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Computer Technology and Twitter for Online Learning and Student Engagement

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Abstract

Increased use of online pedagogy in higher education has revealed a need to analyze factors contributing to student engagement in online courses. Throughout the past decade, social media has been a growing influence in higher education. This study examined the attitudes of students and faculty toward computer technology and Twitter for educational use. A total of 127 students and 50 faculty responded to a 15-item Attitudes Toward Computer Technology for Educational Purposes Survey and a 15-item Attitudes Toward Twitter for Educational Purposes Survey.

The testing on the four hypotheses used the Mann-Whitney U and Jonckheere-Terpstra tests. For $H_0$1 and $H_0$2, researchers found no significant differences between students and faculty on attitudes toward the use of computers or on attitudes toward the use of Twitter for learning and student engagement, respectively. For $H_0$3, researchers found significant differences in attitudes toward computers for educational purposes based on the number of online courses taken. For $H_0$4, researchers found no differences in attitudes toward Twitter for educational purposes based on the number of online courses the students and faculty completed.

*Keywords***:** attitudes, cross-sectional, computer technology, online learning, social media, technology acceptance, Twitter

Introduction

The growth of online education has led to considerable interest in research that explores the issues of academic performance, assessments, learning activities, interactions between students, interactions between students and faculty, and engagement in online courses (Allen & Seaman, 2015). As the capabilities of the Internet and the affordability of personal computers increased in the 1990s, distance learning quickly evolved from established approaches, such as instruction by mail, radio, and television, to online learning (Allen & Seaman, 2014; Cuban, 1986; Tyson, 1936).

Although online higher education has been available for 20 years, a number of negative stereotypes persist. For example, online education is not as rigorous as its face-to-face counterpart, online courses are substandard to on-campus courses, and online faculty are less engaged than on-campus faculty (Seaman & Tinti-Kane, 2013). Researchers have pointed out that the online learning platform presents a distinctive challenge on how to engage students in developing content specific knowledge (McCracken, Cho, Sharif, Wilson, & Miller, 2012). However, over the past decade, this form of educational delivery has become widely accepted and a common learning option. Numerous studies have found that online education has outpaced traditional higher education, with the majority of accredited institutions now offering distance learning courses (Parsad & Lewis, 2008). According to the 2015 Survey of Online Learning, online education has continued to outpace on-campus attendance for 13 consecutive years (Allen & Seaman, 2015).

Twitter

The use of social media for educational relevancy offers students and faculty a way to communicate and interact virtually outside of learning management systems (LMS). According to Lowe and Laffey (2011), using Twitter to create concise "Tweets," messages of 140 words or less, is easier to read and less cumbersome than traditional methods of blogging. Twitter allows students and faculty to create a Tweet and have the class see the message, whether the members logged into the LMS or not. Twitter, as an educational tool for fostering a classroom community, practicing collaborative writing, sharing and collaborating with other schools, referencing websites, making announcements, and sending reminders is under exploration (Grosseck & Holotescu, 2008).

Statement of the Problem

In response to the rapid growth of enrollment in online classes, the number of higher education faculty members teaching online is increasing (Allen & Seaman, 2015). However, faculty may be reluctant to incorporate different forms of online teaching strategies because of fear of change, concerns about the reliability of technology, uncertainty about student outcomes in online learning environments, workload issues, and other factors (Bacow, Bowen, Guthrie, Lack, & Long, 2012; Betts & Heaston, 2014; Bolliger & Wasilik, 2009; McQuiggan, 2012). Fostering faculty's acceptance of online delivery methods is critical for institutions that consider online learning to be a key part of their strategic plans and to attract increased enrollment. To facilitate faculty acceptance of online delivery strategies, college administrators need to

understand how both students and faculty perceive online learning and the factors that shape their perceptions about the quality of online teaching and learning.

Twitter correlates to an increase in student engagement and student performance in on-campus classes (Junco et al., 2011). However, it is not evident from the literature whether Twitter is a viable part of the instructional strategy (Junco et al., 2011). Studies on Twitter use for online courses have largely been nonexperimental, with sources such as testimonials and university blogging sites to measure Twitter's effectiveness on student engagement. Researchers, therefore, can consider findings to be subjective and anecdotal, and may not generalize them to all student populations (Anderson, 2011; Berinato & Clark, 2010; Junco et al., 2011; Lowe & Laffey, 2011).

