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The Digital Age: Changing Roles of Lecturers at a University of Technology in South Africa

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ABSTRACT The purpose of this exploratory mixed methods study was to investigate the level of digital technologies acceptance at a University of Technology in South Africa and how lecturers perceive as their new roles in the digital age. A total of 86 lecturers from four programmes in the School of Teacher Education participated in the study. The data for the study was collected using questionnaires and an interview schedule. The study found that the majority of academics surveyed used mobile telephones and computer-based technology more frequently compared to other digital technologies. These findings indicate the high level of technology acceptance among lecturers in the School of Teacher Education. The second part of the study found that the perceived changing roles were influenced by the frequent use of computer-based technologies within and outside the classroom. The study highlight two implications that need to be addressed, namely, technology acceptance and management of roles associated with digital technology use.

INTRODUCTION

The emergence of digital technologies and their penetration into all levels of education has challenged higher education institutions to redefine their teaching and research practices and to redesign their organisational infrastructure (Weller and Anderson 2013). Research (Beetham and Sharpe 2013; Gabriel et al. 2012) has shown that digital technologies play an important and integral role in the instructional process in order to effectively prepare students to face multiple challenges in the workplace of the 21st century. Within the digital age context, the role of the teacher is an important one as most of the students' activities in the school are managed by the teacher (Maldonado et al. 2011).

In this era of student-centred, collaborative, constructivist learning augmented by digital tools, social networks, featuring students' autonomy, self-direction and independence, the role of teachers in education is undergoing continuous evolution –moving teachers away from the epicenter of the teaching-learning dynamics (Beaudoin 2013).

For school leaders (Davis et al. 2013) it means developing a vision for working with this continuously changing landscape. This means living an active, online professional life so that teachers might become more familiar with the new literacies that new technologies require. For teachers, it means integrating online literacy experiences into the classroom in a regular and thoughtful fashion (Leu et al. 2013).

Higher education institutions face a number of opportunities and challenges as the result of the digital revolution. This is because higher education institutions perform a number of scholarship functions including teaching and research which are affected by the availability and usage of digital technologies (Weller and Anderson 2013).

However, despite evidence showing the direct impact of technology on current education practices in higher education institutions, their use is still influenced by the availability of such technologies, and teachers' interest to use them. More importantly, the level of technology acceptance and adoption behavior (Maldonado et al. 2011) is still a determinant of the type of role the teacher can play in the age of digital instruction.

Technology acceptance (Svendsen et al. 2013) refers to the user's willingness to employ information technology for the tasks it is de-

signed to support. According to Lee and Lehto (2013), technology adoption and use, often referred to as user acceptance, has become one of the most researched areas in information science literature. Research suggest a list of factors from the teacher and school perspective that motivate acceptance and adoption of technology in teaching and learning (Inan and Lowther 2010; Buabeng-Andoh 2012). According to Van Acker et al. (2013) teacher's successful use of technology in teaching and learning depends on factors such as access and affordability, knowledge, self-efficacy pedagogical beliefs, and school culture. In addition, (Behrend et al. 2011) technology adoption/acceptance in Higher education may also be influenced by the usefulness and ease of use of a particular type of technology.

To understand technology acceptance and use by teachers, Turel et al. (2010) calls for an examination into the factors that influence teachers' acceptance and use of digital technology. The successful use of technology in teaching and learning depends on factors such as access and affordability, attitudinal, cognitive and normative assessment of factors relevant to the technology, the social system, the target task, and the implementation context (Hu et al. 2003).

The emergence of digital technologies is not the only challenge that teachers in higher institution of learning face. There is also the emergence of a new generation of students entering institutions of higher learning, termed the Digital Natives (Prensky 2001a). They are a new generation of young people who were born during the digital era. According to Prensky (2001a), exposure to certain technologies, such as video games and virtual worlds, have altered the minds of these students in such a way that educational theories that worked in the past do not in the 21st century. Jones et al. (2010) used the term 'Net Generation' to describe young people who have grown up with digital media and are often assumed to be universally savvy with information and communication technologies. Hanewald and Ifenthaler (2014) on the other hand used the term "techno-savvy" to describe the technology skill levels of the new generation of students.

