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Computer Literacy and Online Learning Attitude toward GSOE Students in Distance Education Programs

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Abstract

The purpose of this study was to explore graduate students' competencies in computer use and their attitudes toward online learning in asynchronous online courses of distance learning programs in a Graduate School of Education (GSOE) in Taiwan. The research examined the relationship between computer literacy and the online learning attitudes of these students. Data were collected via a survey through 252 GSOE students in Taiwan. Results revealed a significant positive relationship between computer literacy and online learning attitude among the students. Higher computer literacy was correlated with higher online learning attitude. However, no statistically significant difference was found in online learning attitude by gender or by age group. Suggestions and managerial implications were discussed in the study, and would provide contribution both to the body of knowledge in the filed of education management.

Keywords: computer literacy, attitude, online learning, GSOE

1. Introduction

1.1 Problem Statement

Information technology tools have been developed to make completing educational tasks more efficient. The invention of the computer has had a great influence on social progress and has become a necessity in today's society. Education is affected reciprocally with the change of the environment and evolves along with events occurring within human society. All of the changes and transformations experienced by today's society have led to the restructuring and modernization of education systems (Castro, Africa, Clara, Colmenar, Mora, & Yeves, 2001). Educators are continuously challenged to find better tutoring strategies to improve student learning performance. The application of information technology on campus can be used for calculation and data processing in teaching or research, system simulation, administration, and computer-assisted instruction. Rapidly growing Web-based learning technologies promise unlimited potential in lifelong education. The new information age has changed the educational system, resulting in the birth of information technology-applied instruction and computer-assisted learning. Teachers who do not have such competence may have difficulty in shifting into new teaching modes, adopting innovative teaching methods, and using multiple evaluations supported by new technologies. The improvement in the effectiveness of higher education has led to improvements in courses and research quality (Casini, Prattichizzo, & Vicino, 2003). Systems and learning theories have been developed for Web-based learning in higher education (Al-Adwan & Smedley, 2012; Fabos & Young, 1999), which have been empirically evaluated as effective. Internet-based distance education is an important learning tool for graduate students. Online learning can provide a convenient and accessible environment in today's educational system. For many graduate students, their work and multiple roles prevent them from attending regular courses on campus; asynchronous online courses allow them to meet the requirements of both work and school.

The current education system in Taiwan stresses technology education. In recent years it has also promoted students' computer literacy. However, there are still diverse opinions regarding online learning due to specific factors that may affect students' attitudes toward online learning. The negative factors that confront students could be eliminated via online learning programs. It has been demonstrated that using the computer or Internet to

learn is valuable (Hobbs, 2002). It is therefore important to explore the factors that directly or indirectly affect the relationship between personal computer literacy and online learning attitudes. Students who are accustomed to traditional classroom instruction methods demonstrated different attitudes when facing educational activities on a computer via a network (Allen, Bourhis, Burrell, & Mabry, 2002). The lack of computer literacy was also a reason that students rejected or gave up on online courses. Many studies have been conducted regarding attitudes toward online learning based on students' personal backgrounds (e.g., gender, major) or have focused on the relationship between learning efficiency and attitudes toward online learning (Chen, 2005; Richard, Overbaugh, & Shin, 2006). However, those studies lacked a discussion of the factors that affected the relationship between student's personal computer literacy and his/her online learning attitudes. In fact, the online learning attitude of students has been shown to be impacted by both the personal profile and the diversity of computer literacy (Sanders, Morrison Shetler, & Alison, 2001).

1.2 Purpose of Study

The advance in IT has improved the quality of research and benefits to graduate students in higher education. To accept the implementation of information technology into education and recent policies regarding technology in education, graduate students must have or acquire sufficient computer literacy and develop an ability to apply computers in education. Since Graduate School Of Education (GSOE) students will play an important role in the field of education in the future, it is critical to integrate IT in education, particularly in online learning. It is also important that graduate students be able to apply IT in education via efficient and effective educational resources. Therefore, the purpose of this study was to explore factors that affected graduate students' computer literacy and online learning attitudes. In addition, the study examined whether there was a relationship between graduate students' computer literacy and the online learning attitudes toward students who were engaged in higher education. It is important to determine whether knowledge and competence in technology played a role in improving the field of education. The results of this study will help to determine whether the current computer knowledge of students in GSOE colleges is adequate and identify their preferences for using the computer. The results will be used to inform education decision makers as they provide access to computer-based instruction.

