ASSESSMENT OF SYNCHRONOUS ONLINE ARCHITECTURE EDUCATION FROM STUDENTS' PERSPECTIVE

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ABSTRACT

This research aims to identify and investigate different dimensions and underlying factors influencing the successful implementation of e-Learning, from participants' viewpoint, i.e. architecture students. To examine the constituents of an effective e-Learning experience in education, evaluation themes were formulated as overall substitutability level, cognitive performance, social interaction and engagement, student comprehension and comfort, personal preference, and learners' satisfaction. Through literature survey and review of mostly referred factors affecting e-Learning efficiency, four dimensions were designated for further elaboration in this study: (i) course characteristics, (ii) participant characteristics, (iii) e-Learning environment, and (iv) prior acquaintance, with each category including several sub-measures. Survey method was employed and a questionnaire was administered to 122 architecture students at both undergraduate and graduate levels to investigate participant perspectives in reference to particular synchronous lectures delivered online. Out of ten potential influencing factors hypothesized, seven were verified to be critical determinants of e-Learning effectiveness in architectural education.

Keywords: Architectural education, distance education, e-Learning, statistical analysis, students' satisfaction.

INTRODUCTION

The digital transformation in education has been a subject of remarkable interest for decades and continues its fast-paced evolution, shifting trends in learning and teaching experiences. Coupled with technology and innovation, the digitization of education requires a complete transition in methods, approaches, and mindset. The digital ecosystem, facilitated by information and communications technology, is the current medium for e-Learning, also known as online learning or web learning. Yet, it sustains a long-standing history as a successor to distance education.

Through its history, introducing new media and communication forms have inevitably shaped and revolutionized distance learning. Currently, two main modes of distance education are characterized as synchronous (real-time) and asynchronous distance learning. In this study, synchronous e-learning activities

have been explored through distant lectures conducted under various conditions. The lectures were delivered as part of an Erasmus+ partnership project entitled Re-use of Modernist Buildings (RMB - https://www.rmb-eu.com/about), where remote or blended distance education was considered for a prospective master's programme.

The paper investigates different dimensions and underlying factors influencing online teaching/e-Learning effectiveness in architectural education, and examines their relation to various outcome variables such as overall substitutability level, cognitive performance, social interaction and engagement, student comprehension and comfort, personal preference, and learners' satisfaction in comparison to face-to-face instruction. To explore the experience of online architectural education from the perspective of learners, this study employs the survey research method. Feedback data on the distance sessions executed were collected from the audience through a questionnaire administered to participating university students of undergraduate, graduate levels and attendants of the workshop. Participation in the survey was voluntary and completely anonymous. The results acquired through the survey and the subsequent analyses, the presented advantages and obstacles of online architecture education from the perspective of learners, are expected to contribute to the field by advancing and strengthening the remote teaching/learning potentialities.

The results presented here illustrate participants' perspectives and experiences on online education prior to the Covid-19 pandemic, before all actors of education had to adapt to new ways of learning and teaching. Therefore, the focus and outcomes shall be addressed independent of currently offered emergency remote teaching, blended or hybrid methods, and other models to maintain instruction during the pandemic.

THEORETICAL BACKGROUND

The literature agrees on certain prominent models for evaluating e-Learning success. Nevertheless, various researches and studies have introduced different dimensions that impact online education effectiveness regarding the discipline addressed, cultural differences, and the diversity of student populations included. Following sections present a selection of commonly cited factors affecting online education efficiency, success components, and measurement items that were leveraged to further develop the research framework.

Critical Success Factors

A prominent issue in the field of e-Learning is to provide a successful online educational experience, and consequently, several studies have focused on identification of critical success factors (CSFs) influencing online education effectiveness.

A recent literature survey on e-Learning by Al-Fraihat et al. (2020) identifies four prominent approaches for measuring success: DeLone and McLean information systems success model; Technology Acceptance Model; User Satisfaction Models; and E-Learning Quality Models. The original and updated models of DeLone and McLean (1992; 2003) are foremost and frequently employed evaluation models for measuring e-Learning success. A significant number of studies adopt and reformulate its six interrelated constructs: system quality, information quality, service quality, (intention to) use, user satisfaction, and net benefits (e.g., Al-Fraihat et al., 2020; Bhuasiri et al., 2012; Manisi et al., 2018; Mtebe and Raphael, 2018; Raspopovic et al., 2014).