Although these and similar claims have been questioned by other authors, there appears to be broad consensus among educators of the profound impact of digital technologies in higher education (Warschauer and Matuchniak 2010). This is due to the nature of new digital media, which bridge the interactive features of speech and the archival characteristics of writing, allow communication among people without regard to time and space, and enable content production and distribution in both writing and multimedia on a scale previously unimaginable (Alvarez et al. 2013). For all these reasons Chen et al. (2012) consider computer-mediated communication as a new *mode of information*.

While the introduction of Information and Communication Technology (ICT) and other digital technologies in some higher institutions of learning has yielded positive results, the birth of interactive learning has called into question the acceptance of such teaching tools and the new roles that teachers have to play (Lu et al. 2014). In light of the Technology acceptance (Fong et al. 2014; Trigueros et al. 2014) maintains that teachers' acceptance of digital technologies is largely influenced by the perceived usefulness for personal benefit, perceived usefulness for social benefit, ease of use, issues of concern about time, issues of concern about technology and support.

In addition to the current debate are the incompatibilities between schooling and the new technology. Collins and Halverson (2009) identified uniform learning vs. customisation, teacher as expert vs. diverse knowledge sources, standardized assessment vs. specialisation, knowledge in the head vs. reliance on outside resources, coverage vs. knowledge explosion, and learning by acquisition vs. learning by doing. By way of summary, ICT and other digital technologies have a major role to play in the teaching and learning environment. However, this also brings with it new roles that teachers must adapt in order to cope with the changing demand of students. Given the limited research in this regard, this paper explored the changing roles of lecturers at the Universities of Technology in South Africa

Theoretical Framework

Digital technologies are increasingly being used to support teaching in higher education. These technologies place new demands on the tasks and responsibilities of the teacher and can influence their roles. To better understand the teacher's new roles, the researchers adopted socio-cultural perspectives on learning, which

focus on knowledge and learning as social, situated, distributed, mediated activity (Vygotsky 1986). The researchers therefore chose to view the School of Teacher Education at one University of Technology in South Africa as a community of practice (Jones and Healing 2010; Hughes et al. 2013) where there is mutual engagement by all the academic staff in the joint enterprise of using digital technology in teaching students the disciplinary content knowledge and acculturating them into the ways of thinking, talking and writing in their disciplines (Lee and Lehto 2013).

As literature indicates, teacher's roles are embedded in a teaching-learning environment, of which the digital technologies are an integral part (Beaudoin 2013). Therefore, several interrelated aspects of digital technologies constitute the teaching-learning environments, and thus are part of the changing role of the teacher. Crook et al. (2010: 4) indicate that ICT can impact on teachers in many ways. These include the balance of roles they play with a perceived risk of reduced influence; providing greater access to information, leading to increased interest in teaching and experimentation; requiring more collaboration and more communication with teachers, administrators and parents, requiring more planning and energy, requiring the development of skills and knowledge of ICT; providing more time to engage with students; and leading to greater productivity (Rajeswari and Poornima 2013).

In their review of the research, Kreijns et al. (2013) identify a range of factors such as teacher's beliefs about how their students learn; and the types of ICT resources teachers choose to use; their knowledge about their own subjects and the potential of the technology to enhance learning. While acknowledging the fundamental impact on traditional pedagogical teaching styles such as lecturing and mentoring (Pachler (2013) emphasise how the effectiveness of new technologies in the learning process depends on the 'centrality' of the role of the teacher in rendering the students' experiences with the computer and other digital devices.

From the above, it can be concluded that it is vitally important for teachers to be aware how the use of digital technologies in the classroom impacts on teacher-learner, learner-teacher and learner-learner interactions as well as the social context surrounding the use of digital technologies and how it is shaped by them (Leask and Pachler 2013).

Problem Statement

The emergence of digital technologies in the classroom presents new challenges for academia in higher institutions of learning particularly in presenting learning opportunities that capture the imagination and prepare students for the world outside the classroom. The reality of new students (the so-called Digital Natives), diverse and often tech-savvy, that is, those new generation of students with high knowledge and skills in manipulating digital gadgets requires new education approaches (Prasad and Kumar 2013).

Unfortunately, the growing range of digital technologies has created new and more complex roles for both students and educators within and beyond the classroom. Lanham (2006) calls the social, technological and theoretical challenges that these changes create "an extraordinary convergence", catalysing fundamental shifts in higher education, allowing more interactive learning, and giving students the ability to interrogate or even create knowledge, instead of simply absorbing it.

