Journal of Information Systems Education

Volume 32
Issue 4
Fall 2021

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Recommended Citation: Peslak, A., Kovalchick, L., Wang, W., & Kovacs, P. (2021). Effectiveness of Educational Delivery Modes: A Study in Computer Information Systems. *Journal of Information Systems Education*, 32(4), 253-261.

Article Link: https://jise.org/Volume32/n4/JISE2021v32n4pp253-261.html

Initial Submission:	6 January 2021
Accepted:	4 March 2021
Published:	15 December 2021

ISSN: 2574-3872 (Online) 1055-3096 (Print)

Journal of Information Systems Education, 32(4), 253-261, Fall 2021

Effectiveness of Educational Delivery Modes: A Study in Computer Information Systems

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ABSTRACT

Starting with the advent of the Internet, the concept of online distance education became a more vibrant and viable alternative and has grown rapidly. With the arrival of the COVID-19 pandemic and low-cost Internet-based videoconferencing, more hybrid options have become the standard in the current pandemic global environment. This study explores the evolution of student perceived effectiveness of online, hybrid, and on-ground course delivery methods so that when the pandemic abates, we can make better decisions on the viability of online and blended learning options. Survey results of over 400 students studying Computer Information Systems at three universities in 2017-2020 show that students have consistently perceived courses offered on-ground with an online supplement as being the most effective and such perception does not vary significantly based on age or gender. Students have the lowest perception of effectiveness for completely online courses. Moreover, the Computer Information Systems subject matter being taught does not change students' perceived effectiveness of the instructional delivery methods.

Keywords: Online education, Face-to-face teaching, Blended learning, Web-based learning, CIS curriculum, Student expectations

1. INTRODUCTON

From Socrates and Aristotle to Dewey and Herbart, the traditional form of education for millennia was the concept of a live lecture or demonstration by a learned professor to a student audience. With the advent of the printing press, books were added as resources for students but the primary form of educational delivery remained, live lecture to students present in a classroom or auditorium setting. However, the emergence of forms of rapid mass communication is now providing an alternative for delivery of educational content. For instance, historically, the development of a relatively fast and reliable US mail system resulted in the development of correspondence education. The largest, most successful example of this, which is still operating today, is the International Correspondence Schools (ICS), now Penn Foster. Started in 1891, T.J. Foster developed a mining safety course that students could complete via the mail service, reading and returning assignments for grading and obtaining certificates. This grew exponentially and by 1899, the school had 190,000 students enrolled in over forty engineering trades. By 1925 ICS had 2.5 million students, a staggering number 100 years ago. However, the number of students did not necessarily translate to graduates; for example, long engineering has a completion rate of only about 5%. The

educational delivery method, thus, had limited success and eventually greatly reduced its educational footprint. The dropout rate, the rise of community colleges, and the GI Bill in 1944 (which was initially designed to allow veterans from World War II to receive stipends to cover tuition and related expenses for veterans and family members who attended a college or trade school), eventually relegated mail correspondence education to a very small slice of the educational delivery pie (Watkinson, 1996). In addition, the "50% rule" of Title IV of the Higher Education Act (i.e., an institution's eligibility in participating in student financial aid programs depended on it offering less than 50% correspondence courses or less than 50% of its students being enrolled in correspondence courses) also made correspondence courses less attractive.

The development of the Internet in 1969 preceded the concept of instantaneous online delivery of educational courses. No longer would students need to endure mail delays and lack of timely teacher-student interactions. In the mid-1970s the first college courses using the Internet via computer conferencing and email were offered. The first fully online course was offered in 1981 by Western Behavioral Sciences Institute. The first online undergraduate course was offered by New Jersey Institute of Technology. In 1985, Nova Southeastern University in Fort Lauderdale, Florida, offered the first college graduate courses. Online degrees started shortly thereafter in 1986. Since that time online course enrollment has exploded (Harasim, 2000).

