



TEACHING USING NEW TECHNOLOGIES AND STUDENTS RESILIENCE

Smaranda Gabriela Onofrei

Abstract: Under the conditions of a digital age, new technologies undergo various interpretations, approaches and usages. Education reaches new dimensions at all its levels, by adopting new technologies in order to deeper support modern possibilities of learning that define the new generations: a high degree of digital capabilities, the capacity to accomplish various tasks, constant connectivity, literacy in multiple media, the need for speed in data transmission, an education for delivery of information, as well as a unique approach towards the learning system. Undeniably, the new learning realities require these new technologies, without limiting their importance in the student's academic study. This paper analyzes the characteristics of today's students in connection with the development of their resilience to adopt new learning-style changes. It is meant to focus on the technology access and practice in academic study and to evaluate the level of the students' adaptability for change.

Key words: digital natives, net generation, technology, resilience, education

1. Introduction

By naming the generation born after 1980, Digital Natives, Millenials or Net Generation, an idea of separation and discontinuity gained ground in defining the generation that is rapidly embracing the digital technology.

After analyzing the dependence of today's students to maintain social contact, to share content, to accomplish various tasks and their rapid understanding of the new computer tools, Prensky named those born in or after 1980 digital natives and those born before 1980 - digital immigrants. This main view not only divided the generations by means of the abilities developed in using computer technologies, but also by the fact that they process information fundamentally differently from their predecessors (Prensky, 2001).

By comparing these two groups and by determining the lack of homogeneity ascertained in relation to technology use (Kennedy, 2008; Bayne & Ross, 2007), it was established that the constant changes in the development of new technology and Internet services over the last 15 years brought both advantages and uncertainty in the life of children and young people. The teachers'/parents' main task is to find a balance between helping build resilience in children, who are confronted with the problems of this new epoch, and the capacity of the web to provide rich and useful information in building up the present and the future generations.

However, the degree of resilience, the exposure to the risks and how these develop will vary between countries, depending on factors such as the use of new technologies and internet services (Livingstone & Hasebrink, 2011). It is important that attempts to protect children and young people should not come at the expense of children's privacy rights and the ability for young people to benefit from the rich seams of education and entertainment available on the web (Sonck et al., 2011).

2. Background

The term “digital natives”, popularized by Prensky (2001), represent the generation born after 1980 when a technological disparity between the youth of the time and their parent and teachers has emerged. It was noticed that these young people share a common global culture defined less by age than by their experience on digital technology. Additionally, Prensky introduced also the concept of „digital immigrants” defining those who were not born into the digital world and which will never be able to master the use of technology to support engaging education.

This new theory was better substantiated in the academic environment. The gap and the changes in interaction between digital natives and digital immigrants were of such negative impact that radical changes were proposed to attempt adopting new education teaching approaches and professional development (Bennett, 2008).

A new literature emerged, illustrating the characteristics of digital natives: a degree of digital capabilities, the capacity to accomplish various tasks, literacy in multiple media, constant connectivity, the need for speed in data transmission, an education for delivery of information as well as a unique approach towards the learning system (Dede, 2005; Oblinger&Oblinger, 2005; Prensky, 2012). These studies revealed new aspects that refined the borders between the two groups. So, before speaking of using new technologies, it is imperative to have access to this infrastructure. Apart from this condition of economic growth, the capacity to navigate a digitally mediated world must be taken into account and the participation gap between those with advanced digital capabilities and those without (Benson & Makolichick, 2007).

Young people lacking access to the Internet or the support of experienced digital users, like parents or teachers, will be hindered in their attempt to gain the necessary social, learning and technical skill sets for success in a wired global society. Recent studies discovered that the more the number of technology-owners increased, the richer was their online media activity. Consequently, the main criteria of whether a person can be considered a digital native is not the age, but rather the usage level and experience with technology. (Dede, 2005b; Bullen et. al., 2009; Corrin et al., 2010).