Although the use digital technologies at Universities of Technology have significantly increased over the last decade, little empirical evidence have been available to examine in order to understand the effects of digital technologies especially on the teachers' roles at the University of Technology in South Africa. Investigating the roles of teachers in Higher education in a Digital age may shed light on the availability and use of digital technologies for teaching and learning and how such technologies impact on teachers roles.

Aim of the Study

The aim of this paper is to explore the role of teachers in Higher education in a Digital age. Teachers' role is very vital in molding the future of any country and, as such, it is considered the noblest profession. Therefore, the researchers question is:

How has the introduction of different digital technologies changed lecturers' traditional roles at the school of Teacher Education?

In order to answer this question the researchers focus on a number of more specific questions:

1. How often do lecturers in the School of Teacher Education access digital technologies for instruction and research?
2. How often do lecturers in the School of Teacher Education use the available digital technologies in their respective departments?
3. To what extent and in which ways has the use of digital technologies changed the traditional practices and activities of lecturers at the school of Teacher Education?

METHODOLOGY

Research Design

The study used a mixed research method and employed a descriptive survey research design because it deals with lecturers' perceptions about their new roles in the use of digital technologies. The study was conducted at one University of Technology in South Africa. The participants were drawn from four departments of the school of Teacher Education, namely: Technology, Natural Sciences, Computer Sciences and Economics and Management Science departments. Simple random sampling was employed to select 86 participants for the survey while purposive sampling method was used to select four participants for the interviews. The four participants were selected because they were exposed to different digital technologies in their departments.

Data Collection

Data were collected in two phases. In the first phase a semi-structured questionnaire was used to collect quantitative data. The questionnaire was used to collect quantitative data related to: (a) the types of digital technology that are commonly accessible to the lecturers, (b) the types of digital technology commonly used by lecturers in teaching and learning and (c) lecturers' rating of the roles associated with the use of digital technology. In the second phase a semi-structured interview was conducted to determine whether or not the responses obtained from the questionnaire was consistent with that of face-to-face interviews.

Data Analysis

Statistical data analysis for the first part of the research was done using SPSS Version 22 to calculate the percentages according to the participant's responses. Before data analysis was carried out, the researchers made sure that the data were correct and that the missing values (for example, not answered questions in a survey) were clearly identified as missing data.

The qualitative data analysis processes included reviewing each respondent's answer to the survey's two open-ended questions and coding the results. Individual words from the text were grouped into various categories and further grouped into predominant themes. The primary themes or commonalities among responses that emerged from coding were counted and ranked according to frequency. The qualitative data were categorized in terms of themes relevant to the research questions and then the categorizations were coded.

RESULTS

Questionnaire Results

This section of the study is meant to report on the respondents' answers to the research questions as set out in the questionnaire. Question 1 was meant to determine lecturers' access to different types of teaching and learning digital technology in their department. The data from the findings are presented in Table 1.

Table 1: Lecturers' access to different types of digital technology (N = 86)

Access to teaching, learning and research technologies	*Unrestricted access*	*Limited access*	*No access*
Mobile phone	79 (92%)	3 (3.4%)	4 (4.6%)
Desktop computer	68 (80.2%)	11 (12.8%)	6 (7%)
Digital camera	35 (40.7%)	13 (15.1%)	38 (44.2%)
Flash disc	76 (88.4)	7 (8.1)	3 (3.5%)
Laptop computer	65 (75.6%)	11 (12.7%)	10 (11.7%)
Wireless Internet	38 (44.2%)	17 (19.8%)	31 (36.0%)
Broadband Internet	45 (52.3%)	10 (11.7%)	31 (36.0%)

Analysis of the data in Table 1 shows that a high number 79 (92%) of the respondents indicated that they have unrestricted access to a mobile telephone. However, there was no evidence to suggest that mobile phone was used for the purpose of instruction. The findings also show that over two-third of the respondents (69 or 80%) have access to desktop computers and used them on a daily basis. Similarly, 76 (88%) and 65 (76%) of the respondents have access to flash discs and laptop computers, respectively. In contrast, only 38 (44%) of the respondents have unrestricted use of wireless Internet, compared to 45 (52%) who have broadband Internet. Access to digital camera appears to be limited to a few people given the limited and no access responses. From the data analysis it is evident that the majority of lecturers have access to a wide range of digital technology. However, the findings do not suggest they are all used in teaching and learning.

