

INVESTIGATING THE ACCEPTANCE OF DIGITAL TECHNOLOGIES IN AN EXCEL COURSE

Trudie Benadé¹, Janet Liebenberg²

North-West University South Africa

trudie.benade@nwu.ac.za¹, janet.liebenberg@nwu.ac.za²

ABSTRACT– It is widely reported that university students are Digital Natives and the diffusion of digital technologies into education holds prospective advantages. However, will students be prepared to engage with and accept the technology? This quantitative study aimed to investigate students' intentions to use an eBook and Specialised Learning Management System (SLMS) in an Excel course. The study used the Unified Theory of Acceptance and Use of Technology (UTAUT) as a lens to understand students' intentions to use digital technologies. Approximately a thousand first year students used the eBook and SLMS in the Excel course and the questionnaire was completed by 738 students to determine the effect of the following factors Performance expectancy, Effort expectancy, Facilitating conditions, Self-efficacy, Anxiety and Attitude towards using technology on Behavioural intention. Results indicate positive views about the use of both digital technologies. It was further found that students' intentions are highly influenced by their attitude toward using technology, performance expectancy, and facilitating conditions, whereas effort expectancy and self-efficacy have a moderate correlation with intention and anxiety has a small negative influence. It can be recommended that timely training in the use of digital technologies should be provided to students in order to demonstrate the advantages of the use of these technologies. It can further be recommended that the developers of SLMS's should design the SLMS to be smart phone friendly.

Keywords: Educational technology, technology acceptance, UTAUT, SLMS, eBook, digital natives

1. INTRODUCTION

A good deal of literature tell us that we are currently seeing a new generation of young people, who were all born after the time when digital technologies were invented and became commonplace in everyday life. These youngsters, being used to a life with the Internet, are said to have an innate aptitude and high skill levels when it comes to the use of new technologies. It is easy to see that this generational shift has had profound consequences for teaching-learning approaches (Jones, Ramanau, Cross, & Healing, 2010). Students are making sense of advances in technology in ways unique to their histories and cultures. Venter, van Rensburg, and Davis (2012) state that the diffusion of digital technologies into education and the consequent realisation of its potential advantages will be subject to whether students at universities are eager to engage with and accept the technology. This statement might be more complicated in the African context and this lead to the research question: What are students' intentions to engage with and accept digital technologies? There is a lack of studies in the African context and furthermore, most studies focus on the acceptance of only one digital technology. This study therefore investigated students' intentions to use an eBook and Specialised Learning Management System (SLMS) in a first year Excel course at a university in South Africa.

2. BACKGROUND

2.1 Students and Technology

There is a popular assumption amongst Canadian and American authors that children born after 1980 are technology savvy and display a unique set of characteristics that distinguishes them from previous generations (Schulmeister, 2015). They are being called Digital Natives, Generation Y, the Millennial Generation or the Net Generation. These young people have a positive attitude, high skill level and a natural aptitude when it comes to the use of new technologies (Oblinger, Oblinger, & Lippincott, 2005). The fact that they are extensively exposed to technology from an early age, shapes their preferences and inclines them to prefer certain types of entertainment, learning styles, social choices and ways of communicating (Saiedian, 2009). Digital Natives like immediate exposure to information, they can easily and quickly process information, they prefer multi-tasking, they prefer

non-linear access to information, they do not like the passive, traditional way of being taught, they highly favor active learning, they make use of communication technologies to gain access to information and perform social and professional interactions. They want their environment to be entertaining by offering participatory, sensory-rich, investigative activities (physical or virtual). Furthermore, they are more involved with visual media opportunities for input, they dislike telling or reading pertaining to learning and prefer learning by doing and they like to discover things rather than simply being told (Jones & Shao, 2011; Oblinger, 2003, 2008; Prensky, 2001; Prensky & Berry, 2001).

