

Quality Assurance Of Online Surgical Learning Process: Development and Validation of Shalamar Online Learning Experience Measure (SOLEM)

Fatima Tuz Zahara; Zaitoon Zafar; Talat Waseem; Hasan Shoab

IMPORTANCE The COVID-19 pandemic has strained medical infrastructure, stagnated global economy and disrupted student life worldwide. The need for social distancing presented a unique challenge to surgical educators, and schools took the opportunity to become virtual, medical students learning surgical techniques in particular were required to take clinical instructions online. This also presented another challenge for the educator— quality assurance of the online learning process.

OBJECTIVE In this study we have developed and validated an online learning instrument, namely Shalamar Online Learning Experience Measure (SOLEM), which would serve as a standard against which quality assurance of online learning programs, particularly of surgery, could be established and maintained.

METHODS Using previously validated questionnaires assessing various dimensions of learning along-with necessary modifications, we designed a comprehensive instrument (SOLEM) to gauge parameters of student cooperation, teacher support, resource adequacy, computer usage, active learning, design and appeal, order and organization, reflective thinking, and lastly, of perception (of self, of teacher, of atmosphere and of learning). This newly designed instrument was expert validated for relevance and content validation and was finally piloted to run Exploratory Factor Analysis (EFA) for determining reliability, internal consistency and construct validity.

RESULTS Following an expert validation from eight experts, a total of 162 participants completed the questionnaire. The final version of the SOLEM has 48 items allocated to 12 scales. Cronbach's alpha for the overall questionnaire was 0.921. The alpha reliability coefficient for each subscale ranged from 0.776-0.912. The output of EFA revealed that each representative learning item had a factor loading of at least 0.50 with its own scale, thus adding to the overall construct validity of the questionnaire.

CONCLUSION & RELEVANCE Newly designed 48-item Shalamar Online Learning Experience Measure (SOLEM) is a valid, reliable and efficient method to measure medical students' perception and test the quality assurance of an online learning experience in a surgical setting and may be generalizable to other online educational programs as well.

KEYWORDS Learning experience; Online education; Questionnaire development; Surgical learning; E-learning; quality assurance of online learning, quality assurance

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Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: Dr. Talat Waseem FRCS Eng, FACS
Consultant Surgeon
Shalamar Medical & Dental College, Lahore
twaseem@gmail.com
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In order to contain the ongoing pandemic brought on by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), all instructions from governing bodies point towards social and/or physical distancing as a non-pharmaceutical intervention for infection control, intended to slow the spread of disease by minimizing close contact between individuals^{1 2 3}. Social/physical distancing is defined by the American CDC as “keeping a safe space between yourself and other people who are not from your household”². The CDC recommends a distance of 6 feet (1.8 meters)² while the WHO recommends a distance of 3 feet (1 meter)³. Such measures have presented a special challenge to people worldwide, but especially to educational institutes, for whom it will be most difficult to maintain social/physical distancing rules. According to UNESCO, the pandemic, at its peak in April 2020, caused almost 200 countries to completely close their schools, with more than 1.5 billion students affected⁴.

Educators have taken the task in stride and have turned to the internet to ensure their students’ precious time is not wasted. The predicament is particularly worrisome for students in the medical sciences, who have had to take clinical instruction usually available in a hospital or clinic setting in their final years, on webinars and Zoom sessions.

This transitioning of mass schooling to virtual screens is a solution to social distancing that would not have been possible more than a decade ago and hence is a situation that has presented itself for the first time. Resultantly, there is a gap of knowledge in regards to the effectualness, strategies necessary for, and shortcomings of an online education. With our study at Shalamar Medical and Dental College, Lahore we have tried to bridge this gap. Our study especially dealt with medical students who had to take necessary instructions online.

The college, based in the metropolitan city of Lahore, Pakistan, wasted no time in introducing Shalamar e Learning Management System (SeLMs)—a Moodle based application, Webinar Jam and Surgiomics (a collection of web resources for the students) for online learning. Daily lectures were broadcasted live to students of all years (Year 1 through 5 of MBBS), with clinical wards and operative procedures being taught live to students in Year 3 through Year 5. Subsequent assessments were taken on the SeLMs in the form of Multiple-Choice Questions (MCQs) and Short Essay Questions (SEQs).

