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The Effectiveness of Survey Instruments on Students' Frustration in Regards to Online Courses

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Abstract

A pilot test was conducted on a new constructed survey instrument designed to measure student frustration levels in four specific areas that were related to participation in a computer-based distance education course. The four areas investigated were the amount of frustration attributed to the characteristics and instructions of the class, the skill and competence of the instructor, the course format as related to computer technology, and the general experience of participating in an online course. The survey was distributed to students enrolled in computer-based (online) distance education courses. The survey instrument was evaluated for reliability and construct validity. The results for reliability were encouraging (α = .9226). Yet, the factor analysis results of a rotated three-factor solution to assess construct validity were inconclusive. This may have been the result of the small sample size (n = 55). The lack of research and evaluative instruments in this area emphasizes the need for an in-depth analysis of this topic and the subsequent modification of the survey instrument.

Keywords: distance education, frustration level, higher education system

Many educators believe that distance education will inevitably become a major component of higher education systems. There remains some resistance to this assumption, however, especially from educators who question its effectiveness. Such resistance is understandable, based in part, upon misunderstandings of current distance education technological capabilities and methodology (Doucette, 1993). Despite the misgivings about distance education, its emergence continues due to the prevailing current economic and social pressures on the higher educational system. Doucette (1993) also argues that the increasing demands of students to attain higher education and technical training are straining higher education's ability to offer an adequate number of classes. In addition, the technical demands of the workplace, and the increase of competition among global economies are forcing adults to seek educational opportunities that enable them to rapidly attain technical literacy. Accordingly, Doucette indicates that the need for more technical education places a renewed importance on adult education and training facilities that can deliver technical courses in a timely matter, yet at the convenience of the working adult.

The significance of distance education research is that if distance education can be proven to be a viable alternative to traditional education, it can provide a more accessible way to meet the growing needs of adult learners. This is particularly true for students who do not have convenient access to educational institutions. Much of the research on computer-based courses (both from comparison studies and case studies) indicates that students do as well or better and are satisfied with their learning experiences. Ample interaction (with material, students, and faculty) enabled by the internet may be the key to this improved performance (Becker & Huselid, 1998). But student learning may also depend on a number of individual qualities, including a positive attitude and motivation, independence, and sufficient computer skills, as well as a predominantly visual learning style and an understanding that learning is not a passive process of absorbing information. These individual differences will make it difficult to believe that computer-based distance education is for everyone (Meyer, 2002). One individual quality that is of vital importance to a student's success in a distance learning environment is that of frustration (Capdeferro & Romero, 2012). Questions about students' frustration need to be explored. How much frustration will a student in a computer-based distance education course tolerate before dropping that course? What are some of the sources/causes of student frustration that are unique to computer-based distance education? How do the differences in the instructional mode of course delivery between computer-based courses and traditional courses affect student satisfaction and success?

Internet-based distance education is quickly becoming the predominant delivery system in distance education. According to Parker, Lenhart, and Moore (2011, p. 1), approximately one-in-four college graduates (23%) account that they have taken a class online. Nevertheless, based on their findings, the portion increases to 46% among those who have graduated in the past ten years. In this study, 39% of among those who taken a class online in the past ten years state that traditional way of learning is equivalent to that of a course taken in a classroom (Parker et al., 2011, p. 1).

This growth is due to technological and pedagogical factors. The technical factors include the accelerating power of personal computers, increasing telecommunications bandwidth capabilities, and state-of-the-art software development and delivery (Phipps & Merisotis, 1999). However, many advocates of computer-based distance education often cite its pedagogical advantages as the primary reasons for its rapid growth. They argue that the interactive components of the internet can help engage learners in the active application of principles, values, and knowledge. These components also provide feedback that allows understanding to grow and evolve. The communication technologies used can greatly increase access to family members, help them share useful resources, and provide for joint problem solving and shared meaning. Grimes (2002) contended that interactive learning communities provide a rich environment in which to share ideas and engage in learning.

Despite the social and psychological benefits conveyed in the previous literature about interactive learning methodologies (Grimes, 2002), students involved in online learning proceedings can encounter a high level of frustration. In terms of computersupported learning projects, a high level of frustration can be the source of negative outcome (Artino, 2008; Goold, Craig, & Coldwell, 2008; Romero, 2010).