The Babson Survey Research Group has been tracking online education for more than a decade with data collected from more than 2,800 colleges and universities (Allen & Seaman, 2015). This research group has found that institutions are incorporating online classes in their long-term strategies significantly more today than they did when the first survey began in 2002. The number of students enrolled in online courses has increased from about 1.6 million in 2002 to 5.8 million in 2014 (Allen & Seaman, 2015). For the institution, online education can be cost-effective and provide growth opportunities (Bristow et al., 2011). Administration in higher education view online courses as more cost-effective than face-to-face courses, because they are not required to provide physical space for the courses.

The National Center for Education Statistics estimates 6.7 million college students participated in online education in 2017 (U.S. Department of Education, 2018).

With the current Coronavirus pandemic most universities have converted to online or remote learning through live virtual classrooms. Though we have not been able to study this nascent educational delivery method, yet, we believe it is a variation of blended (hybrid) learning that we study.

This study examines evolving student perceptions of online, blended (hybrid), and generally resident instruction with online supplements in relation to Computer Information Systems (CIS) courses. The authors believe this research will provide educators, researchers, and administrators with valuable information when we emerge from the near total lockdown of in-person delivered classes.

Specifically, the study was conducted to answer the following research questions.

1) Has there been a significant change in the perceived overall effectiveness of courses, based on delivery methods, from 2017 to 2020?
2) Does the amount of course delivery provided online affect the perceived overall effectiveness rating of courses?
3) Is there a variation in the perceived overall effectiveness of course delivery methods based on age or gender?
4) Is there a variation in perceptions of the instructional method that provides the best learning, based on course content?

2. DEFINITIONS

For the purposes of this study, the definition of an online course is one delivered entirely through the Internet without any face-to-face contact among instructor(s) and students. In contrast, a face-to-face course (FTF) is delivered on-ground totally in a physical classroom without using any Internet technology for instructional purpose. A hybrid course (also called blended learning or partially online learning) is partially delivered online and partially delivered face-to face (FTF) in the physical classroom (i.e., between 30 percent and 80 percent of the course content is delivered online). A course that incorporates web-based supplements (e.g., assignments, electronic bulletin boards, threaded discussions and examinations) is not considered online or hybrid but regarded as a face-to-face, on-ground course with online components or supplements.

3. LITERATURE REVIEW

Dobbs et al. (2009) measured students' perceptions of online and on-ground course experiences and found that more students regarded on-ground courses to be easier than online courses. Student views about online education varied greatly between those who had completed an online course and those who had never taken such a course. The study found that the acceptance of online education increased as the number of online courses taken increased.

Ilgaz and Gülbahar (2015) developed an "e-Readiness" and "e-Satisfaction" research model to comprehensively measure a student's readiness *before* taking online courses, and the resulting satisfaction of students *after* taking online courses. The authors found that students begin online classes with specific expectations; therefore, meeting or not meeting these expectations directly impacts students' satisfaction levels. Students expect to have an effective learning experience that emulates the physical classroom by "…interacting with the instructors and other participants" (p. 183). The authors also found that students are most satisfied with online classes if their expectations regarding "instructional content, communication and usability, and teaching process" were met by their online learning experiences (p. 183).

Vidanagama (2016) used the *Technology Acceptance Model* (TAM) to determine if technology has an impact on several factors associated with online learning by surveying 209 undergraduate students enrolled in computer-related degrees. The finding revealed that students enrolled in computing degrees are more satisfied with online learning when the technological environment (Learning Management System (LMS), software used in courses, etc.) performs adequately and

is easy to use. It can be inferred from this study that students in computing fields are *more critical* about online learning than students in other degree fields.

Cole et al. (2014) conducted a three-year study to determine how satisfied students were with both online and partially online courses, as well as to determine the factors that contribute to student satisfaction and dissatisfaction with the online course delivery methods. Their results indicated that, overall, students were moderately satisfied with fully-online courses. The study also revealed that the participants were slightly more satisfied with hybrid/partially-online courses. Convenience was the factor that contributed most to *satisfaction* and lack of interaction (with both the instructor and other students) was cited as the main factor that contributed the most to *dissatisfaction* with online courses.