Contrary to popular belief, not all of the students today can be described as the Net Generation. The reason being, that a lot of children grow up in homes and go to schools where they do not have access to state-of-the-art, ubiquitous technology. Internet penetration for households in 2015 was a meagre 15.4% in Africa, which means that students in Africa do not fit the profile of the normal Net Generation. In South Africa, 50.5% of households are using the Internet (in 2012 the percentage was much lower at 25.5%) which places the country in 41st place amongst developing countries. It is evident that there was a substantial rise in Internet use in South Africa over the past few years and it can be directly linked to the rise of mobile broadband subscriptions, which was 26 per 100 citizens in 2012 and increased to 59.5 per 100 citizens in 2015 (UN Broadband Commission, 2013, 2016). According to the results of a study at a South African University, assessing computer skills of over 4000 first-year students in 2009, a good deal of students that entered South African universities for the first time, are not adequately equipped with the computer skills that they will need for their first year. It was also found that African students are the most likely to be disadvantaged, because they lack previous skills (Nash, 2009). Radical changes are necessary and educators as well as universities will have to follow suit, because students have an entirely different approach to learning than they used to. Although this statement is not new, it continues to have an ongoing significance. Having said that, there is definitely a need for a more meticulously critical and nuanced understanding of the impact of new technologies on the behaviors and subject positions of learners and teachers in higher education (Bayne & Ross, 2011; Schulmeister, 2015). According to Jones and Shao (2011) "There is no evidence that there is a single new generation of young students entering Higher Education and the terms Net Generation and Digital Native do not capture the processes of change that are taking place".

2.2 Theoretical Framework

Several models have emerged out of research pertaining to user acceptance of new technology. The first one was the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and an extension was the theory of planned behaviour that specifies that attitudes and subjective norms have an influence on Behavioural intention, which in turn influences actual behaviour (Ajzen, 1991).

The Technology Acceptance Models (TAM/TAM2) are used extensively in the field of Information Systems (IS) for explaining the acceptance of IT tools. Drawing heavily from the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), Davis, Bagozzi, and Warshaw (1989), in the technology acceptance model (TAM), identified and measured a set of generic beliefs that apply across a range of IT tools with two primary direct determinants of intention: Ease of use and Usefulness. TAM2, an extension of TAM, added Subjective norm and Voluntariness (Venkatesh & Davis, 2000).

The diffusion of innovation (DOI) theory (Rogers, 1995) states that the decision to accept or reject an innovation is based on the beliefs that users form about the innovation. The theory of Rogers (1995) has been used to study a variety of innovations (e.g. World Wide Web, spreadsheets, and teaching methods).

Venkatesh, Morris, Davis, and Davis (2003) evaluated and compared eight prominent models and formulated a unified model, named the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT was developed with four core determinants of intention and four moderators of key relationships. The four determinants are Performance expectancy, Effort expectancy, Social influence and Facilitating conditions. Gender, Age, Voluntariness of use, and Experience with technology are the

four moderators. Furthermore, Self-efficacy, Anxiety and Attitude towards using technology are the mediators and therefore not direct determinants of Behavioural intention. A summary of the determinants and mediators follows in Table 1 below.

Table 1. The UTAUT model

Factor	Definition
Performance expectancy	The degree to which a person believes that using the system will help him/her to better his/her performance and therefore enhance the quality of his/her work (Venkatesh et al., 2003). Individuals form intentions towards behaviours, which they believe will increase their performance. Beliefs have an influence on attitudes, which lead to intentions and therefore cause behaviours (Davis et al., 1989).
Effort expectancy	The degree of ease that is associated with the use of a certain system (Venkatesh et al., 2003). Davis et al. (1989) refer to this as perceived ease of use and claims that it refers to the degree to which an individual believes using a particular system would be free of effort.
Social influence	Refers to the degree to which a person experiences interpersonal influence to use a system from important people within his/her social environment.
Facilitating conditions (Compatibility)	“the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system” (Venkatesh et al., 2003). Rogers (1995) defined Compatibility as “the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters”
Self-efficacy	A person’s belief in their own ability to succeed in a specific situation or accomplishing a task (Bandura, 1995)
Anxiety	A sense of worry, nervousness, or unease about something with an uncertain outcome (Oxford English Dictionary, 2014).
Attitude towards using technology	A person’s overall affective reaction to using a system (Venkatesh et al., 2003).
Voluntariness of use	“the degree to which use of the innovation is perceived as being voluntary, or of free will” (Moore & Benbasat, 1991).
Behavioural intention is the dependent variable	A student’s intention to use digital technologies in the future, whether or not he or she is currently using it. According to Ajzen (1991) “Intentions are assumed to capture the motivational factors that influence a behaviour; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour. As a general rule, the stronger the intention to engage in a behaviour, the more likely should be its performance”.