The informational demands of the 21st century insure that using computer-based distance education as an instructional mode of delivery will be a cornerstone in higher educational practices (Clayton, Blumberg, & Auld, 2010; Palmer & Holt, 2010). A much broader and deeper research base is needed in this area. This is necessary in order to assess how effective this mode of instructional delivery is and how to improve it as higher education tries to meet the growing demand for its services.

Rationale

Online delivery of college courses appears to be imminent in the 21st century. Findings show that there is significant growth in taken a class online and in 2021 most of students will be enrolling classes online (Parker et al., 2011). Even though the cost-benefit of computer-based instruction is a subject of much debate (Savage & Vogel, 1996), the number of distance education courses is growing (Parker et al., 2011; Rahm & Reed, 1998). It is estimated that 50 million American workers need retraining. In higher education, distance learning is providing undergraduate and advanced degrees to students in offices, at community colleges, and at various receiving sites.

Johnstone and Krauth (1996) point out that there is not considerable difference between the success and fulfillment of students in distance education courses and in traditional classrooms. Computer networks are a solid way to link the world, and in a sense this notion is pertinent to distance education (Harasim, 1993). However, past studies have not illustrated the details of students' perspectives on distance education (Keller & Karau, 2013). Moreover, some research on the impact of distance education has concentrated on pupil results (Ahern & Repman, 1994), rather than on the touching characteristics of distance education (Keller & Karau, 2013).

A methodical examination of the ERIC database found some inquiry concerning complications of distance learning, such as students' seclusion, segregation, and lack of tangible guidance (Abrahamson, 1998; Rahm & Reed, 1998). However, there is little research about students' frustration in distance education. A few scholars ascertain this matter (Arbaugh et al., 2009; Falloon, 2011), nevertheless; this theme has not been underlined in the literatures with regards to computer-mediated distance education.

Regardless of the reasons, further study of students' frustrations with computer-mediated distance education courses is warranted. Higher education is experiencing a revolution in educational presentation (Saleem, Beaudry, & Croteau, 2011). The revolution involves the use of computers and the Internet to deliver course content. With every revolution, there are casualties. Casualties online come in the form of student frustration (Burford & Gross, 2000).

Literature Review

A published instrument that both confirms the sources of students' frustration with computer-based distanced education courses and measures their frustration levels is needed to better design course content and improve delivery of such courses (Arbaugh et al., 2009; Falloon, 2011; Phelan, 2012). To this point, no instrument that specifically targets the sources/causes of students' frustration with distance education could be found in the research literature. In order to design such an instrument, it was deemed prudent to review the research literature to identify some common sources and/or causes of students' frustration with computer-based education.

The literature suggests that one source of student frustration relating to the professor or instructor of a computer-based course deals with ambiguous instructions (Hara & Kling, 2002). Most students believe that the two most important tasks of a professor are to spell out from the beginning what the expectations of the course are and to be a "facilitator" of the students' learning (Burford & Gross, 2000). One of the aspects of being a good "facilitator" is prompt feedback and the ready availability of help from the professor or instructor.

Several studies have been conducted that report students' frustrations with technology, but this topic has not been thoroughly investigated (Gregor & Cuskelly, 1994; Sierpinska, Bobos, & Knipping, 2008). Students without direct access to technological support may experience extreme levels of frustration, especially if the computer system they use is archaic in relation to memory, processing speed, and downloading speed (internet). Unfamiliarity with software and email capabilities (i.e. sending attachments) can also cause a great deal of frustration for students.

Sustained frustrations impede students' learning. Study found that high levels of anxiety decline the storage and processing capability of working memory and inhibit the structure of implications among college students (Darke, 1988a; Darke, 1988b). Furthermore, students who have high levels of frustration are more likely to be demotivated (Palmer & Holt, 2010). In this regard, motivation is a robust dynamic that impacts student learning in this new learning paradigm (Dirkx & Smith, 2004). According to Abrahamson (1998) there are requirements with regard to distance education students to be exclusively self-regulated. In this regard, students are being away from traditional classrooms. However, in this kind of learning environment for students' frustration can be a foremost impediment to effective education.

