studies on technology acceptance have proliferated in recent years, with a wide variety of theoretical models being proposed to explain differences in individual acceptance and use of ICT. The technology acceptance model (TAM) promoted by Venkatesh et al. (2003) has proven useful in predicting adoption and use of ICT. By investigating perceived usefulness, performance and outcome expectancies, and relative advantage, user attitudes towards technology can be used to help explain acceptance and use of ICT.

There seem to be some clear differences between teachers and students regarding technology, and this may lie in how they use the technology and how important they perceive it to be. Gu, Zhu, and Guo (2013) found that Chinese students had a longer experience using ICT than their teachers, with teachers using ICT more inside the classroom than outside. Their findings revealed a complex relationship between personal factors and social influence that explained teacher's ICT adoption. In contrast, Ertmer et al. (2012) found that teachers' pedagogical beliefs (i.e. student-centered or teacher-centered pedagogy) as well as their beliefs and attitudes about the relevance of technology in education played key roles in shaping ICT practices. The results of Ertmer et al. (2012) are similar to the reports of Li and Ni (2011). This survey of Chinese English teachers found that although the teachers held positive attitudes toward technology in education, they used technology mainly for teacher-centered purposes. One of the possible explanations given for this result was the predominance of teacher-centered practices and a lack of professional development.

It may be that there is as much variation within the digital native generation as between the generations, and that differences exist across cultures as well. The purpose of the present study is to survey the current state of ICT use among Japanese university students, their learning style preferences, and compare these results with the results of a similar study with their teachers. If there is indeed a distinct digital native generation in Japan, and their learning style preferences match the model hypothesized by Prensky (2001) and Brown (2000), then changes to the teaching style and curriculum of higher education are warranted.

The present study seeks to understand student and teacher attitudes towards digital technology. It is hoped that through understanding the 'digital state' of our students and teachers, we can better inform teachers and administrators on how best to implement ICT in the university environment. Two questionnaires were devised to address the following general questions:

- How does a sample of Japanese university students use ICT technology in academic and non-academic settings?
- How does a sample of Japanese university teachers use ICT technology in an academic setting?
- Do student learning style preferences lean more towards digital media, or paper-based media?
- Do teachers' educational style preferences lean more towards digital media, or paper-based media?

## 3. METHODOLOGY

### 3.1 The Setting

The university in question is a private university in Kyoto Japan, with over 13,000 students enrolled. The majority of the students are what can be considered social studies and liberal arts students, with a small group of science majors. The university itself is ranked in the top 10 in the area in terms of academic standing. In an effort to maintain that standing and attract more students in a country with a declining university student population, the university has been aggressive about modern infrastructure on campus. The campus has Wi-Fi throughout the buildings and in many public areas, has about 2,000 computers available to students in a variety of open computing rooms, library access, and CALL classrooms and computer labs. Fulltime faculty are provided with computers in their offices, and both faculty and staff have dedicated server space available to them for storing documents on the university server.

In addition, the university has adopted the Moodle CMS, both for students, faculty, and staff. The Moodle is used as the primary method of communication between administration, faculty, and the students. All courses have a dedicated Moodle page which can be accessed by both students enrolled in the course and their teachers.

### **3.2 The Participants**

The data was collected from 337 first-year students, in eight faculties, in September, 2011. The respondents were predominantly male (74%) and age range was 18-19. Half of the students were living with their families, and half were living away from home (primarily in rented apartments).

Data from 170 teachers (again, in eight faculties) was collected in September 2012. Respondents for the teacher survey were also predominantly male (81%), with an age range of 25-65. The teachers were all full-time faculty, and as such all had an office which could be equipped with a university-supplied computer.

### **3.3 The Surveys**

The purpose of this study is to understand how technology is used and perceived by both university teachers and their students. Two survey instruments were used to collect data. The questionnaires examined: Japanese university students' use of ICT in academic and non-academic settings, and their learning style preferences (digital- or paper-based); and Japanese university teachers' use of ICT in academic settings, and their teaching style preferences (digital- or paper-based). The questionnaires covered four general areas: technology use, self-efficacy, familiarity, and learning/teaching style preferences. The student questionnaire consisted of 75 questions, and the teacher questionnaire consisted of 47 questions. The items in both instruments required responses on a four-point Likert scale. The student questionnaire was administered in class, in a paper-based format, and the teacher questionnaire was administered in a paper-based format via campus mail. The response rate for the teacher questionnaire was 47%.