In 2009, the U.S. Department of Education commissioned a meta-analysis of research comparing online to traditional learning by examining twelve years of experimental and quasi-experimental studies (Means et al., 2010). The results found that despite what appears to be strong support for online learning, the studies in this meta-analysis do not demonstrate that online learning is superior as a delivery method. In many of the studies that involved a preference for online learning, the online and classroom conditions differed in terms of time spent, curriculum, and pedagogy. This meta-research also indicated that a blend of online and face-to-face instruction has been more effective, which provides a rationale for more effort to design and implement blended approaches.

4. METHODOLOGY

This study used a web-based survey created in *QuestionPro* that consisted of 34 closed-ended questions. In addition to the questions concerning student demographics, learning styles, and CIS-related course categories, subsequent questions asked students to identify motivations for either taking or not taking online courses. The survey was administered over a three-year period from the fall semester of 2017 through the spring semester of 2020.

Only students enrolled in CIS courses participated in the survey, regardless of their academic majors. While, five hundred and fifty three (N=553) students answered all questions, the actual number of responses to each question varied by question.

The three universities involved in this survey consisted of a private university, a state-owned public university, and a state-related university. The state-related university receives funding from the state but remains a separate and private entity, with assets under its own ownership and control, operating under its own charter, and governed by an independent board of trustees. The state-owned universality receives significant public funds from the state and is governed by a Board of Governors with a membership that includes four state legislators, the Governor, and the Secretary of Education. The private university does not receive any state funding. The students surveyed at the private university included those seeking a bachelor's, master's, or doctoral degree. The students surveyed at the state-owned and the state-related universities only included those seeking a bachelor's degree.

Respondents from different types of universities were surveyed because these universities provided a diverse, socio-economic mixture of participants and potentially different demographics. According to Norvilitis et al. (2006), many demographic differences exist between state and private university students, including debt to income ratio and a significant disparity in race. This research strategy of surveying students in different universities is consistent with the survey and data analysis strategy of categorizing research results based on different groups of universities used in the 2017 Noel-Levitz National Student Satisfaction and Priorities Report. Similarly, to the 2017 report, where 62% of surveyed online learners were undergraduate students and 34% were graduate students, in this research, more undergraduate students were surveyed than graduate students, by design.

5. RESULTS

The statistical analysis of the results begins with the general demographics of the survey participants. Undergraduate students made up the majority of the survey respondents at 88%. The ratio of male to female students was 76% male, 23% female, and 1% identified as other.

As noted, the survey responses were received from three U.S. universities. Twenty-two percent (22%) of the responses were from the state-owned university, 31% from the state-related university, and 47% from the private university. These universities provide a diverse, socio-economic mix of participants.

The survey respondent age group was skewed with the general population but reflective of the specific population for receiving college education. Fifty-one percent (51%) of the survey respondents were in the 18-21 age group, 32% were in the 22-30 age group, and 17% were in the over 30 age group. In addition, 90% of the students were enrolled full-time.

5.1 Has There Been a Significant Change in Perceived Overall Effectiveness of Courses, Based on Delivery Methods, From 2017 to 2020?

Survey respondents were asked to rate their perceived overall effectiveness of courses that are offered completely online, partially online and partially on-ground (i.e., hybrid), and on-ground with an online supplement, on a scale of 1 to 6, this scale was *reverse scored* with 1 being "Very Effective" and 6 being "Very Ineffective." Figure 1 and Table 1 show the average response rating provided for each delivery method during the years of 2017 through 2020. As shown in the figure and the table, regardless of year, the students perceived courses offered on-ground with an online supplement as the most effective, hybrid as the second most effective, and completely online as the least effective. All methods of delivery have shown improvement over the years, with the exception of the completely online and on-ground with an online supplement delivery methods during the year 2020.