To evaluate the efficiency of the virtual learning set up, the Shalamar Online Learning Environment Measure (SOLEM) was developed. This article begins with foundation information about learning environment research, next the phases in the turn of selection of scales and items of SOLEM questionnaire. The article at that point moves to expert validation and pilot validation of the newly developed questionnaire.

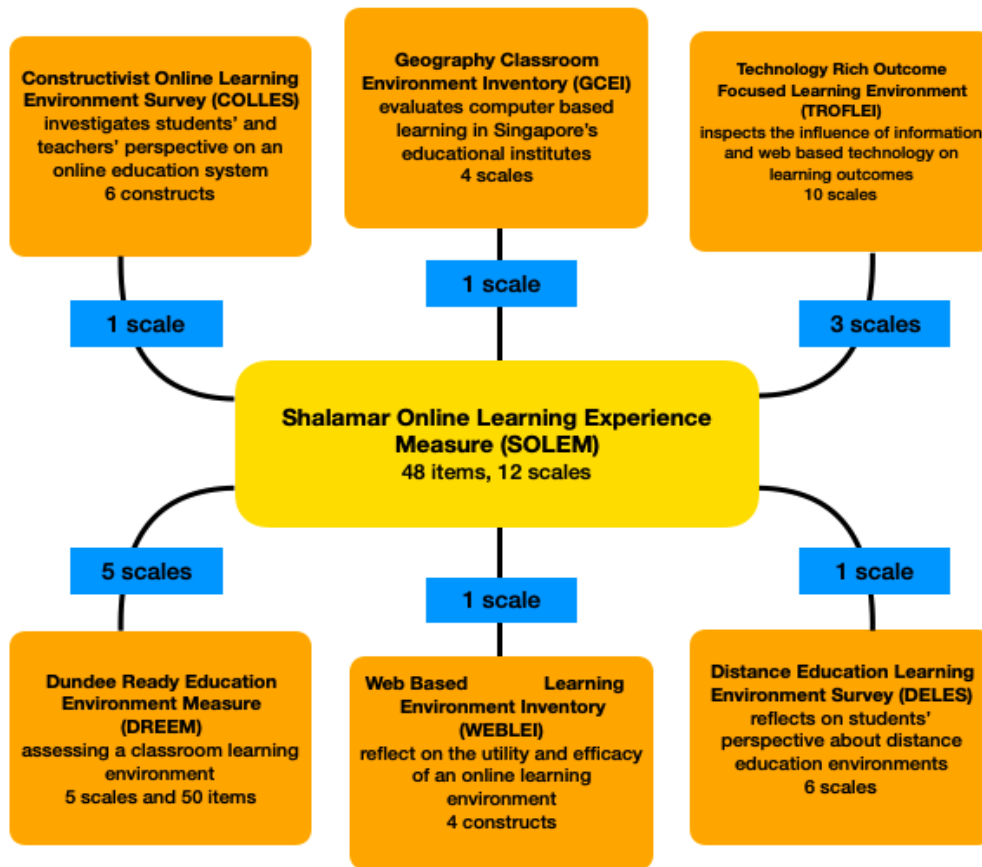
METHODS

a. Development of Shalamar Online Learning Experience Measure (SOLEM)

The development of SOLEM followed three key steps that are involved in learning environment scale development⁵. Extensive literature review was done to review previously available and validated instruments. First step was identification of individual scales and items. Total 56 items were selected and divided under 12 scales (See Appendix 1). These items were retrieved from 6 validated scales. The items were modified according to the perspective to fit to measure various dimensions of the online learning process. The item and scale selection were done by a panel of experts to enhance its capacity to measure the surgical learning process more comprehensively.

Briefly, various educational environment scales were explored and research materials were studied to identify vital elements of a high-quality online learning environment. First step involved reviewing previously validated learning environment instruments that could be modified for SOLEM. 12 scales were selected from six validated instruments. Second step was to categorize these scales based on Moos’ three psychosocial dimensions. Third step was writing new items and adopting individual items for each scale. The initial version of SOLEM contained 56 items. Fourth step was expert validation.