2.3 Acceptance of Digital Technologies

Venkatesh and Zhang (2010) extended research on technology adoption and use by discussing the generalizability of UTAUT in two different cultural contexts, i.e., China and the U.S. Their study found that culture does play a significant role in affecting technology adoption.

Attuquayefio and Addo (2014) determined the strength of predictors for students’ intention to accept and use ICT for learning and research in Ghana by using the UTAUT model and found that Effort expectancy was a significant predictor of Behavioural intention to use ICT. Marchewka, Liu, and Kostiwa (2007) investigated student perceptions when using course management software. Although

the students agreed that the course management software is a good concept and use it regularly, most of the software's features are not being used to their full potential. Moran, Hawkes, and Gayar (2010) examined students' acceptance of tablet personal computers. In the milieu of their study, the variables of Performance expectancy, Effort expectancy, Attitude toward using technology, and Self-efficacy were key components of behavioural intention. Social influence and anxiety did not appear to contribute much towards Behavioural intention.

Chen (2011) stresses that researchers should consider technological expectancy as well as educational compatibility (the unique learning expectancies of students) while studying technology acceptance in educational settings, since he found in his study that educational compatibility had a greater total effect on e-learning acceptance than technological expectancy.

A number of studies in South Africa researched technology acceptance in various settings. Kyobe (2011) investigated the influence of three factors (i.e. capacity to adopt and use ICT, exposure to international environment and state policies) in South Africa on ICT adoption and found that the capacity to adopt and use ICT has the most significant influence on ICT adoption in South Africa, followed by exposure to the international environment. The effect of state policies was surprisingly not significant.

Venter et al. (2012) observed the determinants of usage of an online learning management system (LMS) in a South African open and distance learning institution. The findings suggest that perceived Usefulness and perceived Ease of use are confirmed and Study relevance and Facilitating conditions are also confirmed. The relationship between Behavioural intention and LMS use were significant, but not particularly strong.

The claims that young people are Digital Natives need closer scrutiny in the African continent. This study therefore aimed to investigate students' intentions to use two digital technologies: an eBook and Specialised Learning Management System (SLMS) in an Excel course at a university in South Africa and used the UTAUT as a lens to gain understanding of students' intentions for using digital technologies.

3. METHODOLOGY

In this section, the demographics of the participants will first be explained, followed by the data collection and analysis and finally the results will be discussed. The research question that guided the study was: What are students' intentions to engage with and accept digital technologies?

3.1 Settings and Participants

This study was conducted at the North-West University in South Africa. The participants were first-year students in a first semester ICT course called "Introduction to Computers and Programming". For the majority of students, this course is the only ICT course included in their program and it comprises students from the Economic-, Science- and Engineering faculties.

Two types of digital technologies were introduced at the beginning of the semester, namely an eBook and a specialised learning management system (SLMS).

The eBook served as their textbook for the course, making this the first course at the university to introduce an eBook as a textbook.

The SLMS is an interactive, online learning environment that helps students to master Microsoft Excel and other computer concepts. Students use technology to observe live applications, then practice these applications and thereafter apply their skills in short questions and projects. Projects can be scheduled with deadlines for submissions and a variable number of resubmissions as determined by

the lecturer are allowed. An auto-grading system grades the projects and a reporting tool gives immediate feedback, providing the students with an opportunity to make corrections and resubmit. Four months after the digital technologies had been introduced, an announcement with the link to the anonymous online questionnaire was sent via the e-learning system to the 978 students taking the course. A total of 738 usable responses were received, indicating an overall response rate of 75.5%. Table 2 provides a summary of the biographic data.