2. Literature Review

2.1 Computer Literacy

Computer literacy is the basic condition for technology learning environment. With the rapid increase in technological development, the need for students and teachers with requisite skills grows. Teachers with rich technology experience and ability in areas such as instructional technology application have helped students in need of advancing computer literacy via technology and using technology as a teaching tool (Jou & Wu, 2012; Anderson & Petch Hogan, 2001). Due to nature differences and cultural influences, gender plays a major role in the field of mathematics and technology. There could be some discrepancy in computer knowledge between males and females. Her (1999) found that male teachers had better Internet knowledge, Internet information usage behavior, and Internet attitudes than did female teachers. Male graduate students showed more positive attitudes toward computers and higher computer literacy than did females. It was also found that different age group had different social cultural backgrounds; therefore, some discrepancy in computer literacy could exist. Jayasuriya and Chapman (1997) identified elderly users were inferior to younger users in document processing and file management. Younger instructors showed higher computer proficiency than older instructors. Lai (2002) found that teachers under the age of 30 had a more positive view than did those over the age of 30.

In addition, computer literacy correlates with computer ownership, time spent using computers, and number of computer-related courses taken. Shih (2000) indicated that more hours of computer use and time online resulted in stronger computer attitudes and achievement. Huang (2001) found that more online hours among senior high students resulted in higher Internet literacy. Computer experience with technology also facilitates acquisition of skills (Jayasuriya & Chapman, 1997). Shih (2000) found that junior high students with richer computer experiences displayed better computer learning attitudes and higher achievement. Similar results have been reported; for example, students with more off-campus computer sources, Internet experience, computer learning experience, and participation in computer clubs displayed higher computer literacy levels (Al-Adwan & Smedley, 2012; Tsai, 2002).

2.2 Factors Influencing Online Learning

Aversion to computers often results in an unwillingness to participate in online learning (Kenny, 2000; Billings, Ward, & Penton Cooper, 2001). Lack of computer skills, emotions, and attitudes inhibit willingness to use information technology. Researchers found that personal attitude toward distance learning influences online learning (Simonson, Smaldino, Albright, & Zyacek, 1999). Learners often develop a most effective learning style

when they face a new learning experience. Learning style also affects online learning (Federico, 2000; Terrell, 2002). Dillon and Gabbard (1998) reported that personal attributes such as ability, activity or passivity, independence or dependence, and deep or shallow processing influenced online learning. The interactivity of online learning circumstances has been in doubt due to its asynchronous features. Online learners may feel isolated, absent, and detached from Web interaction, and they may simply avoid it (Haythornthwaite, Kazmer, & Robins, 2000). In addition, students' self-learning progress will be ascertained by the instructor, and the assessment of the task schedule of each group should be presented publicly; this can address insufficient interactivity between peers (Jou & Wu, 2012; Lee & Chen, 2000).

Distance education diversifies information dissemination and learning process via advanced software and hardware. Learners can select their own learning pattern (Jou & Wu, 2012; Williams, Paprock, & Covington, 1999). Empirical studies have identified various perspectives regarding advantages of online learning. Online learning features quick information circulation, unrestricted time or space limits, respect for personal privacy, a fair learning opportunity, aptitude for instructional management, horizontal communication, and two-way communication (Lin & Cheng, 2001). Collins, Buhalis and Peters (2003) reported that online learning saves time by being available at different places and times; it can also be less expensive than hiring a professional. The cost of traditional training can be reduced by 50% to 70% by replacing it with online learning (Urdan & Weggen, 2000). Chiang's (2002) study concluded that the hypermedia system, by breaking the assertive and uniform instructional fashion, allows learners to take courses in accordance with personal requirements or interests. However, Chou, Sun and Ju (2000) found that online learning was impeded when students lacked self-discipline, when online materials were too complicated, or when students could not match the pace of the course curriculum. It is difficult to develop self-confidence and cultivate good relationships in the absence of face-to-face communication.