Null Hypotheses

To fulfill the purpose of this study, the research study addressed the following null hypotheses:

$H_0$1: There is no difference between students and faculty regarding attitudes toward the use of computer technology for learning and student engagement.

$H_0$2: There is no difference between students and faculty regarding attitudes toward the use of Twitter for learning and student engagement.

$H_0$3: There is no difference in attitudes toward computer technology for student and learning engagement based on the number of courses students completed online.

$H_0$4: There is no difference in attitudes toward Twitter for student and learning engagement based on the number of courses students completed online.

Theoretical Foundation: The Technology Acceptance Model (TAM)

The theoretical model the researchers used as the foundation for the current study is the Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989). This model is the most powerful extension of the theory of reasoned action (TRA) by Ajzen and Fishbein (1975). The TRA promotes understanding of an individual's voluntary behavior, attitudes, and subjective norms. The technology acceptance model, based on the TRA, has a firm theoretical basis and empirical support (Davis, 1989; Davis et al., 1989). The TAM has been the most influential model to predict the acceptance and use of various technologies for learning (Davis, 1989; Jen-Hung et al., 2007; Seyal, 2015; Seyal et al., 2015; Shih-Chih et al., 2011).

The effectiveness of the TAM in explaining and predicting the success of new technology, led to testing the model across disciplines to examine acceptance in various public sectors of diverse technologies. These areas include computer-based information systems (Davis, 1989); health information technology (Holden & Karsh, 2010); World Wide Web (Lederer, Maupin, Sena, & Zhuang, 2000; Porter & Donthu, 2006; Shih, 2004; Yi & Yujong, 2003); electronic commerce (Ha & Stoel, 2009; Pavlou, 2003; Vijayasarathy, 2004); e-mail (Gefen & Straub, 1997); Internet banking (Lai & Li, 2005; and online learning (Saadé & Bahli, 2005). In

the case of technology acceptance about social media, there is a lack of comprehensive literature reviews of existing empirical studies (Wirtz & Göttel, 2016). This scarcity is surprising given the current meaning of social media for individuals and society as well as the high level of user acceptance.

Online Learning

Technological advances, including the Internet, have affected the delivery of education across the world. Online learning is growing at an exponential rate (Kauffman, 2015). With nearly 30% of college and university students in the United States currently enrolled in at least one online course, online learning enrollments continue to develop at a more rapid pace than overall enrollments in higher education (Allen & Seaman, 2010, 2015; Armstrong, 2011).

According to Kim (2017), the use of social media in colleges and universities can lead to a loss of control for many faculty who may believe social media is highly disruptive. This view results from most students' greater familiarity with the use of a variety of social media tools than faculty. King et al. (2009) further observed that faculty might resist the adoption of social media networking systems because the faculty simply lack knowledge of the systems.

Student Engagement

In 1984, Alexander Astin recommended a developmental theory for university students that focused on the concept of involvement, which he later renamed engagement. Astin (1984) defined engagement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 297). Trowler and Trowler (2010) described student engagement as involving interaction, participation, effort, and time of students and faculty with the purpose of enhancing the learning experience, which also fosters student development and success. Today, the concept of engagement refers to the time and effort students invest in educational activities that link empirically linked to desired college outcomes (Kuh, 2009).

Engagement is among the better predictors of learning and personal development of student learning (Carini, Kuh, & Klein, 2006). Students lacking engagement in their schooling and the process of postsecondary education early in their careers are at risk to inadequately acquire the knowledge and skills for transfer to future educational and work experiences (Miller, Rycek, & Fritson, 2011). Engagement is a fundamental component of any online course. When student engagement lacks, the course is little more than a correspondence course (Gazza, 2017).

Social Media in Education

Institutions of higher learning are pursuing ways to enhance student engagement (Meyer, 2014). As a result, social media networks have become the subject of academic attention. Universities are now using social networking sites as alternative spaces where students can adapt to the college lifestyle through interacting online with peers and faculty (Yu et al., 2010).

McLoughlin and Lee (2010) reported the pedagogical benefits of social media and identified specific benefits of social media connections and social rapport, collaboration (information finding and sharing), student-generated content, and accumulation of knowledge and information. All of these benefits contribute to students' cognitive development.