Question 2 was aimed at establishing the extent to which Information Communication and Technology (ICT) are used by the lecturers. Data from the participants' responses are presented in Table 2.

The results show that a large number of the lecturers 76(88.3%) use a computer for producing documents everyday while 55(64.0%) do not use a computer to create web pages. Interestingly while 44(51.2%) of the respondents use a computer for general study without accessing the web. Disappointingly, only a small number of respondents 4(4.7%) indicated that they use a computer for creating and editing audio and video and 7(8.1%) to play games. The use a computer to play digital music files appears to receive little interest among the respondents as indicated by the responses. However, it is important to note the high number 77(89.5%) and 71(82.6%) of respondents who never used a handheld computer as a personal organizer and a game console to play games respectively.

Overall, the lecturers perceived seven main roles associated with the use of ICT in teaching and learning. Analysis of the data indicate that over 70 percent of the respondents rarely perform the role of IT specialist, network administrator and designer of learning experiences. However, 52(60.5%) saw themselves as member of a learning team while 41(47.7%) are able to perform the role of are able to perform the role of a learning facilitator at least once a week, 36 (41.9%) as learning facilitator and 41(47.7%) as learning from students. Interestingly less than 35% of the respondents are able to perform the above roles on a daily basis. The findings from the quantitative data suggest that the lecturers' ability to perform the changing roles might be influenced ICT access and frequent use in teaching and learning (Table 3).

Table 2: Use of computer-based technology (N = 86)

Use of computer-based technologies	*Used everyday*	*Used few days a week*	*Used once a week*	*Not used at all*
Use a computer for producing documents	76(88.3%)	12(14.0%)	-	-
Use a computer for creating web pages	-	4 (4.7%)	14(16.3%)	55(64.0%)
Use a computer for creating multimedia presentations	40(46.5%)	18(20.9%)	7 (8.1%)	14(16.3%)
Use a computer for creating and editing audio and video	4 (4.7%)	-	11(12.8%)	-
Use a computer for general study and surfing internet	69(80.2%)	11(12.8%)	4 (4.7%)	2 (2.3%)
Use a computer to play digital music files	28(32.6)	17(18.8%)	4 (4.7%)	37(40.0
Use a computer to play games	7 (8.1%)	9(10.5%)	18(20.9%	52(60.0%)
Use a game console to play games	4 (4.7%)	4 (4.7%)	7 (8.1%)	71(82.6%)
Use a handheld computer as a personal organizer	2(12.0	3 (4.7%)	4 (4.7%)	77(89.5%)

Table 3: Changing role of lecturers (N=86)

How often do you do play the following roles	*Every day*	*Once a week*	*Rarely*
IT specialist	4 (4.7%)	10 (11.6%)	72 (83.7%)
Network administrator	1 (1.2%)	11 (12.8%)	74 (86.0%)
Designer of learning experiences	5 (5.8%)	21 (24.4%)	60 (69.8%)
Learning facilitator	19 (22.1%)	41 (47.7%)	26 (30.2%)
Member of a learning team	28 (32.6%)	52 (60.5%)	6 (7.0%)
Mentor and counselor	19 (22.1%)	36 (41.9%)	31 (36.0%)
Co-learner (Learn from students)	36 (41.9%)	41 (47.7%)	9 (10.5%)

Interviews Results

The qualitative data analysed in this section were obtained from the interviews held with a sample of four participants. The researchers conducted interviews with participants in order to better understand the extent to which the use of digital technologies has changed the traditional practices and activities of lecturers at the school of Teacher Education. For the sake of consistency, each participant was asked: "*To what extent and in which ways has the use of digital technologies changed your traditional practices and activities as a lecturer?"*

Respondent 1: "*Apart from other roles, I find myself playing the role of a [...] facilitator. Today's students are more advanced in the use of technology than many of us and the only way is to make learning more student-centered … active learners"*

Respondent 2: "*There are so many computer-based technologies out there that our students have access to and use them on a daily basis. That means I am no longer the source of all the information. I also need to learn from my students."*

The respondent further state:

"*As a result, my role as a teacher has changed significantly. Before, we were like ship captains, directing students to the exact information they needed. But now, they are more like navigators in the tsunami, giving students the tools and skills they need to map out their own journeys through the mass of information they encounter every day"*

Respondent 3: "*I always remind my students about the good and the bad things about the use of web-based technologies. I see myself now as a mentor because of plagiarism associated with the use of Internet as source of information."*

Respondent 4: *"The use of ICT in my daily teaching has added many roles. For example I now see myself playing the role of a coordinator because I need the computers to work but I get frustrated when I don't get quick service from the technician." "Students will always look for help from the lecturer when the technologies they need cannot to be accessed."*

Analysis of the above responses suggests that the use of computer-based technologies demands a number of new roles, in addition to other teaching responsibilities. The interviews report appears to confirm the task of facilitator, co-learner, mentor and member of a learning team as new roles that they are often faced with when using computer-related technology.

DISCUSSION

The purpose of the first part of the study was to investigate the effects of access and use of various digital technologies on lecturers' perceived new roles. The results of the research suggest that access of digital technologies make a significant contribution towards one's technology use. According to the study results technology acceptance and adoption are important factors in an individual's propensity towards technology especially ICT use. These findings seem to be in line with early research findings suggesting that ICT preferences of individual's intellectual status are important factors to individual's technology use and preferences (Thinyane 2010; Ritzhaupt et al. 2013).

The findings of the survey indicate that the majority of lecturers irrespective of the department they come from, appear to use computer for producing documents more frequently than for other activities such as creating web pages, creating multimedia presentations, creating and editing audio and video, playing digital music files or using handheld computer as a personal organizer The findings appear to confirm the current debate on the digital divide between students and teachers in terms of their knowledge and competence in the use of digital technologies. While the Net-generation have great access to and can easily use most technologies available in the market, (Prenskey 2001a) a reasonable number of lecturers commonly known as "digital immigrants" still retain, to some degree, their culture, that is, their foot in the past. In terms of digital technology access and usage, the results show that proportionately, lecturers from Computer science and Technology programmes appears to have more access and use as compared to those from Languages, Natural Sciences, and Economic and Management Sciences. The reason for the disparity in digital technology use could be partly due to technology acceptance and digital propensity, and technological knowledge by the lecturers.

The second part of the study investigated the extent to which ICT use can change the traditional practices and activities of lecturers at

the school of Teacher Education. We identified technology associated roles as IT consultant, designer of learning content, facilitator of learning, member of a learning team, mentor and co-learner (sharing with students as a fellow learner). The study revealed a complex relationship between the introduction of technology, changes to lecturer roles, and the teaching-learning environment in general. Some changes are found to be technology driven, and others are indirectly attributed to the presence of computer-related technologies in the respective departments.

It is often very tempting first to draw a simplified picture of the role of the teacher in "traditional" or even "old-fashioned" education and then present contrasting visions of a new role in the future. While new roles have emerged, the researchers also found different arrays of activity and roles that lecturers perform in each department. They argue that one of the most crucial changes in the traditional teacher role could be partly due to influence by the advancement of technology, the use of technology in teaching and learning, and the nature of the millennial students entering the university. As alluded to by Laurillard (2013) teaching in higher education has traditionally been teacher dependent and personal. While these changes are clearly identifiable, they do not fundamentally alter the teacher role, that is, they are changes within the traditional activities and practices of a higher education teacher (Johnson et al. 2013).

Results from qualitative data analysis indicate that most lecturers see themselves first and foremost as facilitators followed by being coordinators, co-learners, and least as IT specialist and network administrator. One important finding is that the frequency of the roles appears to vary from lecturer to lecturer and from programme to programme. For example, the findings show that lecturers from Technology education and Computer science are more likely to engage more in ICT activities than those from other programmes. In general, the researchers' interview findings are consistent with the survey findings where advancement of technology, the use of technology in teaching and learning, and the nature of the millennial students entering the university appears to play a part in lecturers, changing roles.