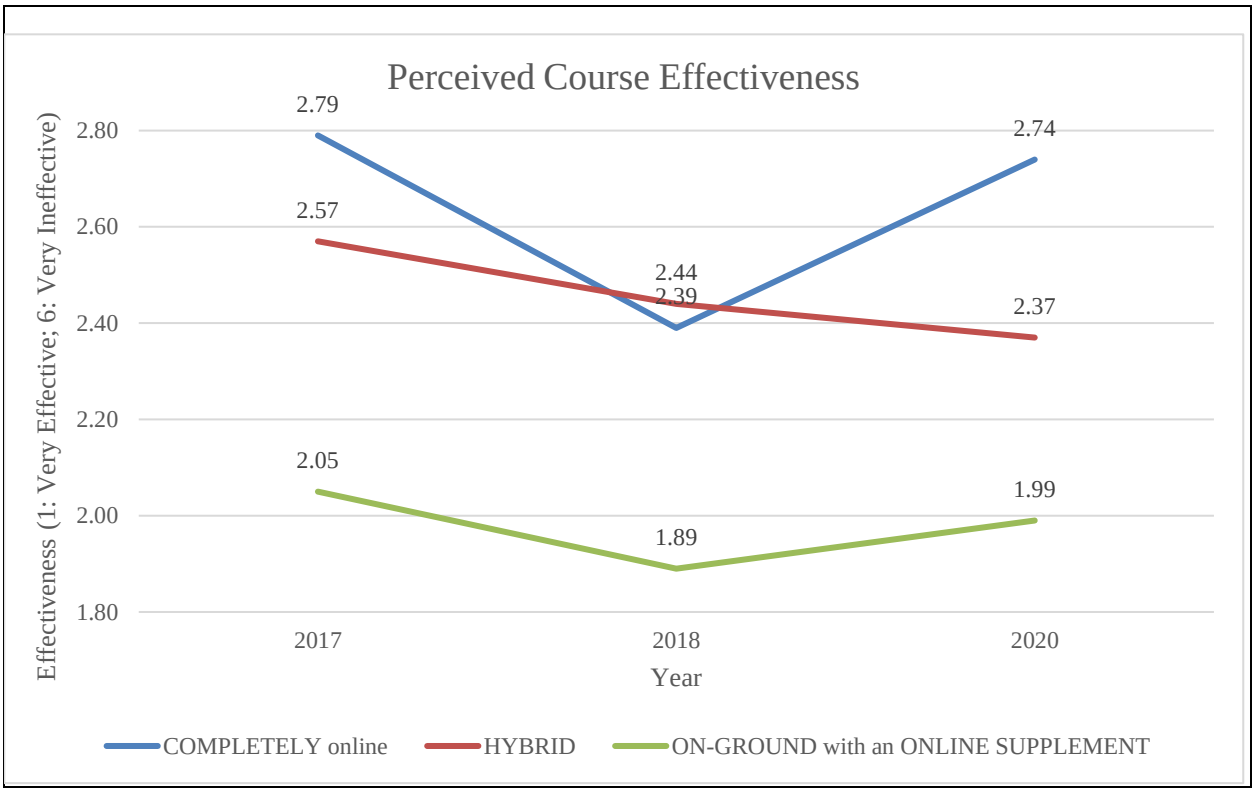

Figure 1. Average Perception of Overall Effectiveness of Courses (1=Very Effective, 6=Very Ineffective), Based on Delivery Method, from 2017 to 2020

Perceived effectiveness of course offered		N	Mean
COMPLETELY online	2017	239	2.79
	2018	90	2.39
	2020	89	2.74
	Total	*418*	*2.70*
HYBRID (i.e., partially online and partially on-ground)	2017	237	2.57
	2018	89	2.44
	2020	89	2.37
	Total	*415*	*2.50*
ON-GROUND with an ONLINE SUPPLEMENT (i.e., materials on LMS or an instructor's website)	2017	238	2.05
	2018	89	1.89
	2020	89	1.99
	Total	*416*	*2.00*

Table 1. Average Perception of Overall Effectiveness of Courses (1=Very Effective, 6=Very Ineffective), Based on Delivery Method, from 2017 to 2020

Table 2 depicts the results of an ANOVA test to determine the significance of the perceived overall effectiveness of courses, based on delivery method. As shown in the table, over the years, only the change in perceived overall effectiveness of courses taught using a completely online delivery method was statistically significant at $p < 0.05$.