McLoughlin and Lee (2010) also proposed that the inherent design of social media supports the development of student self-directedness.

Consequently, a number of studies exist that examine whether Facebook and Twitter had positive effects on encouragement of greater student engagement (Deng & Tavares, 2013; Heiberger & Harper, 2008; Junco, 2011; Junco et al., 2011; Junco et al., 2013; Kirschner & Karpinski, 2010). The primary challenge for college leaders and educators is to understand and fully utilize these technologies to help students succeed. However, insufficient research exists exploring the role of social media in colleges and universities. Furthermore, very little knowledge exists regarding the perceptions of higher education administrators of social media and the roles it can play in their institutions (Rios-Aguilar et al., 2012).

Twitter in the Classroom

Social networking sites have received a great deal of attention, but among them, Twitter appears to be the most popular in the university setting (Haytko & Parker, 2012). With large numbers of students using social networking sites such as Twitter, it is appropriate for educators to identify means to use these technologies in beneficial ways within the classroom (Junco, 2014). Researchers have shown that Twitter increases student engagement within the classroom (Grosseck & Holotescu, 2008; Junco et al., 2011; Kurtz, 2009; Rinaldo et al., 2011). Twitter also increases social interaction among students and educators inside and outside of the classroom (Lowe & Laffey, 2011; Rinaldo et al., 2011).

Twitter is more convenient than other forms of social media. Tweeting from any location with access to the Internet or a mobile phone is possible. Users tweet without charge on a computer with Internet connection but, depending on text messaging and data plans, incur a nominal fee when users access them on a mobile device (Dunlap & Lowenthal, 2009b). Using microblogging in online learning situations to create the opportunity for free-flowing, just-in-time interactions (Dunlap & Lowenthal, 2009b), often lack in this setting. These interactions are short and informal, and take place between the logins common in learning management systems (Dunlap & Lowenthal, 2009a). Socially, microblogging allows for a type of out-of-the-classroom interaction that previously was unavailable in learning management systems. Microblogging thus strengthens interpersonal relationships between students and faculty (Dunlap & Lowenthal, 2009a).

Research Design

This study utilized a quantitative survey research methodology to study participant behaviors and attitudes toward computer and Twitter use. A representative sample of students and faculty reflected the wider population of interest. In this study, the nominal and ordinal independent variables were type of user (students or faculty members) and number of completed courses by the students and faculty (0, 1-5, 6-10, and >10), respectively. The continuous dependent variables were attitudes toward the use of computer technology and attitudes toward the use of Twitter for education.

Using the Attitudes Toward Computer Technology for Educational Purposes (ATCTEPS), the study measured the differences in the attitudes toward using comparative average scores on the ATCTEPS survey between the two independent groups, students and

faculty. The ATCTEPS survey is an adaptation of the Attitudes Toward Computer Technology Scale (ATICTS; Albirini, 2006).

Target Population and Sample

The target population for this study consisted of both students and faculty who either took or taught online courses at a small private university in south Florida. The total student enrollment was 4,918, for the summer semester 2017, of whom 820 students took courses online. Approximately 400 active faculty members were at the university, suggesting a 12:1 student-faculty ratio. The total population size for this study was approximately 5,300 individuals (U.S. News and World Report, 2017). The sample size was 177; 127 were students and 50 were faculty and administrators.

Sampling Procedure

This study employed purposive sampling design. This nonrandom sampling method selects or includes subjects with a researcher's specific purpose in mind. The study applied certain criteria for selection on the principle that some subjects were more suitable for the research than were others. For purposes of this study, the inclusion criteria required that the respondent be a current student or faculty member at a specific university.

Instrumentation

The ATCTEPS was the primary instrument for this study. The ATCTEPS survey is an adaptation of the Attitudes Toward Computer Technology Scale (ATICTS; Albirini, 2006).

Using the ATICTS for measuring teacher attitudes toward information and communication technology took into account three components of attitudes inclusive of affective, cognitive, and behavioral dimensions. These components correlate with actual behaviors based on the theory of reasoned action (Albirini, 2006; Eagly & Chaiken, 1993).