Of main importance is also the understanding of the ways young people navigate the online world and use the digital media. The lack of studies on how students use technology for their intellectual growth and education brings about the need to identify the technologies daily used by students and the way in which these technologies overlap with or can become ‘learning technologies’ (Kennedy et. al. 2008). Whether ‘friendship-driven’, used in everyone’s daily life, like sharing, using social networks or collaboration, or ‘interest-driven’, developing know-how for professional life, these activities help to improve technological and social skills (Margaryan et al.,2009).

One of the latest steps forward is to understand if the implementation of new technologies in the classroom is needed in order to develop the students learning capabilities or if they are simply used as a result of the rapid propagation of technology (Conole et al., 2008). The problem with which we, as a global society, are faced is how we can help the teenagers grasp the new opportunities of life and lessen the problems and risks involved by digital technologies.

3. Institutional context of the study

The study was conducted in two Secondary Schools, in which the primary level education process was achieved by using new technologies. The study considered the 4th graders. In the Secondary School A, the use of the new technologies in the education process was carried throughout Primary School, starting with the First Grade and at the Secondary School B, the new technologies were introduced in the educational process from the 3th grade. At the time of the study there were 73 undergraduate students of 4th grade enrolled at secondary school A, and 76 students at secondary school B.

Students involved in the study come from families with secondary and higher education, attending courses of state secondary schools in urban areas. Selection criteria for them followed their belonging to the natives digital generation, having features like: access to and use of modern technology, the need for constant connectivity in order to keep in touch with friends in the virtual environment, the

need for speed in providing information, culture enhanced information exchange, digital skills, willingness to multitask.

The introduction of new technologies in the process of education followed that each student to have their own digital device to manipulate it during classes and educational purposes. Learning with new technologies called for students to use educational software and perform various tasks included the use of modern devices.

4. Methodology

The study employed a mixed methods research approach, with a quantitative phase followed by a qualitative phase, which were ascribed equal status (Johnson & Onwuegbuzie, 2004). Mixed methods investigation follows to maximize the strengths of both quantitative and qualitative approaches.

The initial study aims to identify the types of technologies preferred by students, the frequency with which they use both formal and informal learning and how they adapt their behavior from using new technologies. The purpose of the second study was to highlight the complexity of choosing students regarding the use of new technologies, to determine how their use changes the behavior at teaching and learning and how students adapt to these changes.

4.1. Phase 1. Quantitative study

4.1.1. Data collection method, instrument and procedure

In Phase 1, data was collected using a paper-based questionnaire. The survey consisted of four sections: 1) student's experience with new technologies; 2) Generalized Self-Efficacy Scale (GSES); 3) data about changes to teaching and learning; and 4) student background information.

To recruit participants, I initially contacted Secondary Schools principals. They directed me to primary school teachers who were using new technologies in the education process. The questionnaires were distributed after obtaining written consent from parents for children's participation in the study.

4.1.2. Data analysis procedure

Raw data from the questionnaires was digitized, manually coding them using SPSS statistical analysis software. Participant characteristics and associations were analyzed using chi-square statistics. Additional differences and associations between variables were analyzed using non-parametric tests, Man-Whitney u statistics and Spearman's correlations.

4.1.3. Respondents

The questionnaire was completed by 149 4th grade students at Secondary School A (n = 73, 49%) and Secondary School B (n = 76, 51%). Of the total sample, the majority were female (n = 87, 58,4%). The mean age of survey respondents was 10 and half years (mean = 10.55) with ages ranging from 10 to 12 years.

Given that all respondents were born after 1980, they are considered, without exception, digital natives.

4.1.4. Response rate and sample representativeness

All students who attended the classes on the day of data collection completed and returned the questionnaires. This sampling strategy provided clear advantages in terms of time and cost savings. The total sample size (n = 149) ensures statistical power.

4.2. Phase 2: Qualitative Study

4.2.1. Data collection and analysis method, instrument and procedure

The qualitative phase involved semi-structured, in-depth interviews with students and staff. Interviews lasted one hour, on average, and it was audio-recorded. Two separate interview plans were designed: one for students and one for staff interviews. The interview schedule for students was based on the questionnaire responses. Students were asked to describe how the use of new technologies cause changes the behavior at teaching and learning and how they adapt to these changes. Students' perception of barriers to technology use for teaching and learning were also explored. Staff interviews included questions on their experiences of using technologies in teaching, reasons for selecting tools, their observations of the nature and extent of students' technology use, as well as their understanding of the educational value of technologies. Interviews were transcribed and coded for both predefined categories as well as analyzed for emergent topics and themes.