## **4. RESULTS**

The findings give an interesting view of the use of technology by these two groups in university settings, as shown below. All the results discussed here are based on the answers from the respondents from the 8 faculties.

### **4.1 Technology Use**

Figure 1 displays reported computer (PC) use by both teachers and students. Students seem to prefer using computers at home to using them at school. The majority of them use computers less than three hours a day (59% less than one hour, 29% 1-3 hours) while they use phones much longer (45% 1-3 hours, 36% more than 3 hours). On the other hand, the majority of teachers (67%) used computers equally at home and at school, with the majority (74%) using them during daylight hours. Clearly there is a gap between when students access computers, with the students spending less time on computers in general, and very little time on computers while at school.

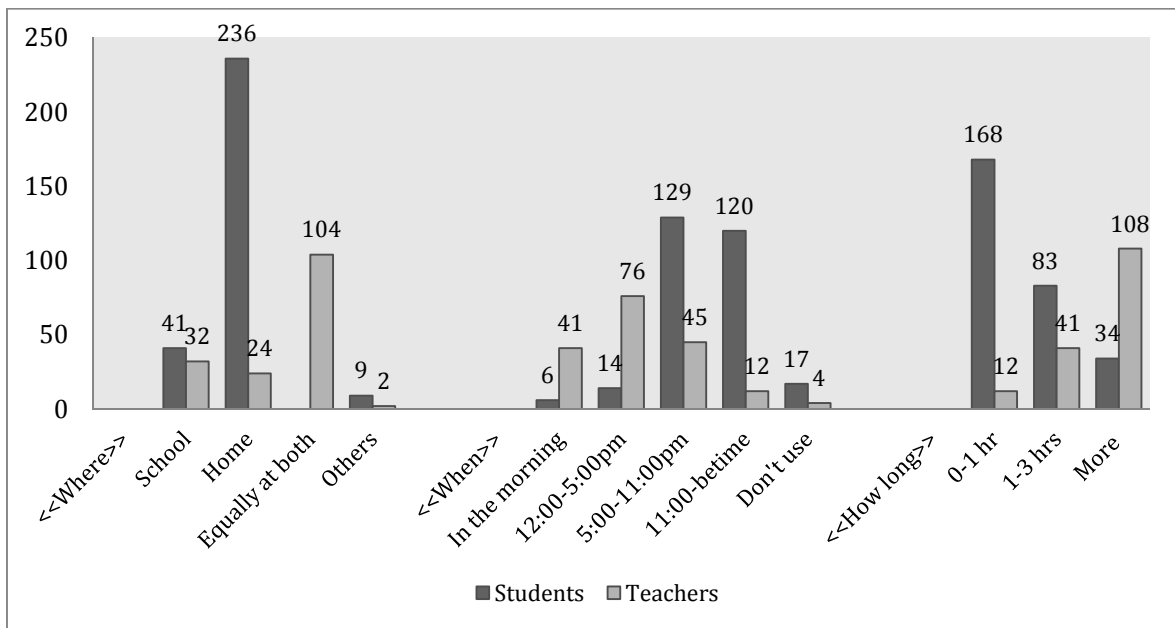


Figure 1. Technology Use of Teachers and Students

More specific information regarding activities for both groups can be found in Table 1. This table shows the average ratings (on the four-point Likert scale: 1 being “use it a lot,” 2 “sometimes use it,” 3 “know about it, but don’t use it,” and 4 “don’t know it”) for each activity, comparing teacher activities with student activities. Although teachers were not asked how they used computers in non-academic settings, it is clear that they are using computers in a greater variety of ways than the students.

Table 1. Digital Activities

Teachers		Students	
Sending email and messages	<b>1.25</b>	Checking school info	<b>1.50</b>
Writing a report or paper	<b>1.32</b>	Research for a report	<b>1.55</b>
Creating instructional materials	<b>1.39</b>	Writing a report	<b>1.59</b>
Gathering information for research	<b>1.45</b>	Using bookmarks	<b>1.63</b>
Gathering information for planning lessons	<b>1.60</b>	Watching movies or TV	<b>1.66</b>
Keeping administrative records	<b>1.63</b>	Using a search engine	<b>1.80</b>
Checking school information (Post)	<b>1.64</b>	Listening to music	<b>1.81</b>
Presenting materials to class	<b>1.65</b>	Downloading music	2.17
Research for a report or paper	<b>1.73</b>	Online Shopping	2.31
Paying for goods	2.08	Social networking	2.5
Social networking (blogs, chatrooms)	2.85	Playing games	2.59
		Editing photos and movies	2.63
		Sending email	2.69
		Reading books, magazines	2.90
		Paying for goods	3.01