Perceived effectiveness of courses offered		Sig.
COMPLETELY online	Between Groups	0.018*
	Within Groups	
	Total	
HYBRID (i.e., partially online and partially on-ground)	Between Groups	0.258
	Within Groups	
	Total	
ON-GROUND with an ONLINE SUPPLEMENT (i.e., materials on LMS or an instructor's website)	Between Groups	0.389
	Within Groups	
	Total	

Table 2. Significance of Perception of Overall Effectiveness of Courses, Based on Delivery Method, from 2017 to 2020

Table 3 depicts the results of a Bonferroni test used to determine the significance of the perception of overall effectiveness of courses, based on delivery method, from one year to another. As shown in the table, the mean difference is significant, at $p < 0.05$, only for courses offered using a completely online delivery method. We have only seen

improvement from 2017 to 2018. The specific reason for the lack of further improvement is unclear but one possible explanation is that improvements in online education have peaked and have not seen further gains. This would require further study.

Perceived effectiveness of courses offered	(I) YR	(J) YR	Sig.
COMPLETELY online	2017	2018	0.015*
		2020	1
	2018	2017	0.015*
		2020	0.132
	2020	2017	1
		2018	0.132
HYBRID (i.e., partially online and partially on-ground)	2017	2018	0.938
		2020	0.381
	2018	2017	0.938
		2020	1
	2020	2017	0.381
		2018	1
ON-GROUND with an ONLINE SUPPLEMENT (i.e., materials on LMS or an instructor's website)	2017	2018	0.517
		2020	1
	2018	2017	0.517
		2020	1
	2020	2017	1
		2018	1

Table 3. Bonferroni Test Results of Significance of Perceived Overall Effectiveness of Courses, Based on Delivery Method, from 2017 to 2020

5.2 Does the Amount of Course Delivery Provided Online Affect the Perceived Overall Effectiveness Rating of Courses?

Based on responses to the survey question asking respondents to rate their perceived overall effectiveness of courses that are offered completely online, hybrid (i.e., partially online and partially on-ground), and on-ground with an online supplement on a scale of 1 to 6, with 1 being "Very Effective" and 6 being "Very Ineffective," a series of paired samples t-tests were performed. Table 4 shows some summary results.

Perceived effectiveness of courses offered	N		Mean
	Valid	Missing	
COMPLETELY online	418	278	2.7
HYBRID (i.e., partially online and partially on-ground)	415	281	2.5
ON-GROUND with an ONLINE SUPPLEMENT (i.e., materials on LMS or an instructor's website)	416	280	2.0

Table 4. Results of a Series of Paired Sample t-Tests Performed on the Dataset from 2017 to 2020

Paired sample t-tests confirm that, for our overall dataset from 2017 through 2020, there is significant difference between each of these means. Test results are omitted in the table format due to the size of the table. On-ground with an online supplement is seen as significantly more effective than hybrid at $p < .001$. Likewise, hybrid is seen as significantly more effective than completely online at $p < .001$. Finally, on-ground with an online supplement is seen as significantly more effective than completely online at $p < .001$.

5.3 Is There a Variation in the Perceived Overall Effectiveness of Course Delivery Methods Based on Age or Gender?

Survey respondents were asked to indicate their age range. Possible age ranges were: 18-21, 22-30, 31-40, 41-50, 51-60, and 61 or older.

Appendix A details our findings of the perceived effectiveness of courses, based on delivery method, by age group. Ratings are based on a scale of 1 to 6, with 1 being "Very Effective" and 6 being "Very Ineffective." While the average rating varies slightly for each age group, there is no significant difference in the perceived effectiveness of courses, based on delivery method by age group.

Survey respondents were asked to indicate their gender. Possible options were: male, female, and other.

Appendix B details our findings of the perceived effectiveness of courses, based on delivery method, by gender. Ratings are based on a scale of 1 to 6, with 1 being "Very Effective" and 6 being "Very Ineffective." While the average rating varies slightly, by gender, there is no significant difference in the perception of overall effectiveness of courses, based on delivery method, by gender, as shown in Appendix C.