Table 2. Profile of Respondents (n=738)

Criteria	Categories	Number (%) of students
Gender	Male	492 (66.7%)
	Female	246 (33.3%)
Access to a computer since Grade 1	Yes	397 (53.8%)
	No	341 (46.2%)
Wireless Internet (Wi-Fi) access at home	Yes	409 (55.4%)
	No	329 (44.6%)
Access to a mobile phone with Internet access	Yes	723 (98.0%)
	No	15 (2.0%)

The gender profile is typical of most ICT classes with only 33.3% of the respondents being women. These students can not be seen as the typical Net generation, because only 53.8% of them had access to a computer from a relatively young age. Moreover, only about half of the students have wireless Internet (Wi-Fi) access at home.

3.2 Data Collection, Instrument and Analysis

A pilot study was conducted in the previous academic year with only the eBook as digital technology (Liebenberg, 2015) and the questionnaire of the pilot study was adapted from Hardgrave, Davis, and Riemenschneider (2003). For this study the pilot questionnaire was refined and further items from UTAUT (Venkatesh et al., 2003) were added. In the pilot study (Liebenberg, 2015) it emerged that social influence was not a determinant and thus the items of this construct was not included in the questionnaire. The items on the eBook were then duplicated and adapted to include the SLMS, resulting in a list of 64 questions.

The first section of the questionnaire gathered information on the biographic data of the respondents as shown in Table 2. The rest of the questionnaire was divided into two sections – one section containing 32 questions regarding the eBook and the other 32 questions on the SLMS. All the questions were accompanied by a five-point Likert response scale from 1 (Strongly disagree) to 5 (Strongly agree).

Venkatesh et al. (2003) and Hardgrave et al. (2003) constructed questionnaires by using measurement scales from previous research and the determinants of Behavioural intention (BI) considered in this study are: Performance expectancy (PEX), Effort expectancy (EfEx) and Facilitating conditions (FC), Attitude towards using technology (Att), Self-efficacy (SE) and Anxiety (Anx). Furthermore, the use of the eBook and the SLMS was mandatory therefore voluntariness of use was excluded. None of the students had used an SLMS before and since the use of an eBook as a textbook was the first to be introduced at the university, we also excluded experience with technology.

The 738 responses were examined using the seven variables. A Cronbach's α coefficient was calculated for each of the seven factors and it was found (as shown in Table 3) to be reliable ($\alpha \geq 0.60$) for all seven factors.

Table 3. Factors* (With Reliability Coefficients)

Factor	Number of items	Cronbach's alpha (α)
Performance expectancy (PEX)	6	0.900
Attitude towards using technology (Att)	4	0.896

Effort expectancy (EfEx)	5	0.860
Anxiety (Anx)	4	0.760
Facilitating conditions (FC)	5	0.749
Behavioural intention (BI)	2	0.724
Self-efficacy (SE)	4	0.643

Analysis of data was done in SPSS Version 24: Basic analysis was done by calculating the mean values and standard deviation of each of the factors; Reliability coefficients by calculating Cronbach's alpha (α); Pearson correlation analysis to determine the relationship of the factors with Behavioural intention. All the groupings were tested for significant differences between means in the different factors using T-tests. When the results of these interaction analyses are reported only the significant interactions or primary effects will be discussed. Since a convenience sample was used instead of a random sample, the p-values will be reported for the sake of completeness but will not be interpreted.

4. RESULTS AND DISCUSSION

In this section the results of the statistical analysis will be presented and discussed.

4.1 Descriptive statistics

Table 4 shows that the mean values of six of the seven factors are relatively high. The factor EfEx had the highest mean with some of the items contributing to the high mean being the ease of use and limited effort when using the digital technologies. Anx is the factor showing the lowest mean which indicates that students have relatively low anxiety when using the SLMS and the eBook.

