

Original Article

The Test - Retest Reliability and Pilot Testing of the “New Technology and Nursing Students’ Learning Styles” Questionnaire

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Abstract

Background: The majority of today’s nursing students in Higher Education undoubtedly belong to the “Net Generation” or the so – called “Millennials”. Born from 1982–2001, millennials have been described as technologically literate. Because of this digital literacy, many scientists claim that millennials have different preferences and style of learning and thus many challenges have been posed to the educational institutes.

Aim: To estimate the validity and reliability of an assessment tool designed to identify the undergraduate nursing students’ digital literacy as well as their learning preferences.

Methodology: A pilot study with 136 participants was conducted in order to estimate the reliability and validity of the survey instrument. The questionnaire was designed after a thorough literature review and taking into account several variables. The variables were separated into two modules. The first deals with the competence on new technology and the second one with the students’ learning preferences. Students of three tertiary nursing institutes were invited to participate in an online survey through an email invitation. The assessment of reliability of the survey instrument was performed using test - retest methodology.

Results: Results from the reliability analysis revealed that the scales had good internal consistency. The Cronbach’s alpha coefficients ranged from a low of 0.60 to a high of 0.84. Results indicated that seven of ten scales had Cronbach’s alphas that exceeded the test value of 0.70. The Intraclass correlation coefficient produced high reliability with the lower score being 0.55 ($p=0.01$) and the upper 0.98($p<0.001$).

Conclusions: The “New Technology and nursing students’ Learning Styles” is a literature based, researcher developed instrument that assesses students’ learning styles in relation to emerging technologies. Although results from the pilot study revealed that the initial version of the questionnaire collected reliable data, there was some room for improving it.

Key words: millennials, new technologies, reliability, repeatability, validity, Web 2.0

Introduction

The vast majority of today's nursing students in Higher Education undoubtedly belong to the so-called "Net Generation" (Tapscott, 1998). Net Generation, also called "Millennials", "Digital Natives", the "Google Generation" or the "Y Generation", have been brought out distinctly as a puzzle generation, which emerges many challenges to the educational institutes. All of these terms are being used to place emphasis on the fact that technology is an integral part of young people's lives (Helsper & Eynon, 2010).

Although there is no single time specification among the researchers, Net Generation refers to the group of individuals born between 1981 and 1999 (Kennedy et al., 2006). Prensky (2001) defines as "digital natives" the group of individuals born after 1980. Oblinger and Oblinger (2005), using studies which were conducted in the United States, claimed that today's Net Generation were born between 1982 and 1991 and began using computers between the ages of 5 and 8. Helsper and Eynon (2010) state that the rise of Web 2.0 applications might have created a second generation of digital natives, which can be separated from the first due to its familiarity with Web 2.0 technologies. So, they suggest dividing digital natives into two different generations: the first generation of digital natives refers to the people born between 1983 and 1990, whereas the second generation refers to the individuals born after 1990. Most of the recent literature seems to agree to this Web 2.0 oriented sub-generation (Helsper & Eynon, 2009; Grail Research, 2010; Stone, 2010).

Net Generation has been attributed with several traits and preferences that differentiate them from previous generations. Howe and Strauss (2007) identified seven key traits of millennials: sheltered, special, confident, team oriented, conventional, pressured and achieving (Yahr & Schimmel, 2013). Moreover, millennials are identified with six core learning related characteristics: ability to multi-task, desire for structure, achievement-focused, technology literacy, team-oriented and seeking attention and feedback (Oblinger & Oblinger, 2005; Raines, 2010).

Much of the debate about this new generation has been provoked by Prensky's (2001) findings and commentaries on digital natives and digital

immigrants. The dominant factor that determines young people is the immersion of new technologies within their lives. Prensky (2001) claimed that the digital environment in which young people had grown up had changed the way they think. Numerous surveys have confirmed that new technologies have been a defining feature in the lives of this generation and they augur fundamental change in the way young people communicate, socialize and learn (Jones et al., 2010).

Accordingly, the rapid advances in new technologies and the alleged students' proficiency with technology have caused an important shift to the students' learning styles. Hence, Net Generation is comprised of active learners. Shaw and Fairhurst (2008) discussed the influence of technology on students' learning style and concluded that technology has increased the need for structured, hands-on, interactive assignments in the classroom. Skiba (2006) highlighted net generation's multi-tasking ability, while Wilson and Gerber (2008) emphasized on involving millennials in the learning process through providing choices and cooperative opportunities. Experiential, interactive approaches have been suggested by the majority of the researchers in order to reach this technology literate group of individuals.