5.4 Is There a Variation in Perceptions of the Instructional Method That Provides the Best Learning, Based on Course Content?

Survey respondents were asked to select the instructional method (on-ground, completely online, hybrid, on-ground with an online supplement) that they feel provides the best learning for different groupings of CIS course topics.

Table 5 depicts the percentage of survey respondents that chose each instructional method that they felt provided the best learning, for each grouping of CIS course topics. As shown in the table, there was very little variation in perceptions of best learning instructional methods, based on course content. For each grouping of CIS course topics, the respondents indicated that they felt that the on-ground instructional method provided the best learning.

6. CONCLUSIONS

Although many universities are offering larger numbers of online courses, this study indicates that students perceive courses offered on-ground with an online supplement, as being the overall most effective. This perception has remained consistent over the years and does not vary significantly based on age or gender. Furthermore, survey respondents reported a lower perception of overall effectiveness of courses, when more course content was delivered online.

	On-ground	Online	Hybrid	Supp
Software Development/Programming (SD)	37%	17%	21%	25%
Network Administration/Security (NA)	39%	18%	19%	23%
Web Development (WD)	33%	21%	25%	21%
Multimedia/Graphics (M/G)	32%	21%	23%	23%
Office Productivity Software (OP)	31%	30%	22%	17%
IT Project Management (PM)	38%	20%	21%	20%
Systems Analysis & Design (SA)	37%	22%	20%	21%
Certification Courses (e.g., A+, N+) (CT)	36%	23%	21%	20%
Operating Systems (OS)	36%	23%	22%	20%
Database (DB)	38%	19%	22%	21%
Data Analytics (DA)	38%	21%	21%	21%

Table 5. Perceptions of Best Learning Instructional Methods, Based on CIS Course Content

In addition, the CIS subject matter being taught does not change the students' feeling regarding the instructional method that has the most effectiveness. Regardless of CIS topic, students feel that the on-ground instructional method with online supplements is the most effective.

This study was limited to only student perceptions of online, blended (hybrid), and generally resident instruction with online supplements in relation to Computer Information Systems (CIS) courses, regardless of the academic major of the student. The authors plan further research regarding the abrupt move to online and hybrid course delivery during the COVID-19 pandemic. This research will include CIS faculty perceptions of the various learning delivery methods by focusing on faculty workload, research disruptions, family-work conflict, and stress levels of faculty.

7. REFERENCES

Allen, I. E., & Seaman, J. (2016). 2015 Online Report Card Tracking Online Education in the United States. Babson Survey Research Group and Quahog Research Group. https://onlinelearningconsortium.org/survey_report/2015-online-report-card-tracking-online-education-united-states/

Bristow, D., Shepherd, D. C., Humphreys, M., & Ziebell, M. (2011). To Be or not to Be: That Isn't the Question! An Empirical Look at Online versus Traditional Brick-and-Mortar Courses at the University Level. *Marketing Education Review*, 21(3), 241-250.

Cole, M. T., Shelley, D. J., & Swartz, L. B. (2014). Online Instruction, e-Learning, and Student Satisfaction: A Three Year Study. *International Review of Research in Open and Distance Learning*, 15(6), 111-131.

Dobbs, R. R., Waid, C. A., & del Carmen, A. (2009). Students' Perceptions of Online Courses the Effect of Online Course Experience. *The Quarterly Review of Distance Education*, 10(1), 9-26.

Harasim, L. (2000). Shift Happens: Online Education as a New Paradigm in Learning. *The Internet and Higher Education*, 3(1-2), 41-61.

Ilgaz, H., & Gülbahar, Y. (2015). A Snapshot of Online Learners: E-Readiness, E-Satisfaction and Expectations. *International Review of Research in Open and Distance Learning*, 16(2), 171-187.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010), Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. https://www.researchgate.net/publication/44840198_Evaluation_of_Evidence-Based_Practices_in_Online_Learning_A_Meta_Analysis_and_Review_of_Online_Learning_Studies

Norvilitis, J. M., Merwin, M. M., Osberg, T. M., Roehling, P. V., Young, P., & Kamas, M. M. (2006). Personality Factors, Money Attitudes, Financial Knowledge, and Credit-Card Debt in College Students. *Journal of Applied Social Psychology*, 36(6), 1395-1413.