Table 4. Descriptive statistics of Factors

Factor	Mean	Std. Deviation
Effort expectancy (EfEx)	3.91	0.71
Self-efficacy (SE)	3.81	0.61
Performance expectancy (PEX)	3.61	0.79
Facilitating conditions (FC)	3.58	0.69
Attitude towards using technology (Att)	3.54	0.86
Behavioural intention (BI)	3.49	0.98
Anxiety (Anx)	2.58	0.81

4.2 Correlation with Behavioural Intention

In Table 5 the results of the correlation between the factors and Behavioural intention (BI) is shown. Att showed the highest practically significant relationship with BI, therefore, students with a positive attitude towards using technology, also have a high intention to use the technologies. PEX also showed a high practically significant relationship with BI, therefore, students who believe that using the eBook and SLMS will help them to better their performance and therefore enhance the quality of their work, intend to use the technologies to a high degree. FC has a significant influence on students' intention to use digital technologies. This indicates that if students believe that the supporting organisational and technical infrastructure exist, they will more likely use the technologies. There is a small practical negative relationship between Anx and BI, thus the higher the Anx of students the lower their BI to use the technologies. Contrary to the findings in Ghana of Attuquayefio and Addo (2014) that EfEx is the dominant determinant of BI, this study found EfEx to not be the dominant determinant.

Table 5. Pearson Correlation Coefficients with BI

Factors	Correlation coefficient	p
Att	0.807	p<0.001
PEx	0.800	p<0.001
FC	0.675	p<0.001
EfEx	0.505	p<0.001
SE	0.453	p<0.001
Anx	-0.198	p<0.001

4.2 Diverse students

The students were categorized based on: Gender, Wi-Fi access and Access to a computer from an early age. Since the students were not diverse in terms of Access to a smart phone, the statistical analysis for that category had to be omitted. All the categories were tested for significant differences between means in the different factors using T-tests. When the differences between the categories for the seven factors were analyzed, only small practically significant differences were found (see Table 6).

Table 6. Differences in categories based on factors

Category	Factor showing largest difference	Effect size (d)	p
Gender	BI	0.249	p=0.001
Wi-Fi access	FC	0.310	p<0.001
Computer access	EfEx	0.256	p<0.001

5. CONCLUSION

The dominant determinant of BI is Att. This implies that if students with a positive attitude towards using technology, will also see value and benefit in using the technologies. It is evident, then, the positive attitude towards technology of the so-called Net generation discussed extensively in the literature is correspondingly reflected in the results of this study in South Africa. In addition, PEx has a large influence on students' intention to use the SLMS and eBook. Therefore, timely training in the use of an eBook and the SLMS should be provided to students in order to demonstrate the advantages of the use of these technologies.

It is expected that students with diversity in terms of Wi-Fi and computer access would differ in acceptance of digital technologies. However, the actualization in this study was entirely different from the expectation – no significant differences were found in this diverse group of students. Educators in the African context should therefore not be concerned about the diverse backgrounds of their students when introducing new technologies into their classrooms.

This study provides a useful insight to educators into the dominant determinants of students' intentions to use digital technologies. The study aids in understanding the drivers of acceptance in order to proactively design interventions like training and targeting students that may be less inclined to accept and use new technologies. These results can assist educators in introducing technology into their classrooms. It is notable that 97.8% of the students have access to a mobile phone with Internet access and therefore it can strongly be recommended that the developers of SLMS's should design the SLMS to be smart phone friendly.

The study highlights the core individual-level determinants of technology acceptance. However, this study only considers technological expectancy as a predictor of technology acceptance and education compatibility as proposed by Chen (2011) is not taken into consideration. This raises a potential research issue for future researchers who could usefully conduct studies to explore and understand the combined effect of this study and education compatibility on the acceptance of new technologies.