Dede (2005) introduced the "Neomillennial Learning Styles" which consist of:

- Fluency in multiple media (learning in simulation – based, virtual settings)
- Learning based on seeking and synthesizing experiences
- Active learning based on experience (real or simulated)
- Communal experiences, team - work
- Mentoring and reflection

A considerable amount of literature supports the idea that the characteristics and preferences of the millennial generation conforms to the active learning style (Partridge & Hallam, 2006; Monaco & Martin, 2007; Wilson & Gerber, 2008). At the same time, the dismissal of passive learning styles as ineffective and incompatible is put forward.

It is crystal clear that members of the Net Generation have grown up with computers and the Internet and are said to have a natural aptitude and high skill levels when using new technologies (Corrin, Lockyer & Bennett, 2010). Yet, many researchers impugn the assertions on millennials' digital fluency (Brown & Czerniewicz, 2010; Kennedy et al., 2010). Indeed, the majority of students use a limited range of technologies for formal and informal learning as well as socializing. Many researchers have stressed the diversity of use of new technologies by young people, underlining that only a small proportion of undergraduate students can be described as digital literate who can use effectively a wide range of new technology applications (Margaryan, Littlejohn & Vojt, 2011).

Moreover, while younger students use new technologies more actively than older ones, there is no significant evidence that these technologies are used to support their learning. Finally, although most students have a positive attitude towards the use of new technologies in education (NUS, 2010), recent studies indicate that technology integration in the classroom is not always welcomed by the students (Salaway, Caruso & Nelson, 2008; Selwyn, 2009; Corrin, Lockyer & Bennett, 2010; Kennedy et al., 2010).

The aim of this preliminary pilot study was to estimate the validity and the reliability of the "New Technology and nursing students' Learning Styles" assessment tool, designed to identify the undergraduate nursing students' digital literacy and their learning preferences with regard to ascertain if they fit the learning profile of the millennial student.

Methodology

The pilot study included the test – retest reliability method in order to assess the stability and reliability of the instrument over a period of three weeks (January – February, 2015). The assessment tool was available on line and was sent via email.

Sample Population

The pilot research was carried out with the voluntary participation of 136 undergraduate nursing students of the Departments of Nursing of the University of Peloponnese, the National and Kapodistrian University of Athens and the Technological

Educational Institute of Athens. The inclusion criteria were:

- Being a currently enrolled undergraduate nursing student of one of the above mentioned institutes
- Willing to participate
- Being a student of assorted year of study

Participants were informed through a cover letter that participation in the research or refusal to participate in the study would not have any impact on their study. Moreover, they received a brief explanation of the purpose and the aim of the study and they were prompted to comment on the questionnaire.

Measurement Instrument

The "New Technology and Nursing Students' Learning Styles" assessment tool was designed and developed to identify the undergraduate nursing students' digital literacy and their learning preferences in order to ascertain if they fit the learning profile of the millennial student. The questionnaire was designed after a thorough literature review and taking into account several variables. Some of the statements were based on the "Student and Information Technology in Higher Education" survey questionnaire of ECAR (2008). The 38 variables of the questionnaire were separated into three sections. The first section included questions to elicit information on the demographic profile of the participants. The second section ("New Technologies") consisted of 20 questions related to the participants' competence on new technologies: previous experience, access to, frequency of use, range of use, skills level on Web 2.0 technologies and their perceptions on technology use in their studies. The third section ("Learning Style") consisted of 9 five point Likert scale statements regarding students' use of technology in their studies and learning preferences.

Content Validity

Establishing content validity is a necessary initial task in the development of a new measurement procedure. Content validity is the extent to which the elements within a measurement procedure are relevant and representative of the construct that they will be used to measure (Haynes, Richard & Kubany, 1995). It is most often measured by relying on the

knowledge of subject-matter experts. Therefore, prior to implementation of the pilot study of our survey, a panel of experts (nurse educators, academics, biostatistics, other researchers) were provided with access to the measurement tool and were asked to provide feedback on how well each question measure the construct in question. The experts judged the appropriateness, meaningfulness, usefulness and effectiveness of each question to determine how accurately the measurement tool taps into the various aspects of the construct questions. Their feedback was then analyzed and the measurement tool was accordingly adapted.

Reliability

Reliability refers to the degree of consistency or dependability of an instrument including stability, internal consistency, and equivalence (Neuman, 2012). Reliability is an important concept in research because it can be used to reduce errors during the analysis of responses to questionnaires. The stability of the instrument refers to the extent which similar results are obtained on two separate occasions or a test-retest procedure (Polit & Beck, 2008). For the purposes of our survey, the test-retest reliability technique was performed to evaluate the stability of the instrument across time. There are two necessary conditions in test – retest reliability. The first is that the true score does not change between administrations and the second one refers to the time period being long enough to prevent learning, carry over effects or recall (Allen & Yen, 1979). To meet the time period condition, the test and retest administration were separated with a three week time interval (January – February, 2015).