Diverse aspects and measures addressed by different researchers were correlatively reviewed and compiled to identify often-referred factors contributing the e-Learning success (Table 1). The large number of CSFs identified represents differing objectives when analyzed in detail; therefore, similar and consistent CSFs were clustered to establish convenient and manageable criteria set. In particular, technology, e-Learning environment and infrastructure (ENV), instructor and audience characteristics (CHAR), course structure and content design (CRSE) are the main CSF aspects widely associated with effective and successful e-Learning implementation. Communication and interaction among course participants and instructors, besides technical assistance and support, were other up-front factors to consider; thus, included in ENV due to their close affiliation with e-Learning environment. Use of the proffered e-Learning tools and environment (USE), benefits and perceived usefulness of it (ADV) were comparatively rare factors referred to. Finally, learner satisfaction (SATF), being the ultimate objective of a successful implementation, emerges as an uncommon CSF as well.

Table 1. CSFs identified by researchers and associated aspects

Author(s)	CSFs	Aspect
DeLone and McLean (1992; 2003)	System Quality (adaptability; availability; reliability; response time; usability in 2003 model)	ENV
	Information Quality (completeness; ease of understanding; personalization; relevance; security in 2003 model)	CRSE
	Service Quality (assurance; empathy; responsiveness in 2003 model)	ENV-CRSE
	Use (nature of use; navigation patterns; number of site visits; number of transactions executed in 2003 model)	USE
	User Satisfaction (repeat purchases, repeat visits, user surveys in 2003 model)	SATF
	Net Benefits (previously two separate categories as Individual Impact and Organizational Impact in 1992 model)	ADV
Volery and Lord (2000)	Technology (ease of access and navigation; interface design and level of interaction)	ENV
	Instructor Characteristics (attitudes towards students; instructor technical competence, and classroom interaction)	CHAR
	Student Characteristics (the previous use of the technology from a student's perspective)	CHAR
Bolliger and Martindale (2004)	Instructor issues	CHAR
	Communication (i.e., learner-content, learner-instructor, and learner-learner interaction)	ENV-CRSE
	Technology	ENV
	Course management	ENV
	Course web site	ENV
	Interactivity (i.e., social interaction and collaboration)	ENV-CRSE
	General information (i.e., being be motivated, organized, and committed)	CHAR
Eom et al. (2006)	Student self-motivation	CHAR
	Student learning style	CHAR
	Instructor knowledge and facilitation	CHAR
	Instructor feedback	CRSE
	Interaction	ENV-CRSE
	Course structure	CRSE
Selim (2007)	Instructor characteristics (attitude towards and control of the technology; and teaching style)	CHAR
	Student characteristics (computer competency; interactive collaboration; and e-learning course content and design)	CHAR
	Information technology (ease of access and infrastructure)	ENV
	University support	ENV
Sun et al. (2008)	Learner dimension (Learner attitude toward computers; Learner computer anxiety; Learner Internet self-efficacy)	CHAR
	Instructor Dimension (Instructor response timeliness; Instructor attitude toward e-Learning)	CHAR
	Course dimension (E-Learning course flexibility; E-Learning course quality)	CRSE
	Technology dimension (Technology quality; Internet quality)	ENV
	Design dimension (Perceived usefulness; Perceived ease of use)	USE
	Environmental dimension (Diversity in assessment; Learner perceived interaction with others)	ENV
Frimpon (2012)	Student (Discipline; Computer competency; eAttitude; Participation & Involvement)	CHAR
	Faculty (eMindset; Technical competency; Course development; Evaluation & Assessment; eLearning environment)	CHAR
	Technology (eLearning platform; Tech support; Tech quality; eCourse maintenance)	ENV
	Institution (Subject matter experts; Intellectual property; Institutional support; Sustainability)	ENV