4.2.2. Respondents

Student interviews: In the Phase 1, students had an opportunity to provide contact details if they wished to volunteer for a follow-up interview. Out of 30 volunteers identified through Phase 1, eight students were eventually recruited for interview – four from each institution.

Staff interviews: Eight members of staff were interviewed, four from each institution.

4.2.3. Response rate and sample representativeness

The exploratory nature of this study meant that the interview samples were small. While it is possible that the sample may not be representative of the overall group, there are no marked differences between the survey responses of those students who did and those who did not volunteer for interviews.

Staff participants were selected on the basis of their interest in the use of technology for learning and all of them had experimented with technology tools to support their teaching.

5. Results

5.1. Phase 1

5.1.1. General ownership and use of technologies

Most of the students participating in the survey have a wide range of new technologies at their disposal, such as: cell phones (n = 65, 43.6%), smartphones (n = 84, 56.4%), personal computers (n = 142, 95.3%), tablets (n = 80, 53.7%), personal laptops (n = 116, 77.8%), digital cameras (n = 108, 72.5%) and iPods (n = 12, 8%) (see **Figure 1**).

The results prove that both the students of the classes in which learning takes place by means of the new technologies, and the students of the test classes (in which learning takes place traditionally) have their own technology in various forms (smartphones, tablets, cell phones, tablets), which strengthens the common characteristic of the two categories, namely that of a digital native. If the School A students uses technology in a formal context, monitored and supervised by teachers, the School B students use digital technology in a non-formal space, during their spare time, either to learn, or to have fun, to communicate online or to obtain information in various fields.

Hardware device	Ownership	
	Secondary School A	Secondary School B
Cell phones	24 (32.87%)	41 (53.94%)
Smartphones	49 (67.12%)	35 (46.05%)
Personal computers	73 (100%)	69 (90.78%)
Tablets	48 (68.75%)	32 (42.10%)
Personal laptops	55 (75.34%)	61 (80.26%)
Digital cameras	62 (84.93%)	46 (60.52%)
iPods	5 (6.84%)	7 (9.21%)

Figure 1. Ownership of digital devices

5.1.2. Experience in Using the New Technologies

According to student responses, findings (Figure 2) show us an average level of experience in using the new technologies by reference to the instruments of application, easily comprehensible graphics and online communication.

Based on the application instruments (Word text editing, Excel Calculation, Paint Drawing), the School A students (who learn by means of the new technologies) have a higher level of knowledge as compared to those of School B (who learn traditionally). The same differences, with knowledge advantages for the School A students, are also recorded for the instruments of easily comprehensible graphics (Power Point, drawing software, painting software) and of online communication (e-mail, messenger, file upload and download, Google, web surfing, YouTube, online databases, online video and audio files) as compared with School B students, which learn traditionally (see Figure 2).

Our conclusion on students' knowledge in the use of new technologies is supported by the results of tests done at the end of the school year. The purpose of the tests was to identify the level of digital skills developed (minimum, average, substantial and experienced) from the use of modern technology in the education process. Thus, the results support the fact that the students from school A it records a higher level of digital competence compared with the students of school B, due to the presence and use of new technologies for teaching purposes.