Various statistical methods can be used to test reliability according to the characteristics of the data (categorical or continuous) and the contexts of testing variables. Pre- survey and post- survey responses were coded and entered into SPSS software program for Intraclass correlation coefficient (ICC) and Cronbach's alpha internal efficiency. The Intraclass correlation coefficient (ICC) is commonly used to determine the test reliability of continuous variables. Internal consistency of Likert-type scales was calculated using Cronbach's alpha coefficient.

Data Analysis

Analyses were undertaken by means of SPSS Statistics version 20. The level of the significance was considered as $p < 0.05$. The Intraclass Correlation Coefficient (ICC) has values that lie in the range [0, 1]. Negative ICC estimates are possible and can be interpreted as indicating that the true ICC is low. Likewise, the significance of the obtained Cronbach's alphas were judged against the value of $\alpha = 0.70$ and considered acceptable (Kaplan & Saccuzzo, 2009; Mertler & Vanatta, 2005).

Ethical Considerations

The protocol of the study was approved by the Temporary General Assembly of Nursing Department of University of Peloponnese. Permission from the Personal Data Protection Authority was requested. Oral assurance that no written authorization is required, since the questionnaire contains no questions of personal character, was received.

Results

The sample of the pilot study consisted of 136 undergraduate nursing students. The mean age of the students was 21.5 years. The 85.3 % was female and the 70.6 % was students of the Department of Nursing of the University of Peloponnese. The demographic characteristics of the participants who completed the test - retest questionnaires are presented in Table 1.

Test-retest Intraclass correlation coefficients of the instrument varied between 0.48 and 0.98 for an interval of three weeks between test administrations. Table 2 presents a summary of the results of the Intraclass correlation coefficient for the "New Technologies" section of the instrument. Table 3 presents the summary of the results of the Intraclass correlation coefficient for the "Learning Style" section of the instrument.

The Cronbach's alpha coefficients ranged from a low of 0.60 to a high of 0.84. Results indicated that seven of ten scales had Cronbach's alpha indicators that exceeded the test value of 0.70. Those scales were considered to be acceptable reliable scales. Table 4 presents a summary of the results of the Cronbach's alpha coefficients.

Table 1 Characteristics of the sample

Characteristics	N (%)
1. Gender	
Male	20 (14.7)
Female	116 (85.3)
2. Age	
	21.12 ±2
3. Marital Status	
Single	132 (97.1)
Married with no children	0
Married with children	4 (2.9)
Divorced	0
4. Place of former residence	
Urban area	92 (67.6)
Suburban area	12 (8.8)
Rural area	32 (23.5)
5. Nursing Department	
University of Peloponnese	96 (70.6)
University of Athens	12 (8.8)
Technological Educational Institute	28 (20.6)
6. Year of study	
1st	28 (20.6)
2 nd	32 (23.5)
3rd	40 (29.4)
4 th	8 (5.9)
Pending Graduation	28 (20.6)
7. Father's Educational Status	
Primary School	16 (11.8)
Secondary school	20 (14.7)
High school	44 (32.4)
Vocational Technical School	20 (14.7)
Technological Educational Institute	4 (2.9)
University	24 (17.6)
Master Degree	8 (5.9)
Ph.D.	0
8. Mother's Educational Status	
Primary School	20 (14.7)
Secondary school	8 (5.9)
High school	36 (26.5)
Vocational Technical School	32 (23.5)
Technological Educational Institute	20 (14.7)
University	16 (11.8)
Master Degree	4 (2.9)
Ph.D.	0

Table 2 Intraclass Correlation Coefficient (New Technologies)

New technology	Intraclass Correlation coefficient (ICC)	P value
Frequency of Internet use	0.94	<0.001
Frequency of PC use at the university	0.97	<0.001
Level of skill	0.97	<0.001
Mobile use		
Calls	0.95	<0.001
Text messages	0.98	<0.001
Photos	0.89	<0.001
Media sharing	0.84	<0.001
Internet access	0.96	<0.001
Emails	0.97	<0.001
Social networks	0.98	<0.001
Web 2.0 applications		
Blogs	0.94	<0.001
Wikis	0.93	<0.001
Podcasts	0.91	<0.001
Virtual Words	0.65	0.01
Contributing to		
Blogs	0.69	0.008
Wikis	-	
Facebook	0.94	<0.001
Twitter	0.81	0.002
YouTube	0.63	0.02
MySpace	-	
SlideShare	-	
TV attendance/week	0.93	<0.001
Books / year	0.93	<0.001
Importance of Internet as a learning tool	0.87	<0.001
Satisfaction of internet as a learning tool	0.77	<0.001