CONCLUSION

Based on the findings of this study, it can be concluded that a high number of academic staff has access to digital technologies such as computers and mobile phones. However, lecturers' use of computer-based technology is mainly limited to producing documents and surfing internet. The results of this study also indicate the effects of technology availability and access on technology acceptance and technology propensity on lecturers' new roles. There is evidence to suggest that use of digital technologies for instruction can result in new roles. These new roles will depend on the types and complexity of the roles played by the lecturer concern. The results of this study are valuable in understanding the effects of digital technologies on lecturers' changing roles. Understanding the impact of technology-enhanced learning for staff in higher education is important if better informed decisions are to be taken about how and why certain technologies can or should be adopted for teaching and learning. In particular, this paper contributes to the literature in three ways. First, it relates to how the use of digital technology in the classroom has created new roles for lecturers in higher institutions of learning. Secondly, a reasonable number of lecturers commonly known as "digital immigrants" still retain, to some degree, their culture, that is, their foot in the past and thirdly, because technology is advancing at a fast rate, the authors show the need for constant training by the lecturers.

RECOMMENDATIONS

This study presents some results which need to be considered by higher education authorities and researchers. Higher education institutions need to consider not only the availability and access to various digital technologies, but create environment for technology acceptance among lecturers who are still considered "digital migrants". Currently, little is known about lecturers' technology use and their pedagogical excellence. To probe deeper into relations existing between technology use and pedagogical excellence more investigations need to be done. The current findings may have some insights and implication on the provision of digital technologies and the ways in which lecturers support students' learning through use of technologies. It is important, therefore, that university authorities consider the results of this study when planning digital technology use by today's academic staff.

REFERENCES

Alvarez C, Salavati S, Nussbaum M, Milrad M 2013. Collboard: Fostering new media literacies in the classroom through collaborative problem solving supported by digital pens and interactive whiteboards. *Computers and Education*, 63: 368-379.

Beaudoin M 2013. The evolving role of the instructor in the digital age. In: Y Kats (Ed.): *Learning Management Systems and Instructional Design: Metrics, Standards, and Applications*. Learning Management System and Instructional Design – Best Practices in Online Education, pp. 233-262.

Beetham H, Sharpe R (Eds.) 2013. *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning*. New York: Routledge.

Behrend TS, Wiebe EN, London JE, Johnson EC 2011. Cloud computing adoption and usage in community colleges. *Behaviour and Information Technology*, 30(2): 231-240.

Buabeng-Andoh C 2012. Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development Using Information and Communication Technology*, 8(1): 136-155

Chen CY, Pedersen S, Murphy KL 2012. The influence of perceived information overload on student participation and knowledge construction in computer-mediated communication. *Instructional Science*, 40(2): 325-349.

Collins A, Halverson R 2010.The second educational revolution: Rethinking education in the age of technology. *Journal of Computer Assisted Learning*, 26(1): 18-27.

Combes B 2008. The Net Generation: Tech-savvy or Lost in Virtual Space. International Association of School Librarianship. From <kzneducation.gov.za.> (Retrieved on 16 May 2013).

Crook C, Harrison C, Farrington-Flint L, Tomás C, Underwood J 2010. The Impact of Technology: Value-Added Classroom Practice (Final Report). Coventry, UK: British Educational Communications and Technology Agency. From <http: //archive. teachfind. com/becta/schools.becta.org.uk/upload dir/ download> (Retrieved on 16 May 2013).

Davis N, Eickelmann B, Zaka P 2013. Restructuring of educational systems in the digital age from a co evolutionary perspective. *Journal of Computer Assisted Learning*, 29(5): 438-450.

Fong RWT, Lee JCK, Chang CY, Zhang Z, Ngai ACY, Lim CP 2014. Digital teaching portfolio in higher education: Examining colleagues' perceptions to inform implementation strategies. *The Internet and Higher Education*, 20: 60-68.

Gabriel MA, Campbell B, Wiebe S, MacDonald RJ, McAuley A 2012. The role of digital technologies in learning: Expectations of first year university students. *Canadian Journal of Learning and Technology*, 38(1): 1-18.

Hanewald R, Ifenthaler D 2014. Developing Australian undergraduate students' science communication skills through collaboratively created digital knowledge maps. In: D Ifenthaler, R Hanewald (Eds.): *Digital Knowledge Maps in Education*. New York: Springer, pp. 175-193.

Hughes J, Jewson N, Unwin L (Eds.) 2013. *Communities of Practice: Critical Perspectives*. New York: Routledge.