Implementing Instrument	Experience in Using the New technologies									
	Secondary School A					Secondary School B				
	None	Minimum	Average	Substantial	Experienced	None	Minimum	Average	Substantial	Experienced
Implementing Instrument										
Editing Text in Word	-	-	8(11%)	43(58.9%)	22(30.1%)	-	-	21(27.6%)	12(15.8%)	43(56.6%)
Calculation in Excel	2(2.7%)	8(11%)	45(61.6%)	5(6.8%)	13(17.8%)	1(1.3%)	29(38.2%)	19(25%)	9(11.8%)	18(23.7%)
Drawing in Paint	1(1.4%)	4(5.5%)	11(15.1%)	41(56.2%)	16(21.9%)	-	26(34.2%)	22(28.9%)	1(1.3%)	27(35.5%)
Graphic Software										
Power Point Presentation	-	4(5.5%)	9(12.3%)	35(47.9%)	25(34.2%)	-	8(10.5%)	21(27.6%)	35(46.1%)	12(15.8%)
Drawing programs	6(8.2%)	6(8.2%)	43(58.9%)	15(20.5%)	3(4.1%)	25(32.9%)	14(18.4%)	20(26.3%)	15(19.7%)	2(2.6%)
Paint programs	8(11%)	34(46.6%)	20(27.4%)	8(11%)	3(4.1%)	19(25%)	40(52.6%)	16(21.1%)	-	1(1.3%)
ClipArt	8(11%)	28(38.4%)	29(39.7%)	5(6.8%)	3(4.1%)	30(39.5%)	14(18.4%)	27(35.5%)	4(5.3%)	1(1.3%)
Software Communication										
E-mail	-	2(2.7%)	3(4.1%)	35(47.9%)	33(45.2%)	-	21(27.6%)	37(48.7%)	8(10.5%)	10(13.2%)
Messenger	1(1.4%)	1(1.4%)	3(4.1%)	8(11%)	60(82.2%)	-	-	12(15.8%)	28(36.8%)	36(47.4%)
File uploading&downloadi	-	2(2.7%)	11(15.1%)	27(37%)	33(45.2%)	-	10(13.2%)	33(43.4%)	11(14.5%)	22(28.9%)
Google	-	2(2.7%)	4(5.5%)	15(20.5%)	52(71.2%)	-	12(15.8%)	15(19.7%)	23(30.3%)	26(34.2%)
Web surfing	1(1.4%)	4(5.5%)	9(12.3%)	28(38.4%)	31(42.5%)	-	29(38.2%)	32(42.1%)	8(10.5%)	7(9.2%)
YouTube	-	1(1.4%)	1(1.4%)	12(16.4%)	59(80.8%)	-	11(14.5%)	28(36.8%)	22(28.9%)	15(19.7%)
On-line databases	-	4(5.5%)	13(17.8%)	22(30.1%)	34(46.6%)	1(1.3%)	16(21.1%)	33(43.4%)	14(18.4%)	12(15.8%)
On-line video&audio files	-	2(2.7%)	9(12.3%)	55(75.3%)	7(9.6%)	4(5.3%)	24(31.6%)	36(47.4%)	8(10.5%)	4(5.3%)

Figure 2. Experience in Using the New Technologies

5.1.3. Students' Behavioural Adaptations Arising out of the Use of New Technologies

For secondary school A students, there resulted a positive relationship between the number use of technology in formal learning and the behavioural adaptations arising out of this use ($r_s = .593$, $p < .001$), in formal learning and recreational use ($r_s = .457$, $p < .001$). This suggests that these students exploit the new technologies and transfer the utility of these instruments into different contexts of behavioural adaptation: they train their focus on multitask activities, can pay attention and focus longer on a certain activity, develop and adapt their distributive attention, socialize more easily within a project, develop new learning styles, adapt their capacity of making connexions between the information from various fields. For school A students, an increase in the use of technology as a learning purpose was associated with an increase in the behavioural adaptations in the formal environment. Such a relationship wasn't observed on secondary school B students, which suggests that the late introduction of technology in learning generates certain limits of adapting to the new situation, the students finding it more difficult to build their resilience. From these data it cannot be concluded if these limits are built by students or generated by external factors.

5.2. Phase 2

Students and staff results were compared under three key themes that guided the interviews: perceived educational value of technologies, perceived factors impacting adoption of technology for learning and perceived factors impacting adoption of technology for learning.

5.2.1. Perceived educational value of technologies

The students of the secondary school B didn't seem to understand the potential of the technologies for the support of teaching and learning. By contrast, they tried to find in teachers ideas of improving the educational process by the use of technologies.