REFERENCES

- Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50(2), 179-211.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice-Hall.
- Attuquayefio, S. N., & Addo, H. (2014). Using the UTAUT model to analyze students' ICT adoption. *International Journal of Education and Development using Information and Communication Technology*, 10(3), 75.
- Bandura, A. (1995). *Self-efficacy in changing societies*: Cambridge University Press.
- Bayne, S., & Ross, J. (2011). 'Digital Native' and 'Digital Immigrant' Discourses. In R. Land & S. Bayne (Eds.), *Digital difference: Perspectives on online learning* (pp. 159-169). Rotterdam: Sense Publishers.
- Chen, J.-L. (2011). The effects of education compatibility and technological expectancy on e-learning acceptance. *Computers & Education*, 57(2), 1501-1511.
- Davis, F. D., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982-1003.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Hardgrave, B. C., Davis, F. D., & Riemenschneider, C. K. (2003). Investigating determinants of software developers' intentions to follow methodologies. *Journal of Management Information Systems*, 20(1), 123-151.
- Jones, C., Ramanau, R., Cross, S., & Healing, G. (2010). Net generation or Digital Natives: Is there a distinct new generation entering university? *Computers & Education*, 54(3), 722-732.
- Jones, C., & Shao, B. (2011). *The net generation and digital natives: Implications for higher education*. York: Higher Education Academy.
- Kyobe, M. (2011). Investigating the key factors influencing ICT adoption in South Africa. *Journal of Systems and Information Technology*, 13(3), 255-267.
- Liebenberg, J. (2015). Determinants of ICT students' intentions to use e-books. In Proceedings of the ISTE International Conference on Mathematics, Science and Technology education., Mopani Camp in Kruger National Park, Limpopo, South Africa. Unisa Press.
- Marchewka, J. T., Liu, C., & Kostiwa, K. (2007). An application of the UTAUT model for understanding student perceptions using course management software. *Communications of the IIMA*, 7(2), 93-104.
- Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), 192-222.
- Moran, M., Hawkes, M., & Gayar, O. E. (2010). Tablet personal computer integration in higher education: Applying the unified theory of acceptance and use technology model to understand supporting factors. *Journal of Educational Computing Research*, 42(1), 79-101.
- Nash, J. (2009). Computer skills of first-year students at a South African university. In Proceedings of the 2009 Annual Conference of the Southern African Computer Lecturers' Association (pp. 88-92). ACM.
- Oblinger, D. (2003). Boomers, Gen-Xers & Millennials. Understanding the new students. *EDUCAUSE Review*, 38(4), 37-47.
- Oblinger, D. (2008). Emerging technologies for learning. *Becta*, 3, 11-29.
- Oblinger, D., Oblinger, J. L., & Lippincott, J. K. (2005). *Educating the net generation*: Brockport Bookshelf. 272.
- Oxford English Dictionary. (2014). Anxiety. <http://oxforddictionaries.com/definition/anxiety> Date of access: 20 Feb. 2017.
- Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the Horizon*, 9(5), 1-6.
- Prensky, M., & Berry, B. D. (2001). Do they really think differently? *On the Horizon*, 9(6), 1-9.
- Rogers, E. (1995). *Diffusion of Innovations*. New York: Free Press.
- Saiedian, H. (2009). Software engineering challenges of the "Net" generation. *Journal of Systems and Software*, 82(4), 551-552.
- Schulmeister, R. (2015). Deconstructing the net generation thesis. *Qwerty-Open and Interdisciplinary Journal of Technology, Culture and Education*, 10(1), 69-103.

UN Broadband Commission. (2013). *The state of broadband 2013: universalizing broadband. A report by the Broadband Commission.* Retrieved from <http://www.broadbandcommission.org/documents/bb-annualreport2013.pdf>

UN Broadband Commission. (2016). *The State of Broadband: Broadband catalyzing sustainable development.* Retrieved from <http://www.broadbandcommission.org/Documents/reports/bb-annualreport2016.pdf>

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of Information Technology. *MIS Quarterly, 27*(3), 425-478.

Venkatesh, V., & Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of Global Information Technology Management, 13*(1), 5-27.

Venter, P., van Rensburg, M. J., & Davis, A. (2012). Drivers of learning management system use in a South African open and distance learning institution. *Australasian Journal of Educational Technology, 28*(2).