The ATICTS instrument (Albirini, 2006) contains 15 items with responses based on a 5-point Likert scale. The higher the response number, the higher the degree of agreement. Therefore, 5=*Strongly Agree* and represents the maximum score. Conversely, 1=*Strongly Disagree* and represents the minimum score. The scale consists of five subscales that measure computer attitudes, computer attributes, cultural perceptions, computer competence, and computer access. Each subscale ranges between 3 and 15 points. The total scale score ranges from 15 to 75; the higher the score, the stronger the level of respondent's agreement. Additionally, the researchers modified the ATICTS Instrument in a parallel fashion to measure subjects' attitudes toward Twitter.

Rationale for Instrument Selection

Validity

Testing the ATICTS (Albirini, 2006) for both reliability and validity assures the measurement of the actual variable of interest. Face validity refers to the degree to which a test

appears to measure what it claims to measure (Patten, 2014). A panel of experts established face validity of the ATICTS. Content validity is the degree to which a test measures an intended content area (Patten, 2014). A panel of educational and measurement experts established content validity for the instrument (Albirini, 2006).

Reliability

Reliability is the degree to which a test consistently measures whatever it is measuring (Patten, 2014). A reliability coefficient (α) indicates the consistency of the score (Patten, 2014). Albirini (2006) reported Cronbach's alphas for computer attitude (0.90); perceived usefulness (0.86), perceived cultural relevance (0.76), and computer competence (.94). These alpha levels are significantly higher than the typically applied .70 cutoff and strongly suggest this instrument is both reliable and valid (Albirini, 2006).

Data Collection and Recording Procedures

The data collection was through SurveyMonkey, an online survey platform that simplifies creation and hosting of Web-based questionnaires. The survey remained active for data collection one month. The participants read a letter of permission to conduct the research from SurveyMonkey. Participants also read the electronic version of the Informed Consent Form. The informed consent document was part of the e-mail invitation.

Data Analysis and Reporting Procedures

The study used SPSS, Version 24 to conduct the descriptive and inferential analyses of data. Descriptive analysis included a summary of the sample characteristics reported as frequencies, percentages, ranges, averages, and standard deviations. The measuring and reporting of the descriptive data precluded the more complex inferential analysis.

Inferential statistics tested the four null hypothesis statements and to measure the probability that observed results were dependable and useful to make inferences in more generalized conditions. Originally, the study was to address null hypotheses 1 and 2 by *t*-tests for independent samples and null hypotheses 3 and 4 with one-way ANOVAS. The use of these statistical procedures changed after data collection and data inspection. These procedures revealed that the data had nonnormal distributions. The decision to use nonparametric statistical tests resulted after several diagnostic tests: a combination of the Shapiro-Wilk test (a test of normality researchers execute when running descriptive statistics in SPSS), the Levine's test for equality of variances, and subjective examination of the histograms.

Therefore, the study used two other statistical tests for this cross-sectional research design to measure and compare average computer and Twitter acceptance scores between students and faculty. These tests were the Mann-Whitney U test for null hypotheses 1 and 2, and the Jonckheere-Terpstra test for null hypotheses 3 and 4.

Results

Reliability Analysis

The reliability analysis for the ATCTEPS showed that the 15 items in the scale had a Cronbach's alpha, $\alpha = 0.884$. The reliability analysis for the modified scale (Twitter) demonstrated a Cronbach's alpha, $\alpha = 0.919$.

Demographics

A total of 177 individuals responded to the survey over a one-month period. Among the respondents, 127 (71.8%) were students, 43 (24.3%) were faculty, and 7 (4%) identified as administrators. The majority of respondents (64%) were female. There was a fair representation of all age categories, although only 12.6% were over 60 years of age. Among this sample, nearly all respondents (76%) reported ever taking a course online, and 24% reported ever teaching a course online. Among those who reported taking a course, 41% reported taking 10 or more online courses. By comparison, only 18% reported teaching 10 or more online courses.

Nearly two in three respondents reported using Twitter at some time for teaching (68.4%) or learning (63.3%). In addition, 59.2% of the students reported using Twitter at some time when taking a course, and 46.5% of the faculty reported using Twitter at some time for teaching a course.