Following scales were deemed appropriate for inclusion into SOLEM. Roff et al developed an instrument called Dundee Ready Education Environment Measure (DREEM) aimed to assess a classroom learning environment⁶. This instrument was based on 5 scales and 50 items. Aldridge et al created the Technology Rich Outcome Focused Learning Environment (TROFLEI) using the What Is Happening In The Class (WIHIC) scales⁷. This instrument is based on 10 scales and it inspects the influence of information and web-based technology on learning outcomes. Chang et al devised an instrument named Web Based Learning Environment Inventory (WEBLEI) that served to reflect on the utility and efficacy of an online learning environment, this questionnaire consists of four constructs⁸. Walker has created Distance Education Learning Environment Survey (DELES) to reflect on students’ perspective about distance education environments, the survey is based on six scales⁹. Constructivist Online Learning Environment Survey (COLLES) was developed by Taylor et al to investigate students’ and teachers’ perspective on an online education system, this survey was based on six constructs¹⁰. Teh et al developed Geography Classroom Environment Inventory (GCEI) based on four scales to evaluate computer-based learning in Singapore’s educational institutes¹¹. For the purpose of our measure, 5 scales were



Development of the SOLEM

adapted from DREEM, 3 scales from TROFLEI, 1 scale from WEBLEI, 1 scale from DELES, 1 from COLLES, 1 scale from GCEI.

Most of these instruments were based on Moos’ psychosocial dimensions of a learning environment, which were developed in order to measure the perceptions of learners. Moos conceptualized that a well-planned psychosocial environment should cover three dimensions: relationship dimension, personal growth dimension and system maintenance, and change dimension.

b. Expert Validation of SOLEM

In order to improve the construct validity of SOLEM, a questionnaire was prepared which was reviewed by an eight-member expert panel involved in online education and research related to the online learning environment. Word document consisting of scale items, operational definitions and instructions on reviewing the items was sent to experts. After expert validation questionnaire was revised and three items were deleted.

c. Pilot testing and performing Exploratory Factor Analysis:

The SOLEM questionnaire was administered to undergraduate medical students enrolled in Shalamar Medical and Dental College during online classes for pilot testing. Questionnaire was disseminated through Google Forms as it is a more reliable and time efficient method compared to the traditional paper-based version. The sample of students was drawn from medical undergraduate students of Shalamar Medical and Dental college. 162 Students responded to items using a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). All the data from participants was inputted to SPSS v.20 and analyzed to measure the construct validity and reliability.

There were three distinct components of the analysis in the current study. Initially the mean, standard deviation and Cronbach’s alpha coefficient were computed for each of the 12 scales in SOLEM. The second component of analysis consisted of exploratory factor analysis (EFA). Principal component analysis of the final SOLEM suggested that this questionnaire is structurally sound. The final version of the SOLEM questionnaire consists of 48 items assigned to 12 underlying scales. Table 1 contains the name of each scale included in SOLEM along with sample items.

The newly designed instrument, SOLEM, was subjected to expert validation to assess the relevance, face validity and content validity. Table 1 shows the I-CVI of each item. Three weak items were excluded.