One of the greatest challenges that students of "virtual learning environments" face is that of isolation. The key to overcoming this dilemma is to move students from positions of being isolated learners to that of being members of a learning community. Members of a learning community participate in activities together. In computer-based distance education this might include using email, online chat rooms, or discussion threads to share and exchange viewpoints or information relating to class assignments. Strong communal ties can increase flow of information among all members, availability of support, commitment to class/group goals, cooperation among members and satisfaction with group efforts (Dede, 1996; Wellman, 1999). The issue of prompt feedback from a professor or instructor also becomes a source of frustration for students who are isolated in a computer-mediated distance learning environment and are used to a traditional classroom setting.

The type of course delivered to students via Web-based instruction may also play a part in the level of frustration experienced. A class designed around discussions and responses (i.e. asynchronous interactions) requires a different level of computer skills (use of a web board-threaded discussion) than a lecture class where all the notes and assignments are posted for downloading from a web address. These lecture classes may also be supplemented by the use of a CD-ROM supplied by the professor/instructor that includes video demonstrations of concepts. Discussion and response classes that require synchronous interactions may actually reduce students' frustration. Live sessions provide both intellectual and emotional content, but more importantly provide simultaneous, student-to-student contact that helps stave off feelings of isolation (Haythornthwaite, 2000).

Measuring the levels of students' frustration relating to ambiguous instructions, technology, isolation, and type of computer-based course delivered will not only enhance the design and instructional delivery of such courses, but also help us to understand how to better engage students and enhance their potential for success. It is conceivable that the instrument constructed and tested in this study could be used as a model to measure students' frustrations in online distance education courses at any college or university that offers such courses.

Method

The qualitative research study conducted by Hara and Kling (2002, p.1) identified three interrelated sources of students' frustrations with Web-based distance education courses: Lack of quick advice, unclear guidelines, and technical issues. Using these results as a theoretical basis in this study, factor analysis is used as a statistical approach to assess students' frustrations with computer-mediated distance education courses in four areas: The skill and competence of the professor in handling the unique demands of a "virtual learning environment," the skill and competence of the student to master and overcome the problems associated with inadequate computer/technical/software skills, the isolation associated with Web-based distance education courses, and the content of a course selected to be taught as a computer-mediated distance education course.

In this study, Cronbach's coefficient alpha is also employed to analyze the reliability of the instrument. Cronbach's alpha values of .70 or higher are specifically considered as accepted values (Ziyanak, 2015).

The survey was designed to measure the amount of frustration a student would tolerate in each of the four previously identified areas—to the point that the student would consider dropping the course. Participants were informed via email about the study. Respondents' email list was provided by administrators. Participants were aware that if they were not willing to continue, they could withdraw from the survey at any time. We kept their information in a safe and locked place. Participants were also aware of voluntarily participation. Participant's confidentiality and anonymity were maintained. In order to increase the survey response rate, students received a total of three reminder emails to take the survey. The survey link was only emailed to students from six online classes. Students were invited to participate in the survey at their earliest convenience.

Instrument

The survey instrument contained 36 questions. The first three questions were used to obtain demographic information about each respondent. The demographic areas investigated were:

1) gender,
2) academic classification, and
3) college attended.

The last 33 questions of the survey were designed to measure the level of student frustration in each of the four targeted areas of computer-based distance education courses: the characteristics and instructions of the class, the skill and competence of instructor, course format related with computer/technology, and the general experience in online course.

Sample

A total of 69 students responded to the survey questions out of a possible 126 students. However, only 55 of these responses were used for analysis. From the first part of the instrument which included three demographic questions, it was observed that 40% of the participants were male, 27% were pursuing a PhD, 44% were completing a MA degree, and

29% were undergraduates and others. The results of the SPSS analyses for construct validity and reliability were evaluated strictly in accordance with psychometric standards.