"It would be very good if teachers could identify a way in which each student could use this technology and if they could teach us how to use them correctly before starting to actually work with them." (Ioana, School B)

Students expect "to be taught" how to use the new technology, for the best fluency in the instructive-educational act. Also, they expect the teachers to use a wider range of new technologies in the educational area: from laptops, tablets, iPods, to smart boards. With reference to the potential to support the educational activity by means technology, the students proposed activities such as: various ways of reading, drawing in easily comprehensible graphic software, watching demonstrative movies. When discussing about the will to learn and to work in groups, the students of the secondary school B weren't so open any more.

By contrast with their colleagues, the School A students seems to perceive more markedly the potential of technology in the instructive-educational act. They argue that the new technologies help the learning process, if they are daily and constantly used in most activities. Their use helps them better and faster understand certain abstract concepts, when they cannot be experienced in the very near environment – by watching educational films/ experiments, documentary films etc. Moreover, they argue that the will to work in team and to learn by sharing and presenting the results is developed through practical experience. The most commonly used instruments for computer-assisted documentation are Google and Wikipedia, and for the consolidation of new information – the educational software.

Teachers from both schools recognized the educational potential of new technologies, provided that they are used in closely monitored school spaces. Even if they are of the opinion that traditional teaching is easier to manage, the teachers assert that in so far as the new technologies already exist in schools, their use contributes to the development of teamwork, to the assimilation and consolidation of new knowledge through various activities which are carried out by means of the new technologies.

5.2.2. Perceived factors impacting adoption of technology for learning

We solicited students and staff to describe their regarding factors preventing use of technologies in secondary school learning. Three general types of issues consistently emerged: digital skills, hesitation to change and problems such as lack of time and infrastructure issues.

Both students and staff considered lack of skills in using technology a key issue, and this associated to both students' and staff's skills.

“Some of us experience difficulties in using the available digital devices or software and, most of the time, the teachers too are confused when confronted with certain easy digital problems.” (Corina, School B)

Students of both schools asserted that they experienced certain difficulties in adopting technology in learning, which were overcome soon after they used them constantly.

Staff suggested that teachers' IT skills were frequently inferior to students' IT skills. Meanwhile, teachers considered students' needs, characteristics and expectations as a driving force for trying new approaches to teaching, giving that students from both secondary schools are more technology-savvy than the staff themselves.

The teachers stated that problems like the lack of time for experiencing new technologies and for adopting alternative types of teaching are considered as key-factors in the failure to integrate the new technologies in the teaching methods. Teachers have also mentioned the resistance to change of the coordinating institutions, which should provide schools with the technologies appropriate to the nowadays students' needs and particularities and should ensure the necessary maintenance. Other problems have also been reported with regard to the infrastructure, among which the complete lack or the very poor signal of the Wi-Fi Internet connection.

5.2.3. Perceived students' Behavioural Adaptations Arising out of the Use of New Technologies

The students and teachers participating to the interview were requested to specify which were the behaviours which underwent adaptations as a result of using the technology in a formal environment.

Both students and teachers considered that the level of socializing within projects underwent changes towards distributing information among students, the latter no longer being ready to share their discoveries in exchange for other information.

„We like to exchange information when we work on a larger project. Each team is in charge of a certain part and we are impatient to learn what the others did and to show our results. (Rareş, School B)

As compared to the school B students, the secondary school A students allege that they are now more involved in multitask activities than before using the learning technology, which developed their distributive attention and their focus on more than 2 activities. Also, the teachers reinforce these allegations, by supporting the behavioural adaptations in this direction.

„I think that we can do 2 or 3 concomitant activities, being also careful of what we actually do. Well, at first we didn't succeed in staying attentive and focused, but in time we learned how to do it. Now it's really interesting to work like this and it also makes us use our brains.” (Augustin, School B)

Another mentioned behaviour which undergoes changes is the learning style. The introduction of technology in constant teaching led to the adaptation and development of new learning styles. The presence of the new technologies makes it easier for the connections to be achieved among knowledge from different fields, and the verification can immediately be performed, thus obtaining a faster feedback on the correctness of the connection found.