U.S. Department of Education (2018). *National Center for Education Statistics:* Digest of Education Statistics 2018. https://nces.ed.gov/fastfacts/display.asp?id=80

Vidanagama, D. U. (2016). Acceptance of E-Learning among Undergraduates of Computing Degrees in Sri Lanka. *International Journal of Modern Education and Computer Science*, 8(4), 25-32.

Watkinson, J. D. (1996). "Education for Success": The International Correspondence Schools of Scranton, Pennsylvania. *The Pennsylvania Magazine of History and Biography*, 120(4), 343-369.

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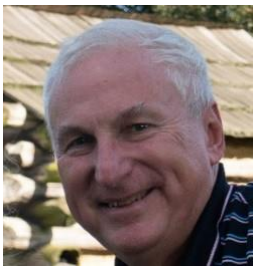

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Wenli Wang is a professor of computer and information systems at Robert Morris University. She obtained her Ph.D. in management science and information systems from the University of Texas at Austin and subsequently held academic posts at Emory University and Trident University. Her past research was on cybersecurity, with interdisciplinary methods of game theory, secure computation, systems engineering, control and assurance. Her current research focuses on artificial intelligence, health informatics, and contemplative studies. She has over 20 journal and 40 conference refereed publications. She has published in *Journal of Economic Theory*, *Decision Support Systems*, *IEEE Computer*, *International Journal of Electronic Commerce*, *Communications of the Association for Information Systems*, *Technology in Society*, *Human Systems Management*, *Information Systems Education Journal*, among others. She has served on the editorial boards of *Journal of Database Management* and *International Journal of E-business Research*. She has a B.S. in computer engineering and telecommunications from Beijing University of Posts and Telecommunications.

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APPENDICES

Appendix A. Perceived Effectiveness of Courses, Based on Delivery Method, by Age Group