Note: scores closer to a value of 1 indicate greater usage

## 4.2 Self-efficacy (Perceived Skill)

Figure 2 reports the results of perceived computer skill. This was a general question asking the teachers and students to rate their general ability on a 5-point scale. The majority of the students (80%) rated their perceived computer skill as fair to poor, while the teachers rated their computer skills as good to fair (60%) with 15% of them rating their computer skills as excellent. This was a surprising finding, since it challenges the concept of the digital native and digital immigrant.

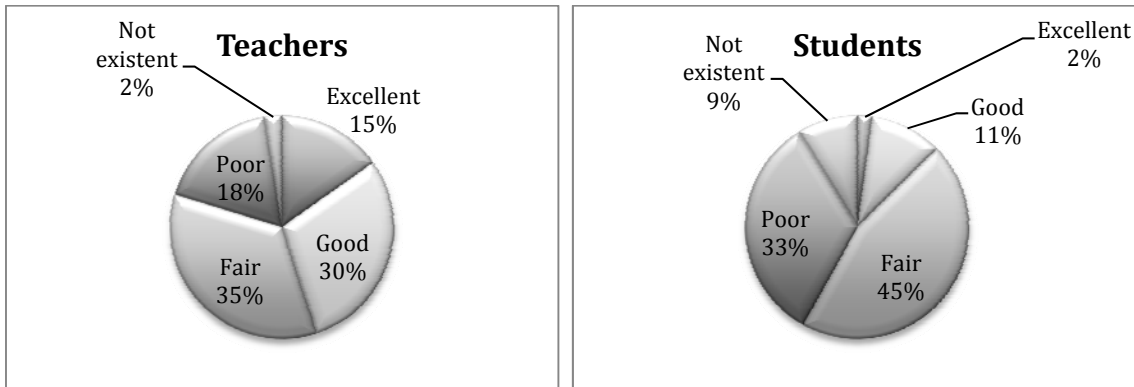


Figure 2. Perceived Skill

### 4.3 Familiarity with Websites and Software

The majority of the questions in the questionnaire were designed to investigate student and teacher familiarity with websites (Table 2) and software (Table 3). Concerning websites, only 4 items were marked as very familiar by the students (YouTube, Yahoo, Google and mixi<sup>1</sup>). Even though many of the students are required to use Moodle, Word, and Excel (and possibly PowerPoint) at school, their reported familiarity was not very high suggesting that their use of websites and software are very limited. The teachers had similar responses, though their familiarity with software was far greater than the students, and their use and familiarity with social sites such as Facebook was much lower than the students’.

Table 2. Familiarity with Websites and Software

Websites				Software			
Teachers		Students		Teachers		Students	
Google	<b>1.60</b>	youtube	<b>1.38</b>	word processing	<b>1.30</b>	word	2.11
Yahoo	2.21	yahoo	<b>1.52</b>	presentation	<b>1.84</b>	iTunes	2.15
Moodle	2.25	google	<b>1.71</b>	spreadsheet	<b>1.99</b>	excel	2.44
Amazon	2.34	mixi	<b>1.87</b>	media players	2.6	skype	2.46
KSU-Cat	2.54	moodle	2.10	sound/movie editor	2.75	powerpoint	2.58
CiNii	2.61	amazon	2.35	statistics	2.78	mediaplayer	2.76
YouTube	2.71	rakuten	2.59	field specific	2.80	realplayer	3.31
Rakuten	2.99	twitter	2.76	online software	3.01	openoffice	3.56
Facebook	2.99	facebook	3.05	communication	3.05	moviemaker	3.56
Twitter	3.13	excite	3.52			iMovie	3.62
Mixi	3.25	myspace	3.64			prezi	3.63
		Flickr	3.71			googledocs	3.66
		picasa	3.75				

### 4.4 Learning/Teaching Preferences

The last part of the questionnaire was about their learning and teaching preferences. We asked students they prefer to do school activities such as lectures and reading assignments in class or out of class, and paper-based or computer-based (Figure 3). Teachers were asked similar questions regarding their teaching and educational style (Figure 4). The student preferences seem to be quite traditional and are generally in class, paper-based. They prefer doing research and writing a paper outside of class, and computer-based, but for other activities, they showed preference to do them in class, and paper-based, especially taking a test/quiz and lecture.