The secondary school B students seem not to be aware of the potential behavioural adaptations arisen in relation to the use of the new technologies in the educational process. This may be due to the late introduction of technology in class, which could also lead to a more burdensome or still unconscious adaptation; it must first take place, therewith the adaptation awareness must be achieved and then it will be compared to the behaviour before the adaptation.

6. Discussions

In order to be considered a mixed-method design, the results must be integrated during the interpretation of the results (Johnson and Onwuegbuzie, 2004). The following discussion is structured around key themes arising from both the quantitative and qualitative phases.

6.1. The adoption of technology is influenced by a series of complex factors

The results prove that the new technologies are used both in the case of learning by means of technology and of traditional learning. The difference would be that the School A students use them in the context of formal education, having a wide scope of digital technologies, especially on laptops, tablets and Ipads, whilst the School B students use them in the context of informal education, the cell phones and tablets being ranked first in terms of use. The fact that the School B students use digital technologies outside school strengthens the fact that they are part of the generation of “Digital Natives”.

The results also prove that students’ technology can be encouraged by the use of technology in the learning process within various school courses. Based upon these results, we can conclude that there is a complex relationship between the object, the scope of the technologies used and the promotion of digital technologies in learning by the educational establishment.

6.2. Students partially understand how the use of technology in learning can contribute to adapting behaviours

Whilst the teachers alleged that the students’ expectations for the use of technology in learning represented an important factor in changing the teaching practice, the students only partially understand how the use of technology can influence upon their adaptation of certain behaviours. Previous researches have shown that the students’ expectations about learning by means of technology are influenced upon, as a matter of priority, by the experience of learning in a formal environment rather than that outside the educational context.

The study data show that few of them (part of school A) are aware that they have developed new learning styles, that they adapted their attention and focus to the multi task duties following the introduction of technology into learning, even though the students adapted them to the new situation. Instead, the study data show a deficit in the digital support offered by the teachers to the students, the latter being more computer-literate than some of the teachers. The traditional methods of teaching adopted by the non-computer trained teachers seem to lead the students to passivity in the gross consumption of information.

7. Conclusions

This study was meant to offer a classification of the types of technologies used by the 4th grade students, their perception of the educational value of these technologies and the perception regarding the adaptive behavior as a result of their introduction and use in the educational space – as a part of the resilient development. The results lead us to the conclusion that students are large technology consumers, both in a formal and in an informal context, thereby strengthening their affiliation to the generation of digital natives, being characterized by sophisticated technological abilities. Their expectations for the introduction of digital technologies into school are closely linked to their use by means of certain current and modern methods of teaching and learning. The introduction and use of the new technologies in the instructive-educational act leads to a correct and monitored digital literacy of students, which reduces the potential risks and threats. Although that generally all students have expertise in the use of the new technologies, the understanding of the educational potential of these devices is limited (the students of the secondary school B). Given the fact that they are not constantly used, for educational purposes, the students cannot understand how these technologies can be adapted and how can they support their own learning. Therewith, the results prove that the students who use the new technologies in learning at school develop new learning styles and they adapt their behavior so that they can cope with the new situations: learning with the help of technology, thereby speaking about resilient development. Considering the results obtained by this study, we believe that today

students fit in the generation of digital natives (Bennett, 2008) and identify strategies to adapt to new situations encountered in the educational system (Conole et al., 2008).

This study has some limitations which must be considered when interpreting the results. The survey and interview samples were small and may not be fully representative of the overall group of students and teachers at the two participating secondary schools.

Future research on students' use of technologies for learning could focus on a number of directions. It could take into consideration a broader range of variables like age and subject discipline. Relevant variables include the pedagogic design of courses, socio-economic background of students and their life circumstances, for example geographic proximity to friend and family and general sociability (introversion, extroversion).

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Authors

Onofrei Smaranda Gabriela, PhD Fellow, SOP HDR/159/1.5/S/133675 Project, Romanian Academy Iași Branch, Iassy (Romania). E-mail: smaranda_onofrei@yahoo.com.

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