Inan FA, Lowther DL 2010. Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development*, 58(2): 137-154.

Jones C, Healing G 2010. Net generation students: Agency and choice and the new technologies. *Journal of Computer Assisted Learning*, 26(5): 344-356.

Kreijns K, Van Acker F, Vermeulen M, Van Buuren H 2013. What stimulates teachers to integrate ICT in their pedagogical practices? The use of digital learning materials in education. *Computers in Human Behavior*, 29(1): 217-225.

Laurillard D 2013. *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies*. 2nd Edition. London: Routledge

Leask M, Pachler N (Eds.) 2013. *Learning to Teach Using ICT in the Secondary School: A Companion To School Experience*. London: Routledge.

Lee DY, Lehto MR 2013. User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. *Computers and Education*, 61: 193-208.

Leu DJ, Forzani E, Kennedy C 2013. Providing classroom leadership in new literacies: Preparing students for their future. In: B Shelley, D Wepner, S Strickland, D Quatroche (Eds.): *The Administration and Supervision of Reading Programs*, New York: Teachers College Press, pp. 200-213.

Lu J, Lu C, Yu CS, Yao JE 2014. Exploring factors associated with wireless internet via mobile technology acceptance in Mainland China. *Communications of the IIMA*, 3(1): 9.

Maldonado UPT, Khan GF, Moon J, Rho JJ 2011. e-Learning motivation and educational portal acceptance in developing countries. *Online Information Review*, 35(1): 66-85.

Pachler, N 2013. Perspectives on and Theories of Learning with Digital Technologies. In: M Leask, N Pachhler, (Eds.): *Learning to Teach Using ICT in the Secondary School:* 3rd Edition. London: Routledge, pp. 1-17.

Prasad U, Kumar V 2013. Digital Technology and the Culture of Teaching and Learning in Higher Education. In: Doris, D. Upasana, S. Sharma, D. and Prabhas R. (Eds.). *Educational Technology in Teaching and Learning: Prospects and Challenges*. Bihar, India: Patna Women's College Publication, pp. 23-29.

Prensky M 2001a. Digital natives and digital immigrants. *On the Horizon*, 9(5): 1-6.

Rajeswari SP, Poornima Y 2013. The Changing Role of the Teacher in Higher Education in a Digital Age. From <www.studymode.com/essays/The-Changing-Role-Of-The-Teacher-1887382.html.> (Retrieved on 28 August 2013)

Ritzhaupt AD, Feng L, Dawson K, Barron AE 2013. Differences in student information and communication technology literacy based on socio-econom-

ic status, ethnicity, and gender: Evidence of a digital divide in Florida schools. *Journal of Research on Technology in Education,* 45(4): 291-307.

Svendsen GB, Johnsen JAK, Almås-Sørensen L, Vittersø J 2013. Personality and technology acceptance: the influence of personality factors on the core constructs of the Technology Acceptance Model. *Behaviour and Information Technology,* 32(4): 323-334.

Thinyane H 2010. Are Digital Natives a World-Wide Phenomenon? An Investigation into South African First Year Students' Use and Experience with Technology", Computers and Education 55(3): 406-414. From <www: late-dpedago.urv.cat/sitemedia/papers/science_6.pdf> (Retrieved on 12 December 2013).

Turel O, Serenk A, Bontis N 2010. User acceptance of hedonic digital artifacts: A theory of consumption values perspective. *Information and Management,* 47(1): 53-59.

Trigueros M, Lozano, M D, Sandoval, I 2014. Integrating technology in the primary school mathematics classroom: The role of the teacher. In: CW Alison, R Ornella, S Nathalie (Eds.): *Mathematics Teacher in the Digital Era. An International Perspective on Technology Focused Professional Development.* Netherlands: Springer, pp. 111-138.

Van Acker F, van Buuren H, Kreijns K, Vermeulen M 2013. Why teachers use digital learning materials: The role of self-efficacy, subjective norm and attitude. *Education and Information Technologies*, 18(3): 495-514.

Vygotsky L 1986. *Thought and Language.* Cambridge, MA: MIT Press.

Weller M, Anderson T 2013. Digital resilience in higher education. *European Journal of Open, Distance and E-Learning,* 16(1): 53.

Warschauer M, Matuchniak T 2010. New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education,* 34(1): 179-225.