2.3 Attitudes toward Online Learning

The success or failure of learning depends on the learner's attitude. Positive attitudes increase learning aspiration, atmosphere management, and activity processes. Attitude influences individual specific likes or dislikes toward matters and events. Through the process of learning, emotions and behaviors and likes and dislikes are expressed; then attitudes are formed (Wu, 1998). Attitudes affect learning interest and produce either active participation or passive resistance. Online learning attitudes result from attitudes toward computer usage, and computer usage results from attitudes toward the computer. Huang (2000) suggested that computer attitude research should focus on the operation, perceptions, and perspectives of users. Cobb and Mueller (1998) indicated that some students reported that online learning allowed more time for learning activities and those interactions with peers and teachers diminished accordingly. Unfamiliarity with and anxiety toward computer technology also contributed to reluctance to take online courses. Most students in his study had a positive attitude to online learning and expressed more interest in online learning than in traditional classroom learning. Learning aspiration had been raised after the acceptance of online learning; while more peer interaction and more active learning attitude were found to be the result of online learning.

3. Methodology

A quantitative research survey was administered by using Likert-type response choices. The questionnaire consisted of 6 demographic questions, 10 questions using a Likert-type scale to obtain a score that reflected the student's computer literacy, and 10 questions using a Likert-type scale to obtain a score that reflected the student's online learning attitude. A composite score was derived from the responses to these items. Possible mean scores on computer literacy and attitude toward online learning ranged from 10 to 50. A higher score indicated better literacy in computer use and a lower score indicated poorer literacy, while a higher score indicated a more positive attitude toward online learning in asynchronous online courses and a lower score indicated a more negative attitude toward online learning in asynchronous online courses. Data were computed using *t*-test, one-way ANOVA, Pearson's correlation and discriminate analysis to evaluate the results of the survey responses. The population studied was full-time graduate students in master's degree programs in Taiwan's GSOEs. A total of 400 questionnaires were distributed and 326 questionnaires were returned. 252 questionnaires were considered effective for further analysis. The response rate was 63%.

4. Results

4.1 Subject Characteristics

The subjects of the study were purposively chosen form six universities, who enrolled in Graduate School of Education. A total of 252 respondents were finally effectively used for data analysis. For the subject characteristics, about 69.84% of the respondents were females (n=176), while 76 were males (n=30.16%). The

age distribution indicated that 65.48% were ages 21~30 (n=165), 20.63% were 31~40 (n=52), 11.11% were 41~50 (n=28), and 2.78% were51~60 (n=7). With regard to first time of computer lesson, 78 (31%) were in College, while 174 (69%) have had computer lesson in Elementary, Middle and High school. For hours of daily computer use, the average hour of the sample was 5.25 hour per day. The majority of respondents indicated 3~5 hours (n=116, 46%), following by 6~10 hours (n=78, 31%), less than 2 hours (n=42, 16.7%), and more than 11 hours (n=16, 6.3%). However, for hours of daily Internet use, the average was 4.10 hours, while 98 (38.9%) responded 3~5 hours and 95 (37.7%) were less than 2 hours. Finally, 60.7% (n=153) indicated they had online course experience before.

4.2 Descriptive Statistics

Results showed that most students considered themselves to have lower levels of competence in using Microsoft Excel but most considered them competent in management of e-mail. The lower scores related to the respondent's competency in Microsoft Word (M=4.55; SD=0.53), PowerPoint (M=4.42; SD=0.60), and Excel (M=3.91; SD=0.88); however, higher scores in basic computer operations (M=4.65; SD=0.51) and in managing e-mail (M=4.71; SD=0.45).

On the other hand, results indicated that most students felt isolated from instructors and classmates in online learning but they considered that online learning offered them more time at their convenience, to learn with confidence. The highest score related to attitude toward online learning was whether online learning offers flexible time to learn (M=3.93, SD=0.87), while the lower scores were whether online learning provides interaction with teachers or classmates via the Internet (M=3.38, SD=1.01) and whether online learning leads to feelings of isolation from instructors and classmates (M=2.78, SD=1.02).