Analysis of Null Hypotheses 1 and 2

The Mann-Whitney U test analyzed differences in student and faculty attitudes regarding computer technology. The estimated level of agreement that computers were useful for educational purposes was at 61.9 for students and 60.2 for faculty. Although acceptance of computer technology was 1.7 points higher for students, differences in overall acceptance of computers between students and faculty did not reach statistical significance ($U = 1.33$, $p = 0.184$) (see Table 1).

In comparison, with the Mann-Whitney U test for null hypothesis 2, Twitter received considerably lower levels of acceptance among both student and faculty groups. Students provided an average acceptance score of 39.3, and faculty provided an average acceptance score of 39.5. Twitter acceptance for both students and faculty were nearly identical with only a 0.020 estimated difference between the groups ($U = -.106$, $p = 0.915$) (see Table 1).

Table 1

Mann-Whitney U Tests Comparing Acceptance of Computers and Twitter for Education Among Students and Faculty (N =170)

Variable	Group		*n*	*M*	*SD*	*U*	*p*	*Decision*
Computers								
	Students	127	61.9	7.4	1.33	.184		
	Faculty	43	60.2	7.7				Fail to Reject $H_0$1
Twitter	Students	127	39.3	11.2				
	Faculty	43	39.5	14.8	-.106	.915		Fail to Reject $H_0$2

Students and faculty reported the use of various forms of computer technologies as virtual learning environment (89.8%), social media (85.9%), electronic media (75.1%), computer-based training (71.8%), teleconferencing (70.6%), simulations (43.5%), and interactive video discs (31.1%). Furthermore, nearly two in three respondents reported using Twitter at some time for teaching (68.4%) or learning (63.3%). Table 1 displays the results of the Mann-Whitney U tests comparing acceptance of computers and Twitter for education among students and faculty. Based on the Mann-Whitney U test, the test failed to reject $H_0$1 and $H_0$2.

Analysis of Null Hypothesis 3

To determine if subject attitudes toward Computer Technology differed depending on the number of online classes subjects had taken, the researchers conducted a Jonckheere-Terpstra test. Results showed that the groups were significantly different, $T_{JT} = 6304$, $p = 0.028$ (see Table 2). Pairwise post hoc tests revealed that those subjects who had never taken an online class had significantly lower attitudes toward computer technology than those who had taken any online courses. Therefore, the test rejected H_o3.

Table 2

Jonckheere-Terpstra Test Results for Differences in Attitudes toward Computers for Learning and Engagement by Number of Online Classes Students and Faculty completed

	Attitudes Toward Using Computers for Learning and Engagement			
Online Courses Taken	*M*	*SD*	T_{JT}	*p*
None	59.950	7.138	6304.000	0.028*
1 to 5	61.150	7.043		
6 to 10	62.260	8.846		
10 or More	62.190	8.804		

*$p < .05$.

Analysis of Null Hypothesis 4

To determine if subject attitudes toward Twitter differed depending on the number of online classes subjects had taken, the researchers conducted a Jonckheere-Terpstra test. Results showed that the groups were not significantly different, $T_{JT} = 5453$, $p = 0.885$ (see Table 2). Therefore, the test failed to reject $H_0 4$.

Table 2

Jonckheere-Terpstra Test Results for Differences in Attitudes toward Twitter for Learning and Engagement by Number of Online Classes Students and Faculty completed

	Attitudes Toward Using Twitter for Learning and Engagement			
Online Courses Taken	*M*	*SD*	T_{JT}	*P*
None	39.170	13.098	5453.000	0.885
1 to 5	41.180	10.483		
6 to 10	36.110	11.722		
10 or More	40.130	12.995		

Discussion of Findings

Testing of the hypotheses revealed mixed results. For $H_0$1 and $H_0$2, there were no significant differences between students and faculty regarding their attitudes toward Computer Technology and Twitter use, respectively for educational purposes. For $H_0$3, subjects' attitudes toward Twitter differed depending on the number of online classes they had taken. Subjects who had never taken an online class had significantly lower attitudes toward computer technology than subjects who had taken any online classes. For $H_0$4, there were no significant differences between the number of online classes the participants took and their attitudes toward Twitter for educational use.