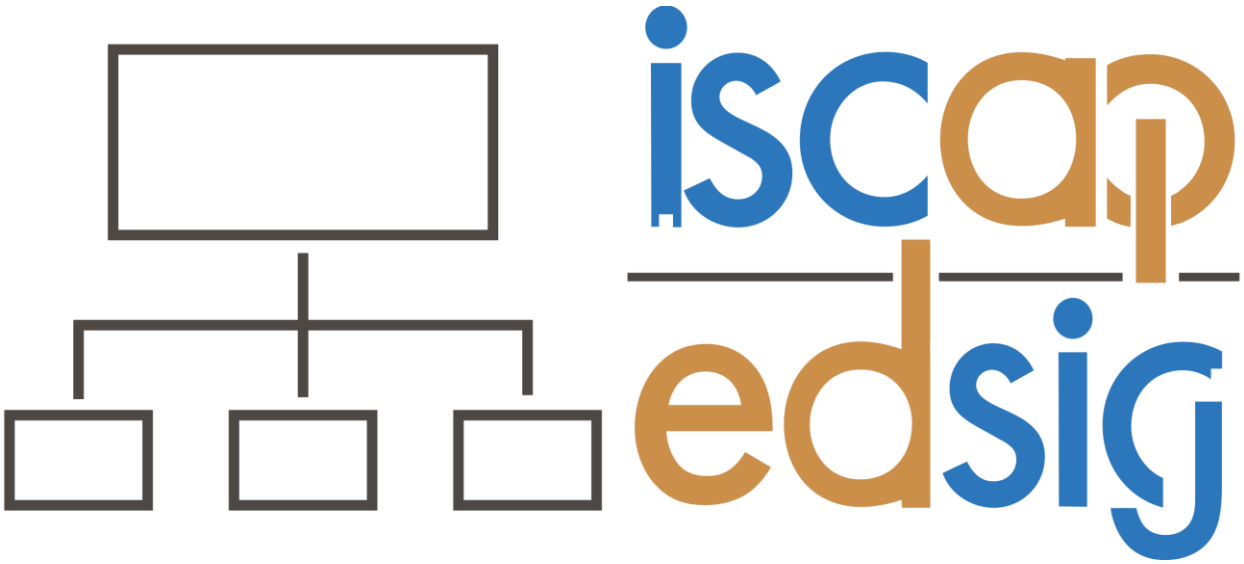
Perceived effectiveness of courses offered Age		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
COMPLETELY online	18-21	183	2.93	1.082	.080	2.78	3.09	1	6
	22-30	142	2.61	1.203	.101	2.41	2.81	1	6
	31-40	54	2.39	1.220	.166	2.06	2.72	1	6
	41-50	17	1.82	1.015	.246	1.30	2.35	1	5
	51-60	6	2.83	.753	.307	2.04	3.62	2	4
	61+	4	2.00	.816	.408	.70	3.30	1	3
	Total	406	2.69	1.164	.058	2.58	2.80	1	6
HYBRID (i.e., partially online and partially on-ground)	18-21	183	2.46	1.026	.076	2.31	2.61	1	6
	22-30	142	2.62	1.083	.091	2.44	2.80	1	6
	31-40	52	2.40	1.071	.149	2.11	2.70	1	6
	41-50	16	2.25	.931	.233	1.75	2.75	1	4
	51-60	7	2.29	1.113	.421	1.26	3.31	1	4
	61+	3	2.33	.577	.333	.90	3.77	2	3
	Total	403	2.50	1.047	.052	2.40	2.60	1	6
ONGROUND with an ONLINE SUPPLEMENT (i.e., materials provided on LMS or an instructor's website)	18-21	183	1.86	.894	.066	1.73	1.99	1	6
	22-30	142	2.10	.845	.071	1.96	2.24	1	5
	31-40	52	2.17	1.216	.169	1.83	2.51	1	6
	41-50	16	1.94	1.289	.322	1.25	2.62	1	5
	51-60	7	1.57	.535	.202	1.08	2.07	1	2
	61+	3	2.33	.577	.333	.90	3.77	2	3
	Total	403	1.99	.942	.047	1.90	2.08	1	6

Appendix B. Perceived Effectiveness of Courses, Based on Delivery Method, by Gender

Perceived effectiveness of courses offered Gender		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
COMPLETELY online	Male	304	2.70	1.148	.066	2.57	2.83	1	6
	Female	100	2.68	1.222	.122	2.44	2.92	1	6
	Other	1	1.00	.	.	.	.	1	1
	Total	405	2.69	1.167	.058	2.58	2.81	1	6
HYBRID (i.e., partially online and partially on-ground)	Male	302	2.52	1.052	.061	2.40	2.64	1	6
	Female	100	2.44	1.038	.104	2.23	2.65	1	6
	Other	1	2.00	.	.	.	.	2	2
	Total	403	2.50	1.047	.052	2.40	2.60	1	6
ONGROUND with an ONLINE SUPPLEMENT (i.e., materials provided on LMS or an instructor's website)	Male	302	2.01	.943	.054	1.91	2.12	1	6
	Female	101	1.91	.960	.096	1.72	2.10	1	6
	Other	1	3.00	.	.	.	.	3	3
	Total	404	1.99	.948	.047	1.90	2.08	1	6

Appendix C. Significance of Perceived Effectiveness of Courses, Based on Delivery Method, by Gender

Perceived effectiveness of courses offered		Sum of Squares	df	Mean Square	F	Sig.
COMPLETELY online	Between Groups	2.919	2	1.460	1.072	.343
	Within Groups	547.115	402	1.361		
	Total	550.035	404			
HYBRID (i.e., partially online and partially on-ground)	Between Groups	.729	2	.364	.331	.718
	Within Groups	440.021	400	1.100		
	Total	440.749	402			
ONGROUND with an ONLINE SUPPLEMENT (i.e., materials provided on LMS or an instructor's website)	Between Groups	1.815	2	.908	1.011	.365
	Within Groups	360.145	401	.898		
	Total	361.960	403			



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ISSN 2574-3872