4.3 Reliability and Validity

To examine the validity, the current study utilized Exploratory Factor Analysis (EFA) to examine the underlying dimensions of computer literacy and online learning attitude. The principal component analysis were used to extract the principal components, selecting components with an eigenvalue greater than 1, using the varimax rotation procedure, and all variables with an extraction of greater than 0.50, and without double loading cross factors. The KMO for the computer literacy construct was 0.876, and 0.816 for the online learning attitude construct. In addition, the approximate chi-square in the Bartlett's Test of Sphericity for computer literacy construct was chi-squre=1154.474, df=45, sig.=.000 and chi-squre=643.875, df=45, sig.=.000 for the online learning attitude construct. Both reached the level of significance, indicating they were adequate for the factor analysis. Two principal factors were extracted for computer literacy construct, which explained 60.84% of total variance, with 49.65% of variance for "tool assistance" and 11.19% of variance for "file management", respectively. And, three principal factors were extracted for online learning attitude, which explained 60.59% of total variance, with 36.72% of variance for "learning efficiency", 13.77% of variance for "class interaction", and 10.10% of variance for "work loading", respectively. Overall, the values of each factor were above the suggested value of 0.5, which met the least requirement and had convergent validity.

Cronbach's alphas were calculated to ensure internal consistency of the scales. In this study, Cronbach's alpha estimates for the two dimensions of computer literacy construct were "tool assistance" .783 and "file management" .820. For online learning attitude construct, three dimensions were included, "learning efficiency", "class interaction", and "work loading", with Cronbach's alphas of .705, .711 and .814, respectively. All scores were well above 0.70, which meet the minimum acceptable level (Nunnally & Bernstein, 1994).

4.4 T-test and ANOVA

A *t*-test was used to examine differences of computer literacy and online learning attitude dimensions for both gender and online course experience groups. For gender groups, results indicated no statistically significant difference between male and female students enrolled in GSOEs. However, the mean of both groups was approximately 4.4, indicating a high level of computer literacy reported by both gender groups. For online course experience groups, there were statistically significant differences found between each of the dimensions, reporting t=4.519, 3.065, 3.479, 2.577, 2.064, p<.05, respectively. Therefore, the result indicated that students had a higher level of literacy in computer use when they had had previous experience in online learning. Students with previous online course experience had a more positive attitude toward online learning.

ANOVA was used to examine differences among age groups, daily hours of computer use, daily hours of Internet use, and first time of computer lesson for computer literacy and online learning attitude dimensions. For age groups, results showed there was a statistically significant difference for "learning efficiency" dimension toward online learning attitude among age groups (F=4.169, p<.05, Scheffe post hoc test, 31-40 years old>11-30 years

old). For daily hours of computer use, results showed there were statistically significant differences for both dimensions toward computer literacy among each of groups (F=4.482, p<.05, Scheffe post hoc test, 6-10 hours > less than 2 hours; F=3.459, p<.05, Scheffe post hoc test, 6-10 hours>less than 2 hours). For daily hours of Internet use, results showed there was a statistically significant difference for "tool assistance" dimension toward computer literacy among each of groups (F=4.261, p<.05, Scheffe post hoc test, 6-10 hours>less than 2 hours and 3-5 hours>less than 2 hours). For students' first time of computer lesson, results showed there was a statistically significant difference for "learning efficiency" dimension toward online learning attitude among each of groups (F=3.614, p<.05, Scheffe post hoc test, college>elementary school).

4.5 Correlations among the Variables

In order to ensure that the measures of the latent variable were different from other latent variables, the discriminant validity was tested. To assess discriminant validity, the correlation matrix was used. The correlations among the variables in the constructs are presented in Table 1. Tool assistance was positively correlated with file management (r=.608, p<.01), learning efficiency (r=.343, p<.01), class interaction (r=.233, p<.01), and work loading (r=.127, p<.05). File management was positively correlated with learning efficiency (r=.251, p<.01). Learning efficiency was positively correlated with class interaction (r=.567, p<.01) and work loading (r=.238, p<.01). Class interaction was also positively correlated with work loading (r=.367, p<.01). However, no significant correlations were found between file management and class interaction, and between file management and work loading.