RESULTS

Table 1: I-CVI and Factor Loading of each item in SOLEM

Theme	Representative Items	I-CVI	Factor loading
Perception of learning /teaching	1.The learning process was well planned, well organized and structured	0.99	0.657
	2.The assessment was well aligned to the content taught	0.98	0.619
	3.The learning process was focused	0.97	0.628
	4.The learning process was conformed to learning objectives	0.88	0.706
	5.The teaching/learning was student centered	0.93	0.538
	6.The teaching was too teacher centered	0.82	0.610
	7.The learning process was simulating and engaging	0.95	0.581
Perception of teacher	1.The teacher was/were knowledgeable and trained	0.86	0.788
	2.The teacher helped to develop my practical skills	0.90	0.508
	3.The teacher was/were well prepared for his/her classes	0.87	0.808
	4.The teacher was/were committed to my learning	0.92	0.788
	5.The teacher gave clear examples to explain	0.78	0.766
Academic self-perception	1.I feel I am being well prepared for my career	0.82	0.707
	2.My problem-solving skills are being well developed here	0.81	0.716
	3 Learning strategies which worked for me before continue to work for me now	0.86	0.638
	4.I am confident about passing this year	0.79	0.584
Social self-perception	1.I felt too tired to enjoy this course	0.88	0.748
	2.I was rarely bored on this online learning system	0.91	0.638
	3.There is a good support system for students who get stressed	0.84	0.691
	4.I communicate regularly with other students in the course	0.93	0.634
Perception of atmosphere	1.The atmosphere motivated me as a learner	0.90	0.760
	2.The learning activity was well organized and time tabled	0.96	0.692
	3. There were opportunities for me to develop my interpersonal skills	0.93	0.799
	4.I found the learning experience disappointing	0.89	0.670
	5.I was able to ask questions freely	0.97	0.677
Computer usage	1.There was effective support system to troubleshoot computer/technology related issues	0.98	0.629
	2.I was initially trained and was confident/competent using a computer/learning platform	0.91	0.565
	3.I was confident in using the world wide web to search information	0.96	0.622
Active learning	1.The feedback I receive from activities /quizzes was meaningful	0.99	0.623
	2.The activities /quizzes provided in the course enhanced my learning	0.86	0.602
	3.I felt motivated by the responses I got from activities /quizzes included in the learning activity	0.98	0.561
Teacher support	1.The teacher responded timely to my queries	0.93	0.743
	2.The teacher participated regularly in group discussions	0.94	0.751
	3.The teacher provided regular and constructive feedback on my learning progress	0.86	0.644
Design and appeal	1.The choice of colors and style used in the web text was clear and appropriate	0.83	0.712
	2.The material used in lectures shows originality and creativity in the layout	0.89	0.673
	3.I found the graphics used in software were well designed and visually appealing	0.93	0.655
Order and organization	1.The learning objectives were clearly stated for each topic	0.95	0.723
	2.The information presented in the course was well recognized and easy to follow	0.95	0.745
	3.The information presented was appropriate and related to the topic studied	0.86	0.759
	4.I was able to easily find help on terms or concepts I did not understand	0.82	0.655
	5.The link provided in the topic were clearly visible and were relevant and appropriate to the topic being studied	0.87	0.712
Resource adequacy	1.The instructions provided to use the tools within the online platform were clear and precise	0.78	0.677
	2.The software I used was suitable for participating fully in the course	0.84	0.564
	3.The software applications needed to participate in this course were provided	0.86	0.642
Reflective thinking	1.I felt a sense of satisfaction and achievement about this learning environment	0.92	0.736
	2.I found using the Internet for learning was simulating	0.84	0.637
	3.I felt the web-based learning approach can substitute for or enhance the normal classroom approach	0.76	0.683

The second step involved factor analysis to assess the reliability of the scale items, construct validity in terms of estimation of Cronbach's alpha values and factor loadings. The aim of factor analysis is to identify and explain the co-relationship between variables which forms the basis of learning environment research validation through principal component analysis (PCA), a technique to reduce the dimensionality of each dataset, and to identify new uncorrelated variables in order to maximize the variance¹². In PCA different method of rotations are applied to enhance and simplify the interpretability. In orthogonal rotation, the factor axes are kept at right angle to each other while in non-orthogonal (oblique) rotation methods, the factor axes are not at right angle to each other, the most popular method appears to be the varimax rotation¹². Apart from the selection of most relevant analytic rotation methods, researchers need to clarify factor loading of individual items and scale to construct a validated learning environment survey. The value of factor loading is variable in literature and has a major role to play in exploratory factor analysis. Some studies consider factor loadings of 0.30 and 0.35 acceptable whereas other studies labelled factor loadings of 0.40 for an item on their a priori scale acceptable¹². Standardized factor loading should range from 0.5-0.7¹³. Such high factor loading indicates that items are strongly connected with associated constructs.

We established the construct validity using content validity and principal component analysis (PCA) PCA yielded 7 factors for the SOLEM. The 7-factor solution accounted for 72.6% of variance, while 27.4% of the overall variance remained unaccounted. 48 items had factor loading greater than 0.5, items with factor loadings below 0.5 were removed from SOLEM. Content validity was verified through previous research and expert's interaction in the area of online learning. Content validity index and factor loading of items are detailed in Table 1.

In order to measure internal reliability of the questionnaire, Cronbach's alpha coefficient was calculated. The Cronbach alpha for the questionnaire and subscales were high and suggested that SOLEM has high internal consistency. The Cronbach alpha scores for the questionnaire are detailed in Table 2.

DISCUSSION

The history of research of learning environments dates to the 1950s. However, these scales did not depend on a sound and clear hypothesis. For classroom environment instruments, it is important that these dimensions provide coverage of Moo's three general categories of human environment¹⁴. In the 1960s, Walberg built a learning environment instrument called the Learning Environment Inventory (LEI). Later, Fraser and Wubbels created a Classroom Environment scale stemming from Moo's psychosocial climate dimensions¹⁵. The work of Walberg, Fraser and Moo has catalyzed the research related to the development and application of

learning environment scales. Although physical class room environments are different from the online class rooms, the principles of teaching and learning remain the same.