<sup>1</sup> mixi is a social network site popular among Japanese youth.

Teachers were of a similar vein, with a preference for in-class lectures, quizzes and tests, and paper-based readings and materials. This is against the recent trend of the university administration which is quickly shifting from paper-based to computer-based distribution of information.

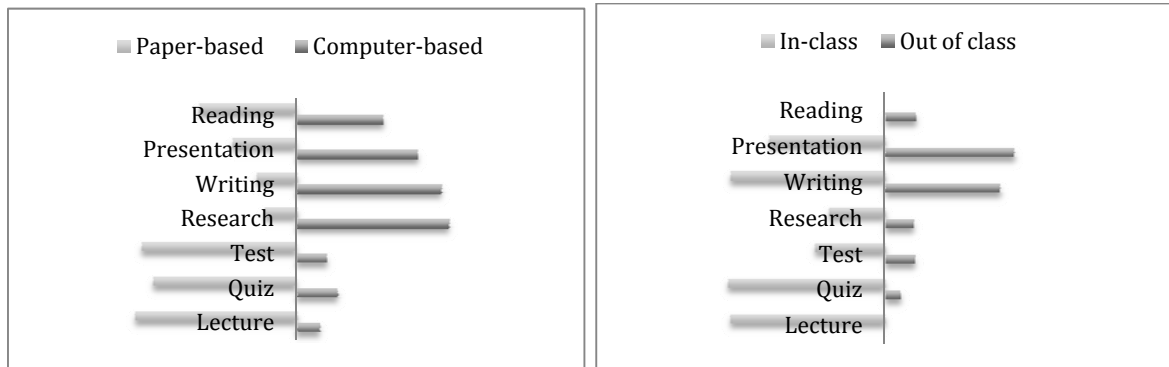


Figure 3. Student Learning Preferences

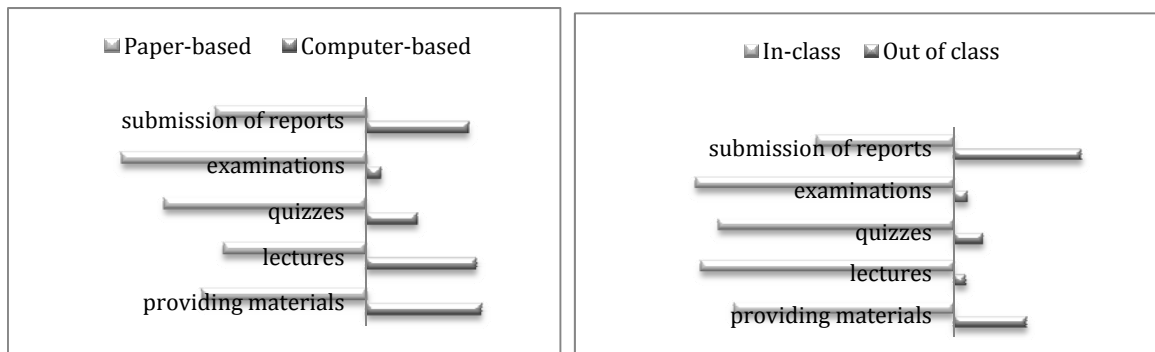


Figure 4. Teaching Preferences

## 5. CONCLUSION

This paper examined the state of ICT and digital media use among a small sample of Japanese university students and their teachers, in an effort to determine the extent to which generation, experience in using the Internet, and breadth of use were indicators of digital nativeness. In contrast with the original digital native argument put forth by Prensky, it seems clear that generation or breadth of use alone does not define one as a digital native. It is obvious from the data that these students are exposed to and have a greater range of ICTs in their lives, but this does not guarantee confidence and skill in interacting with these technologies. The same goes for their teachers, who in many ways seemed to be more digitally active than their charges.

There were two surprising findings from the present study. First was the self-reported general lack of computer use and skills among the majority of the students, and the contrary self-evaluation by the teachers. The second surprising finding is the preference for traditional forms of learning and studying in both the student and the teacher groups. These two general findings suggest that the students are not the digital natives that Prensky describes, and that the teachers are far from the digital immigrants that they are commonly made out to be. The results also parallel the findings of Ertmer et al. (2012) and Li and Ni (2011) suggesting that in this study as well, teacher beliefs and practices influenced the use of ICT in their teaching.