Table 1. Correlations among the variables

		(1)	(2)	(3)	(4)	(5)
(1)	Tool Assistance	1				
(2)	File Management	.608(**)	1			
(3)	Learning Efficiency	.343(**)	.251(**)	1		
(4)	Class Interaction	.233(**)	.099	.567(**)	1	
(5)	Work Loading	.127(*)	.052	.238(**)	.367(**)	1

4.6 Discriminate Analysis

In exploratory factor analysis, two principal components were extracted for computer literacy, named as tool assistance and file management. Further, this study examined discriminate analysis to further figure out the potential factor that has impact on subject's online learning experiences. The results show that Box's M=8.106, P=.054>.05, indicating the null hypothesis was accepted and the data meet the requirement for discriminate analysis. The outcomes in Table 3 presented Wilk's L.=.917, X^2=21.461, P=.000<.05, which mean the discriminant function had well effects for predicting. Second, the highest standardized canonical discriminate coefficient was tool assistance=.934, and the function of centroids indicated Yes=.240 and No=.371, respectively. As a result, it was suggested that subjects had online learning experiences were more likely to have higher level of computer literacy, such as competency of tool assistance using Microsoft Word, PowerPoint, Excel, multimedia hardware equipment, and Internet web browser.

Table 2. Mean and SD of variables of computer literacy towards online learning experience

Factor	Yes		No	
	M	SD	M	SD
Tool Assistance	4.40	.45	4.09	.56
File Management	4.66	.41	4.49	.44

Note. * p<.050.

Table 3. Outcomes between variables of computer literacy towards online learning experience

Factor	Wilk's L.	X^2	*P*	Discriminate Coefficients	Structure Coefficients
Tool Assistance	.917	21.461	.000	.934	.996
File Management				.106	.655

In addition, three principal components were extracted for online learning attitude, named as learning efficiency, class interaction, and work loading. Then, the study use discriminate analysis to further figure out the potential factor that has impact on subject's online learning experiences. The results show that Box's M=6.068, *P*=.425 >.05, indicating the null hypothesis was accepted and the data meet the requirement for discriminate analysis. The outcomes in Table 5 presented Wilk's L.=.950, X^2=12.768, *P*=.005<.05, which mean the discriminant function had well effects for predicting. Second, the highest standardized canonical discriminate coefficient was learning efficiency=.764, and the function of centroids indicated Yes=.184 and No=.284, respectively. As a result, it was suggested that subjects had online learning experiences were more likely to have more positive online learning attitude, such as learning efficiency of providing systematic course as traditional classroom learning, offering more learning information than traditional classroom learning, and being more cost beneficial than traditional classroom learning.

Table 4. Mean and SD of variables of online learning attitude towards online learning experience

Factor	Yes		No	
	M	SD	M	SD
Learning Efficiency	3.83	.66	3.56	.56
Class Interaction	3.41	.69	3.20	.64
Work Loading	3.64	.86	3.43	.75

Note. * p<.050.

Table 5. Outcomes between variables of online learning attitude towards online learning experience

Factor	Wilk's L.	X^2	*P*	Discriminate Coefficients	Structure Coefficients
Learning Efficiency	.950	12.768	.005	.764	.924
Class Interaction				.160	.699
Work Loading				.329	.552

Finally, one of purposes of current study was to examine the relationship between subject's level of computer literacy and online learning attitude. Using mean scores of total items of computer literacy, the study divided subject's level of computer literacy into high and low score groups. Moreover, a discriminate analysis was examined to figure out the potential factor that has impact on subject's level of computer literacy. The results show that Box's M=11.788, *P*=.071>.05, indicating the null hypothesis was accepted and the data meet the requirement for discriminate analysis. As outcomes in Table 7, it was presented Wilk's L.=.943, X^2=14.513, *P* =.002<.05, which mean the discriminant function had well effects for predicting. Second, the highest standardized canonical discriminate coefficient was learning efficiency=.766 and the lowest was work loading=.110, and the function of centroids indicated High=.277 and Low=.262, respectively. As a result, it was suggested that subjects who have higher level of computer literacy were more likely to have more positive online learning attitude, such as work loading of without giving an extra burden on top of regular work schedule and without interfere family life. However, subjects who were in low score group of computer literacy were more likely to have more positive online learning attitude, such as learning efficiency of providing systematic course as traditional classroom learning, offering more learning information than traditional classroom learning, and being more cost beneficial than traditional classroom learning.

Table 6. Mean and SD of variables of online learning attitude towards level of computer literacy

Factor	High		Low	
	M	SD	M	SD
Learning Efficiency	3.59	.57	3.87	.68
Class Interaction	3.21	.31	3.46	.72
Work Loading	3.52	.74	3.60	.91

Note. * p<.050.