In the course of the last two decades, the advent of digital innovation and E-learning has fundamentally changed the structure of training and learning conditions. Albeit web-based learning in clinical training is a fairly unpretentious idea, in any case this pandemic has roused us to investigate alternate methods of achieving set academic standards of medical education. Learning environment is defined contrastingly by different individuals, for the purpose of this study, a learning environment alludes to diverse physical locations, contexts and cultures in which mentors and students interact to take part in learning activities.

Online instruction is a formal educational process in which the instruction occurs when the learner and the instructor are not in the same place and internet technology is used to provide communication between the instructor(s) and student(s). To Siragusa (2005) online learning is when students are using the internet to interact with content, other students and their tutors. This range of definitions and interpretations of online learning is a reflection of the variety of ways educationalists, at all levels, use connected computers in learning.

Internet technology has influenced every function of educational institutes, from teaching, learning, monitoring student progress, to administration. Organizations have put expanding measures of assets into improvement of computerized functions both in foundation and course content. As per a survey directed by the Sloan Consortium in 2004, the number of students enrolled in online courses has exceeded 1.6 million in the USA¹⁶. It has become obvious that instructors need to establish new policies to manage web-based methods of educating and learning¹⁷.

An internet education requires a healthy mix of instruction, collaboration, support, socialization and a stretched-out effort to make a compelling learning framework¹⁸. Interestingly, research to explore both the psychosocial and physical aspect of a networked classroom revealed that the classroom psychosocial environment (especially autonomy/independence and task orientation) was altogether and significantly connected with the learner's fulfillment with their learning¹⁹. However, different barriers were also identified that hinder online learning i.e. technical skills and technical barriers, learner motivation, social interaction and academic skills²⁰.

Table 2: Reliability for SOLEM

Scale	No of items	Cronbach's alpha
Perception of learning/teaching	7	0.868

Perception of teacher	5	0.912
Academic self-perception	4	0.887
Social self-perception	4	0.847
Perception of atmosphere	5	0.860
Computer usage	3	0.809
Active learning	3	0.889
Teacher support	3	0.879
Design and appeal	3	0.872
Order and organization	5	0.906
Resource adequacy	3	0.776
Reflective thinking	3	0.893

Exponential growth in the online education delivery medium has led researchers to probe about its quality and efficiency. Previous research highlights that learners are satisfied with the content quality and online learning experience²¹. Although, virtual classrooms seemed to deliver good learning outcomes and a degree of satisfaction among learners, yet results were not much improved upon than in the traditional classroom environment²².

Moore (1989) explained three characteristic features of an online learning environment. These are, Student to course interaction, Student to instructor interaction and Student to student interaction. Haynes (2004) worked out the fourth component of a learning environment i.e student interface interaction. A well designed, focused and simple to explore course which unmistakably achieves the goals of an online learning environment shows the significance of student to course interaction^{23 24}. The importance of teacher support, aptitude, competence and feedback during online interaction has also been upheld²⁴. The focus on the quality of content and technological adequacy enhances learning achievements.

Utilizing online learning environment instruments intended to gauge the effect of internet technology on students, we can start to quantify effectiveness of online education on knowledge and student's outcome dimensions. As tutors, education practitioners and learning environment analysts perform a significant role, they need substantial instruments to survey contemporary learning environments in order to develop an optimal learning environment. Unfortunately, research related to the efficacy of online education has not kept pace with the rapid growth of this system. Current research was done to develop and validate an instrument to investigate the quality of an online learning environment from a learner's perspective.

LIMITATIONS

The present study has a few limitations. The sample size was relatively small and participants were recruited from a single institute. Further research in this area with large and diversified samples should be conducted to enhance and validate the SOLEM questionnaire.

CONCLUSION

Due to the increasing prevalence of online education, it is of paramount importance for the E-learning service providers to investigate the productiveness of this system and to make effective strategies accordingly. The present study is suggestive in that it involved development and validation of a scale that provides feedback responses based on students' perception of the online learning environment. Using a sample of undergraduate medical students, this article has provided substantial validation of the SOLEM questionnaire and could be used to base and assess the quality of an online learning environment. Our study developed an instrument based on 12 scales, measures the perception of learners about the educational quality, tutors' competence, learning atmosphere and web-based services/resources in an economic and reliable way. The SOLEM can be used to explore methods in which teachers can make an online educational environment more conducive for students learning, thereby enhancing student outcomes. In short, SOLEM can function as an important tool for quality assurance of online learning process.