Findings

All data were coded and SPSS program was employed for statistical analysis. Even though the survey was administered to 69 students, item non-response reduced the useable number of responses to *n* = 55. An assessment of the reliability of the instrument yielded a coefficient alpha of .9226 for the 24 questions targeted at assessing student frustrations with the three designated areas of taking an online course. A review of the literature in this area did not find a comparable instrument for the same research purpose. Therefore, it was not possible to compare the reliability of the instrument used in this study with other previously used instruments. Table 2 contains the current reliability analysis generated by SPSS.

Confirmatory factor analysis was conducted to assess the construct validity of items being measured by the survey. Using principal component analysis as the extraction method, initial eigenvalues were computed on all 24 questions to determine the appropriate number of factors to perform rotation on in order to best meet the simple structure criteria as outlined by Thurstone (1942). Both the initial eigenvalues (λ > 1.00) and a scree plot analysis revealed a possible seven factor rotation. The initial extraction of factors indicated that a four-factor solution would account for 56.244 % of the total variance, while a seven factor solution would account for 77.492% of the total variance. Because factor analysis is sample size sensitive (Crocker & Algina, 1986) and only 55 sets of responses were used, the a priori decision to measure three areas of student frustration with online courses resulted in attempting a three factor rotated solution using the Varimax with Kaiser Normalization rotation.

Using simple structure criteria, questions SC1,SC3,SC6,SC7,SC8,CF1,CF7,CI6, and CI8 appeared to load on factor 1—the skill and competence of instructor. Questions CI2, CI4, CI5, CI7, CI8, CI9, SC2, and SC4 appeared to load on factor 2—frustration related to the computer/technological skill and competence of the student. Questions CI1, CF4, and CF5 appeared to load on factor 3—frustration due to course format related with computer/technology. Fourteen of the questions loaded on more than one factors, which implied that factors are not octagonal (factors rotated with varimax), because more than half of the questions loaded on more than one factors which shows that there are some correlations and communalities with other factors. This also shows that instead of varimax rotation, oblim or oblique rotations would result in better loading than varimax for these data. Table 1, figure 1, and tables 3-6 contain the commonalities for each question before factor rotation, the initial eigenvalues, the extraction sums of squared loadings for a three-factor solution, the scree plot, the rotated component matrix for a three-factor solution, and the component transformation matrix.

Table 1

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums Squared Loadings			Rotation Sums Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.146	38.108	38.108	9.146	38.108	38.108	5.450	22.710	22.710
2	2.371	9.880	47.988	2.371	9.880	47.988	5.351	22.296	45.006
3	1.982	8.256	56.244	1.982	8.256	56.244	2.697	11.239	56.244
4	1.625	6.769	63.014						
5	1.223	5.095	68.109						
6	1.190	4.957	73.066						
7	1.062	4.426	77.492						
8	.985	4.103	81.595						
9	.774	3.226	84.821						
10	.664	2.766	87.587						
11	.532	2.216	89.804						
12	.468	1.952	91.756						
13	.416	1.735	93.491						
14	.297	1.238	94.729						
15	.269	1.121	95.850						
16	.247	1.029	96.880						
17	.200	.831	97.711						
18	.187	.777	98.488						
19	.101	.421	98.909						
20	8.142E-02	.339	99.248						
21	7.490E-02	.312	99.560						
22	5.711E-02	.238	99.798						
23	3.124E-02	.130	99.928						
24	1.718E-02	7.158E-02	100.000						