Table 3 Intraclass Correlation Coefficient (Learning Style)

Scale	n	Lower	Upper
Web 2.0 as study tools	9	0.66 (Wikis)	0.97 (digital libraries)
Web 2.0 requested by the instructors	9	0.55 (Podcasts)	0.97 (simulations, search engines)
Preferred Teaching/ Learning Method	8	0.83 (simulation)	0.92 (in class conversation)
Research tools	6	0.78 (search engine)	0.97 (school library)
Active - Experiential Learning Activities	11	0.61 (variety of activities)	0.92 (multitasking)
Assessment Technique	12	0.48 (group presentations)	0.91 (instant correction tests)
Attitudes towards New Technologies	7	0.52 (internet has benefit my study)	0.96 (the internet encourages cheating)

Table 4 Cronbach's alpha for Scales of the Questionnaire

Scale	n	a	Lower	Upper
Mobile use	7	0.79	0.71	0.97
Web 2.0 applications	4	0.60	0.49	0.91
Web 2.0 as study tools	9	0.70	0.46	0.95
Web 2.0 requested by the instructors	9	0.72	0.46	0.95
Preferred Teaching/ Learning Method	8	0.70	0.71	0.88
Assessment Technique	12	0.82	0.48	0.87

The New Technologies section deals with the students' digital literacy. It consists of 20 variables that refer to the students' familiarity with basic new technologies and Web 2.0 applications, such as blogs, wikis, podcast, virtual worlds and social networks.

The initial reliability analysis on the Web 2.0 technologies scale revealed some poorly performed items. An evaluation of those items resulted in some items being removed. The modifications resulted in a revised scale that consisted of 4 items addressing to Web 2.0 applications and a scale of 7 items addressing to social networks.

On the "Learning Styles" section which deals with the students' learning and teaching preferences in relation to new technologies, the initial reliability analysis on the "Experiential Learning" and the "Students' attitudes" scale revealed several poorly performed items and thus some items were removed and the scales were modified.

According to the age criterion, all the participants belong to the "Millennials". Almost the total of our subjects reported to use a computer and to have access to the Internet from their home. Students were also asked to assess their level of expertise in the use of the computer: the 50% of the sample defines himself as a good user and the 15% as a very good user ($p < 0.001$). The findings suggest that, beyond entrenched technologies and tools (e.g. computers, mobile phones, email), students use a limited range of Web 2.0 technologies. The vast majority prefers traditional teaching and learning methods (the 82% of the sample consider lecture very helpful), but they agree (91%) that new technologies can reinforce their studies and should be embedded to the learning process by their teachers.

Discussion

The "New Technology and nursing students' Learning Styles" is a literature based, researcher developed instrument that assesses students' learning preferences and style in relation to emerging technologies. The items of the assessment tool resulted in a good internal consistency as assessed with Cronbach's alpha. The Intraclass Correlation Coefficient indicated sufficient test retest reliability.

Although results from the pilot study revealed that the initial version of the "New Technology and nursing students' Learning Styles" questionnaire collected reliable data, there was some room for improving the questionnaire. The outcomes from the pilot study were used to revise the instrument. Several items were deleted and others were reworded to improve the consistency scoring. The revised version of the assessment tool consists of 38 items.

Even though surveys show high levels of access to and use of core technologies by young people, this does not necessarily mean they want to use these technologies in all the contexts of their lives. A growing number of researchers suggest students' attitudes toward new technologies as learning tools, is a quite complicated subject. The ECAR study (Salaway, Caruso & Nelson, 2008) found that a small majority of respondents preferred only a "moderate" amount of new technologies in their courses, while the 2007 report (Salaway, Caruso & Nelson, 2007) revealed a degree of hesitation in students' attitudes towards technology.

In each case, technological fluency and digital skills are defined as "basic" competences that every educated person is expected to have. Having the appropriate technology and up-to-date infrastructure is critical to successful learning.

Moreover, the Institute of Medicine (2011) has advocated the use of health information technologies as one solution for ensuring safe, quality health care.

In response, the American Health Information Management Association and the American Medical Informatics Association posed numerous recommendations, most of them concerning academic institutions, on embedding standardized informatics educational competencies in a variety of relevant curricula and promoting faculty professional development in electronic information technologies.

The intense dispute on digital natives and their learning preferences highlights the major challenges and opportunities for the Nursing Institutions of higher education and raises fundamental questions about educators' readiness to prepare technology literate nurses who can use informatics tools to provide safe, quality and patient-centered care.

Acknowledgements

The authors deeply thank all the volunteers for their kind participation to the survey and their positive feedback.

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