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Appendix 1

Shalamar Online Learning Experience Measure (SOLEM)TM



Name:	Age/ Sex:
Year of Education:	Institution:
Date:	

			Strongly agree	Agree	Neutral	Partially agree	Strongly disagree	I-CVI
Perception of Teaching Learning Process	1	"The learning process was well-planned, well-organized and structured".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.99
	2	"The learning process was focused "	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.97
	3	"The learning process was conformed to learning objectives"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.88
	4	"I was welcomed and encouraged to participate in learning process"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.92
	5	"The learning process was stimulating and engaging"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.95
	6	"The teaching/learning was student-centered"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.93
	7	"The teaching was too teacher-centered"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.82
	8	"The assessment was well aligned to content taught"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.98
Order and Organization	9	"The learning objectives were clearly stated for each topic"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.95
	10	"The information presented in the course was well organized and easy to follow"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.95
	11	"The information presented was appropriate and related to the topic studied"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
	12	"I was able to easily find help in understanding of concepts that I do not understand"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.82
	13	"The link/s provided in the topic were clearly visible and were relevant and appropriate to the topic being studied"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.87

Perception of Teacher/ Educator	14	"The teacher/s was/were committed to my learning"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.92
	15	"The teacher/s was/were knowledgeable and trained"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
	16	"The teacher/s helped to develop my practical skills"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.9
	17	"The teacher/s was/were well prepared for his/her classes"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.87
	18	"The teacher/s gave clear examples to explain"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.78
Teacher Support	19	"The teacher/s responded timely to my queries"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.93
	20	"The teacher participated regularly in group discussions"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.94
	21	"The teacher/s provided regular and constructive feedback on my learning progress"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
Resource Adequacy	22	"The instructions provided to use the tools within online platform were clear and precise"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.78
	23	"The software platform I used was suitable for participating fully in the learning activity"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.84
	24	"The software applications needed to participate in this course were provided"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
	25	"There was a little delay in opening and using the software applications used in this course"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.76
Design & Appeal	26	"The choice of colors and style used in the web-text was clear and appropriate"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.83
	27	"The material used in lectures showed originality and creativity in the layout"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.89
	28	"I found the graphics used in learning platform were well-designed and visually appealing"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.93
Computer / Technology Usage	29	"There was effective support system to troubleshoot computer/technology-related issues"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.98
	30	"I was initially trained and was confident / competent using a computer/learning platform"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.91
	31	"I was confident in using the world wide web to search information"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.96
	32	"I was able to reconnect to the network if anything went wrong"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.89

Active Learning	33	"The feedback I receive from activities/quizzes was meaningful"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.99
	34	"The activities/quizzes provided in the course enhanced my learning"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
	35	"I felt motivated by the responses I got from activities/quizzes included in this learning activity"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.98
Perception of Atmosphere	36	"The learning activity was well-organized and time-tabled"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.96
	37	"The atmosphere motivated me as a learner "	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.9
	38	"There were opportunities for me to develop my interpersonal skills"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.93
	39	"The atmosphere was comfortable for online learning process"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.83
	40	"I found the learning experience disappointing"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.89
	41	"I was able to ask questions freely"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.97
Academic Self Perception	42	"I feel I am being well prepared for my career"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.82
	43	"Last year work has been a good preparation for this year's work"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.83
	44	"My problem-solving skills are being well developed and are improving"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.81
	45	"Learning strategies which worked for me before continue to work for me now"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.86
	46	"I am confident about passing this year"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.79
	Social Self Perception	47	"I felt too tired to enjoy this course"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
48		"I was rarely bored on this online learning system"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.91
49		"There is a good support system for students who get stressed"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.84
50		"I communicated regularly with other students in this course"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.93
51		"I was able to share resources and information with other students"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.85
52		"I often asked other students for help in activities we are doing"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.76
Reflective Thinking		53	"I felt a sense of satisfaction and achievement about this learning activity"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	54	"I found using internet for learning was stimulating "	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.84

55	"I feel I was in control of my learning as I review the material provided"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.79
56	"I feel the web-based learning approach can substitute for or enhance the normal classroom approach"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0.76

*The highlighted items were excluded and Final version of scale included 48 Items as shown in Table 1.