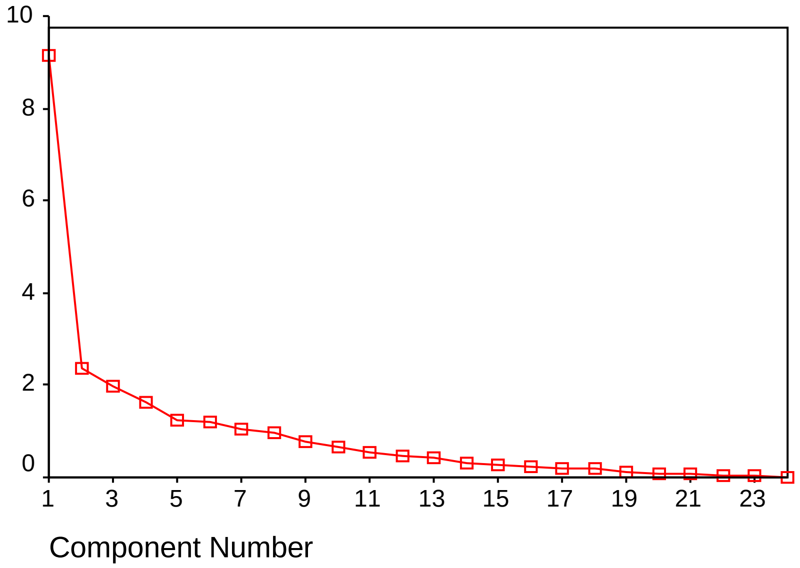

Figure 1. Scree Plot.

Table 2

Reliability Analyses – Scale (Alpha)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Delated
CF1	42.3514	126.5120	.7020	.9167
CF2	41.3514	125.7342	.6220	.9182
CF3	41.2703	133.7583	.3258	.9235
CF4	42.6216	135.4084	.3629	.9222
CF5	42.7027	136.7147	.3551	.9224
CF6	42.2703	129.0916	.5766	.9191
CF7	42.1081	130.7102	.4856	.9207
CI1	42.3784	135.8529	.2195	.9252
CI2	42.2703	135.3138	.2723	.9240
CI3	42.2973	129.3814	.6106	.9185
CI4	42.2162	130.7853	.4543	.9213
CI5	42.3514	130.6787	.5251	.9200
SC1	42.2973	126.7703	.7662	.9159
SC2	41.9459	125.8303	.6906	.9168
SC3	42.2162	129.4520	.5025	.9205
CI6	42.5135	135.2568	.4466	.9214
CI7	42.4595	129.8664	.6625	.9180
CI8	42.1351	125.6201	.6713	.9172
SC4	42.3784	130.9084	.6470	.9185
SC5	41.7297	124.6471	.6641	.9173
CI9	42.0270	128.4715	.6443	.9179
SC6	41.7027	121.9925	.7217	.9161
SC7	42.2162	127.5075	.7123	.9168
SC8	42.1892	127.1577	.6499	.9177
Reliability Coefficients 24 items				
Alpha = .9226 Standardized item alpha = .9224				

Table 3

Course Format Related with Computer/ Technology (CF) (7 items)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Delated
CF1	11.6757	7.1141	.6294	.4355	.5767
CF2	10.6757	7.0586	.4966	.4337	.6190
CF3	10.5946	8.8589	.2332	.3728	.6952
CF4	11.9459	8.9970	.3860	.8232	.6563
CF5	12.0270	9.3604	.4056	.8277	.6597
CF6	11.5946	7.9700	.4337	.2736	.6389
CF7	11.4324	8.6967	.2652	.2635	.6868
Reliability Coefficients 7 items					
Alpha = .6848 Standardized item alpha = .7016					
CF3: 21.Sufficient telephone communication with classmates is available.					
CF7: 8.I can easily find required course materials.					

Table 4

The Skill and Competence of Instructor (SC) (8 items)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Delated
SC1	13.6216	22.3529	.8155	.7618	.8682
SC2	13.2703	22.7027	.6235	.7288	.8845
SC3	13.5405	23.1441	.5625	.5688	.8904
SC4	13.7027	24.3258	.6683	.7429	.8831
SC5	13.0541	21.3303	.7000	.6558	.8776
SC6	13.0270	20.4159	.7346	.7068	.8748
SC7	13.5405	23.1441	.6851	.5954	.8792
SC8	13.5135	22.5901	.6705	.7110	.8799
Reliability Coefficients 8 items					
Alpha = .8933 Standardized item alpha = .8987					

Table 5

The Characteristics and Instructions of the Class (CI) (9 items)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Delated
CI1	13.7297	15.8138	.2801	.3402	.7906
CI2	13.6216	15.2417	.4183	.3880	.7703
CI3	13.6486	14.0676	.6304	.5060	.7402
CI4	13.5676	14.5300	.4485	.2902	.7673
CI5	13.7027	14.4369	.5477	.3526	.7520
CI6	13.8649	16.6201	.3554	.2628	.7782
CI7	13.8108	15.0465	.5263	.4948	.7568
CI8	13.4865	13.9234	.4983	.3588	.7602
CI9	13.3784	14.2973	.5645	.4469	.7494
Reliability Coefficients 9 items					
Alpha = .7840 Standardized item alpha = .7873					
CI1: 1. Registering for the course was easy and straightforward					