These findings then suggest that it would be a mistake for teachers and administrators to blindly adopt a digital learning and CMS route for all aspects of the university environment. The prevalent arguments for CALL and CMS -- 24/7 access and flexibility, were not supported by the findings in this study. Whether accessible or flexible, this means little when the target users are ignoring the technology or prefer different media. Administrators and CMS providers clearly need to take student and teacher preferences for paper-based materials into account and not simply replace them with CALL alternatives. This is not to say that CALL and CMS should be avoided. Rather, a blended approach which combines both digital and paper-based materials should not be overlooked.

## REFERENCES

- Bennett, S., Maton, K. & Kervin, L., 2008. The 'digital natives' debate: a critical review of the evidence. *British Journal of Educational Technology*, 39(5), pp.775–786.
- Brown, J. S., 2000. Growing up digital: how the Web changes work, education, and the ways people learn. *Change, March/April*, pp.10–20.
- DiMaggio, P. & Hargittai, E., 2001. From the digital divide to digital inequality: studying Internet use as penetration increases. *Working Paper Series (15) Princeton University, Center for Arts and Cultural Policy Studies*. Available online at: <http://www.princeton.edu/culturalpolicy/workpap/WP15%20-%20DiMaggio+Hargittai.pdf> (accessed June 1, 2012).
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E. & Sendurur, P., 2012. Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education* 59:2, pp. 423-435
- Facer, K. & Furlong, R., 2001. Beyond the myth of the 'Cyberkid': young people at the margins of the information revolution. *Journal of Youth Studies*, 4(4), pp. 451–469.
- Gibbons, S., 2007. *Redefining the roles of information professionals in higher education to engage the net generation*. Paper presented at EDUCAUSE, Australasia.  
Available online at: [http://www.caudit.edu.au/educauseaustralasia07/authors\\_papers/Gibbons2.pdf](http://www.caudit.edu.au/educauseaustralasia07/authors_papers/Gibbons2.pdf)
- Gu, X., Zhu, Y. & Guo, X., 2010. Meeting the "Digital Natives": Understanding the Acceptance of Technology in Classrooms. *Educational Technology & Society* 16(1), pp. 392-402
- Helsper, J., & Eynon, R., 2010. Digital natives: where is the evidence? *British Educational Research Journal*, 36(3), pp. 503-520.
- Jukes, I., & Dosaj, A., 2006. *Understanding digital children (DKs): Teaching & learning in the new digital landscape*. Retrieved June 16, 2012, from <http://edorigami.wikispaces.com/file/view/Jukes++Understanding+Digital+Kids.pdf>
- Kennedy, G., Judd, T., Churchward, A., Gray, K. & Krause, K., 2008. First-year students' experiences with technology: are they really digital natives? *Australasian Journal of Educational Technology*, 24(1), pp. 108–122.
- Kvavik, R. B., Caruso, J. B. & Morgan, G., 2004. *ECAR study of students and information technology 2004: convenience, connection, and control*. Boulder, CO: EDUCAUSE Center for Applied Research.
- Lai, C., Wang, Q. & Lei, J., 2012. What factors predict undergraduate students' use of technology for learning? A case from Hong Kong. *Computers & Education*, 59, pp. 569-579.
- Li, G. & Ni, X., 2011. Primary EFL Teachers' Technology Use in China: Patterns and Perceptions. *RELC Journal*, 42 (1), pp. 69-85.
- Li, Y. & Ranieri, M., 2010. Are 'digital natives' really digitally competent? A study on Chinese teenagers. *British Journal of Educational Technology*, 41, pp. 1029-1042.
- Livingstone, S. & Helsper, E., 2007. Gradations in digital inclusion: children, young people and the digital divide, *New Media & Society*, 9, pp. 671–696.
- Prensky, M., 2001a. Digital natives, digital immigrants. Part 1, *On the Horizon*, 9(5), pp. 1–6.
- Prensky, M., 2001b. Digital natives, digital immigrants. Part 2: do they really think differently? *On the Horizon*, 9(6), pp. 1–6.
- Tapscott, D., 1997. *Growing up digital: The Rise of the Net Generation*. McGraw-Hill, New York.
- Underwood, J., 2007. Rethinking the digital divide: impacts on student tutor relationships, *European Journal of Education*, 42(2), pp. 213–222.
- Venkatesh, V., Morris, M., & Davis, G., 2003. User acceptance of information technology: toward a unified view. *MIS Quarterly*, 27(3), pp. 425-478