With reference to $H_0$1, despite their concerns about the use of computer technology and possibly with less experience using them, faculty did not differ significantly from students in their attitudes toward computer technology. The researchers conjectured that faculty personal and professional use as well as the increasing adaptation of computer technology in education influences the faculty attitude toward educational use of computer technology. Second, pertaining to $H_0$2, despite faculty concerns about the use of Twitter and possibly less experience using Twitter, again, no significant differences resulted between their attitudes and those of students regarding Twitter use for education. It is possible that, although faculty may not have been wholly comfortable using Twitter, they acknowledged its widespread use among students and may have been open to its use for education.

With reference to $H_0$3, subjects who had never taken an online class had significantly lower attitudes toward computer technology than subjects who had taken any online classes. The findings may indicate that the taking of online courses enables individuals to become more familiar with computer technology and feel more comfortable using them for other educational purposes. Finally, for $H_0$4, there were no significant differences between the number of online courses students or faculty members had taken and their attitudes toward Twitter use in educational settings to foster learning and engagement. This result may indicate that experiences with online courses did not seem to transfer to differences in attitudes toward the use of Twitter.

The results for Ho1 and $H_0$2, that there was no significant difference between the attitudes of students and faculty regarding Computer Technology or Twitter use for education, seem to coincide with those of previous studies. Seaman and Tinti-Kane (2013) found that only 4.1% of the faculty who used social media used Twitter. The Faculty Focus (2009, 2010) studies reported that faculty had a low rate for communication with students using Twitter (2%) or fellow educators (4%). When the faculty answered, "How likely were they to adopt social media in their courses in the next two years?" only 11.4% responded that they were very likely to adopt Twitter (Faculty Focus, 2009, 2010).

With regard to $H_0$3 and $H_0$4, difference in attitudes among subjects toward computer technology and Twitter based on number of online courses taken, the results for $H_0$3 were significant, and those for $H_0$4 were not. Other studies explored related areas, such as the relationship among attitudes and subjective norms (Park, 2000); usefulness of social media and culture as predictors of teachers' attitudes toward computer technology (Hart & Laher, 2015); and teachers' attitudes and levels of technology use in the classroom (Al-Zaidiyeen et al., 2010). However, no previous literature supports or refutes the present findings regarding the differences in attitudes for students and faculty for computer and Twitter use based on number of online

courses the students and faculty completed. The present study results may be the first to explore the differences with these variables.

Recommendations for Further Research

There is a need for additional measurement of student engagement in online courses (Azevedo, 2015; Bannon et al., 1985; Gardner et al., 1993) and for both quantitative and qualitative studies dealing with social media integration in education. There is evidence of Twitter use in higher education classrooms as an object for study, a tool to communicating classroom announcements, as a way to enable students to reflect on their learning, a chance to get instant feedback from students, and as a tool used to facilitate in-class conversations (Watson, 2011). There are many options for integrating Twitter into online learning.

Replicating the current study at other universities with larger samples of students and faculty is necessary. The replicated study also should report results separately for students and faculty, and conduct comparisons. Further, utilizing other social media for comparisons, such as Flipboard, is essential. Replication could include divisions of class ranks of students, with measurement for significant differences among the ranks, additional demographic questions, such as the number of years of teaching for faculty and experience in workshops on the use of social media in education providing further insight. The current study employed experimental and control groups, with the experimental group of participants with social media experience, and the control of participants without as well as the impact of social media use on students' grade point averages and overall learning. Finally, studying other populations, such as middle school and high school students and faculty, with the same or similar research questions.

Conclusion

The findings from this study confirmed the positive influence of previous online course experience on the attitudes of students and faculty toward the use of computer technology for educational purposes. The results also revealed that close to the majority of students and faculty wanted to learn more about Twitter and more than the majority were not afraid of Twitter for educational purposes. These findings indicate the overall acceptance of computer use and openness to use of Twitter by the students and faculty in this study.

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Discussion Questions

1. What are the practical implications of having previously taken online courses in terms of student and faculty attitudes about using computer technology for learning and engagement?
2. What are some of the practical benefits of using Twitter for student online learning and engagement?
3. What are some of the forms of computer technologies that students and faculty use in virtual learning environments?
4. Albirini (2006) reported reliability coefficients of .90 and the current study reported .884; how can future research pertaining to online learning utilize the Attitudes Toward Computer Technology for Educational Purposes Survey?

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