Table 6

Rotated Component Matrix

		Component	
	1	2	3
SC3	0.799		
SC7	0.786		
SC8	0.725		
SC6	0.697	0.357	
CF1	0.648		0.407
SC1	0.624	0.539	
CF7	0.542		
CI8	0.524	0.486	
CI6	0.455		
SC2		0.816	
SC4		0.722	
CI7	0.466	0.64	
SC5	0.447	0.638	
CI9	0.351	0.632	
CF2	0.451	0.601	
CF3		0.573	
CF6	0.361	0.552	
CI2	-0.301	0.536	0.476
CI3	0.359	0.529	
CI4		0.395	
CF4	0.424		0.74
CF5	0.417		0.732
CI1			0.692
CI5		0.451	0.664
Extraction Method:			
Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
Rotation converged in 22 iterations.			

Limitations

Even though the results of this pilot study were evaluated on their own merits, it is a given that there are limitations involved in any study of this type. One definite limitation to this study involved the fact that currently only ten classes are offered that are totally online. This meant that in order to obtain a substantial response rate, some hybrid (some combination of traditional and online) classes would have to be included in the pilot-testing phase. As expected, survey results are skewed due to small sample size.

Another possible limitation of this pilot study is the fact that the respondents were not involved in class-based instruction; each course students attended had some differences in terms of communications with instructor, and course format. The fact that the students could have direct contact with the professor, could interact among themselves, and were not forced to conduct all class activities online may have had a significant effect on the responses collected. That would affect all four areas of student frustration that the survey was designed to measure: The skill and competence of the professor, the technological skill and competence of the student, the online learning environment, and the characteristics of the class. This may help explain why the rotated four-factor solution did not better approximate the simple structure when factor analysis was used to assess construct validity.

Discussion and Results

Several studies have been conducted that report students' frustrations with technology, but this topic has not been thoroughly investigated (Capdeferro & Romero, 2012; Keller & Karau, 2013). This pilot study sought to assess the reliability and validity of an instrument designed to measure the frustration levels of students in four areas related to computer-based distance education course participation. This is a new educational area and an even newer area for educational research.

The alpha coefficient of .9226 appears to be very satisfactory; given that it is relatively higher than that of Mwavita and Tippin's instruments reliability coefficient (.7966). However, the lack of an appropriate sample size is a significant limitation in the analysis of the results of this study. According to Crocker and Algina (1986), a survey with 24 questions should have had a minimum sample of 200 to 240 participants. The useable sample of $n = 55$ respondents makes the use of factor analysis to establish construct validity on the four areas of student frustration chosen in this study difficult at best. Post hoc analysis of the 24 questions indicated some definite duplication of the survey questions. But, it is possible that a larger sample, perhaps $n > 250$, would yield a rotated three-factor analysis solution that better models the simple structure criteria. The small sample size could also explain the evidence, from both the initial eigenvalues and the scree plot that suggests a rotated seven-factor solution be used. A larger sample may also increase the coefficient alpha value used to assess the reliability of the survey instrument.

Recommendations for Future Studies

The survey needs some changes. As previously mentioned, post hoc analysis of the instrument revealed some duplication among some of the questions. More research should be done and advice sought from professionals who are experienced in the computer-mediated distance education environment when modifying the survey.

The computer-based distance education environment may not be suitable for all students, but during the last decade the growing need for flexibility in education and the advances in technology make it apparent that online distance education will be more prevalent. Educators must help students become more adept at distance interaction because the skills of information gathering from remote sources and of collaboration with dispersed team members are as central to the future American workplace as learning to perform structured tasks quickly was to the industrial revolution.

If both levels and areas of students' frustration with computer-mediated distance education courses can be better measured and identified, then steps can be taken to better design and deliver such courses. This will not only benefit the students who are active participants, but society as well. A better-educated workforce is a worthy goal for the Unites States and beyond.

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