Table 7. Outcomes between variables of online learning attitude towards level of computer literacy

Factor	Wilk's L.	X^2	*P*	Discriminate Coefficients	Structure Coefficients
Learning Efficiency				.766	.951
Class Interaction	.943	14.513	.002	.385	.735
Work Loading				-.110	.209

5. Discussion and Conclusion

The results indicated that these GSOE students in Taiwan obtained high scores in computer literacy (mean 4.43 of 5.00). Not surprisingly, students who spent more time on the computer and more hours on the Internet reported better computer skills. This association may relate to familiarity with computers and the applicability of computer facilities. According to itemized analysis of the survey items, the score for basic computer skills for dealing with e-mail was the highest, which most likely resulted from the popularity of computers and the Internet and the fact that e-mail has become a fast and convenient method to communicate. In addition, those who had attended online courses reported higher computer literacy than those who had not done so. Those students with greater computer literacy may be more willing to participate in online courses.

Accordingly, most respondents (204 of 252) reported that online learning offers an environment that enhances confidence and provides a more flexible approach to learning when compared to traditional classroom learning. However, these GSOE students in Taiwan had only a weak positive online learning attitude, which suggests that learners may have held some resistance to the concept of online learning. This finding may reflect the current educational policies in Taiwan and the relatively infrequent offering of online learning in comparison to traditional courses. A majority of the respondents (134 of 252) stated that online learning gave them a sense of being isolated. Students who have participated in online learning may be drawing on past experience, and those without such experience may hold these views as stereotypical of online learning. Students who are more familiar with traditional learning may prefer that format because it allows them to interact directly with teachers.

The findings suggest that computer skill and knowledge form an important foundation for online learning courses. There was no statistically significant difference between online learning attitude of male and female students enrolled in GSOEs in Taiwan. The finding suggests that gender factors have no impact on attitude toward online learning. The results of this study agree with similar studies finding no significant difference in attitude toward computer Internet between males and females (Huang, 2000; Huang, 2002). The result suggests that student age is not a factor in attitude toward online learning. The finding is different from that of similar studies, in which age was related to attitude towards computer technology (Comber, Colley, Hargreaves, & Dorn, 1997). Perhaps, since online learning is a recent development in Taiwan, it would be interesting to see whether the age difference has no impact when online learning is no longer new.

Quality online learning depends on the interaction and participation of the learners, as is the case with traditional classroom instruction. There is also evidence that online learning is socially isolating. Therefore, it may be the case that successful online learners must be self-driven and that those who are not self-motivated may be unsuccessful in an online learning environment. According to the findings, the hours of using a computer related positively to online learning attitudes, whereas the hours of access the Internet related negatively to online learning attitudes. This suggests that the purpose of Internet usage is distinct from the purposes and skills involved in online learning. Thus, students who spend more time on the Internet may not be engaged in anything analogous to learning; instead, they may be spending their time purely for entertainment purposes, leading to

negative attitudes towards using computer technology for online learning.

6. Managerial Implication

The results provide a rationale for school administrators or program designers to make curricular plans for a variety of learning environments. With the influences of globalization and progressive technology, powerful and diverse information continues to influence daily life. It is therefore critical to promote lifelong learning for the renewal and advancement of personal knowledge for the benefit of the individual and society as a whole. The development of online courses must incorporate learners' computer literacy and online learning attitudes. At the same time, training in online education should be offered both to attract more students and to increase the efficiency and effectiveness of online courses. Also, the quality of online course content and instructors should be improved. If students are satisfied with online courses, they may be more motivated to learn. A student who is satisfied and who has a good attitude toward online learning may be more likely to continue learning online. In addition, constructing a flexible learning environment can address student concerns regarding online instruction, such as the reluctance to work in isolation from the instructor.

7. Suggestion and Future Direction

Future studies could replicate this study using a different population. Online learning may apply to teachers at all levels, students of non-computer-related departments, and staff in administrative roles at schools. Rather than investigating GSOE students alone, persons in other roles should have the opportunity to have contact with issues related to online learning. Furthermore, research methods such as qualitative or action research can be employed for a more holistic understanding regarding the issue of online learning. Issues related to online learning will lessen over time as stakeholders develop a more positive attitude toward the use of technology in education. It seems clear that online learning is destined to become an optimal method of education in the modern global society.

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