Bhuasiri et al. (2012)	Personal dimensions (Learners' Characteristics; Instructors' Characteristics; Extrinsic Motivation)	CHAR
	System dimensions (Infrastructure and system quality; Course and information quality; Institution and service quality)	ENV-CRSE
	Environmental dimensions (E-learning environment)	ENV
Raspopovic et al. (2014)	Systems quality (Flexible for adaptation; Flexible for personalization; Stable Reliable; Secure Responsive; User-friendly)	ENV
	Information quality (Well-organized; Consistent; Clearly written; Systematic; Useful; Personalizable to the individual learning needs; Relevant to the subject)	CRSE
	Service quality (Displayed knowledge; Availability; Promptness; Helpfulness; Evaluation grade for instructors given by students; Stimulating interest in the subject; Understanding the professor; Obtaining feedback from the professor)	ENV-CRSE
Mtebe and Raphael (2018)	System quality	ENV
	Course quality	CRSE
	Service quality (i.e., the quality of services offered by the IT units)	ENV
	Instructor quality	CHAR
	Perceived usefulness	ADV
	Learner satisfaction	SATF
Kerzic et al. (2019)	Student factors (prior experience/knowledge of IT; self-efficacy; self-motivation; learning style and responsibility for one's own learning pace)	CHAR
	Teacher factors (characteristics; ICT competencies; teaching style; knowledge, facilitation, feedback and course structure; online instruction; information quality and service delivery quality)	CHAR
	Technology acceptance and technical support (ease of use; ease of access; user-friendly interface; technical support)	ENV

ADV: benefits and perceived usefulness

CHAR: instructor and audience characteristics

CRSE: course structure and content design

ENV: technology, e-Learning environment and infrastructure

SATF: learner satisfaction

USE: use of the proffered e-Learning tools and environment

The evaluation and measurement of factors affecting e-Learning efficiency have been the subject of a long-running debate; therefore, distinct key determinants and particular derivations of success measures are extensively covered in literature. Based on these findings, four major categories to be explored and employed were identified: (i) course characteristics, (ii) participant characteristics, (iii) e-Learning environment, in association to CRSE, CHAR, and ENV aspects respectively, and (iv) prior acquaintance, which can be linked to CHAR to some extent.

Components of an Effective Online Experience in regards to CSFs

The components of selected dimensions are further examined to distinguish their subscales and are utilized to develop and prepare the evaluation criteria.

Evidently, course characteristics undertake a fundamental role in the success of e-Learning systems. Several researchers (Bolliger and Martindale, 2004; Eom et al., 2006; Sun et al., 2008; Raspopovic et al., 2014; Mtebe and Raphael, 2018) suggest that course-related subscales i.e., management, structure, and quality, are important determinants for creating an effective e-Learning environment.

Another major aspect of e-Learning effectiveness, referred to in a large volume of research, is the student/learner dimension (e.g., Valory and Lord, 2000; Eom et al., 2006; Sun et al., 2008; Frimpon, 2012; Bhuasiri et al., 2012; Seters et al., 2012; Raspopovic et al., 2014; Kerzic et al., 2019). The ongoing debate on gender

effects in online education has been revisited and researched in many studies. Several researchers acknowledge differences in learning strategies, participation and perceptions, attitudes, and communication behaviors driven by gender factors in an online educational environment (Lee, 2002; Rovai and Baker, 2005; Price, 2006; Dong and Zhang, 2011).

Volery and Lord (2000) acknowledge reliability, quality, and medium richness of technology as influencing factors in the effectiveness of distance education. Facilitating different communication types and improving the perceived interaction in online delivery is another aspect to be considered to enhance engagement (Bolliger and Martindale, 2004). According to Sun et al. (2008), interaction mechanisms are decisive in affecting learners' satisfaction in virtual learning environments due to increased exposure to distractions and decreasing attention span.

Previous acquaintance implies face-to-face encounters among the learners and instructors, which influence first impressions and interpersonal perceptions. Prior attendance to the instructor's classical-classroom lectures indicates familiarity with the instructor's perspective, attitude, and way of teaching. Both of which could majorly contribute to the social processes in an online environment. Former association with the instructor may enhance the quality of student-teacher interaction, promoting further communication and engagement within the learning medium. There have been numerous studies to investigate this prospective contributing factor in the field of educational psychology. However, a number of questions regarding its effects on university students and learning/teaching methods for undergraduate and postgraduate courses and qualifications remain to be addressed.

Examining the commonly referred CSFs and their extent, this study concentrates on ten potential subscales covered under (i) course characteristics, (ii) participant characteristics, (iii) e-Learning environment, and (iv) prior acquaintance, as detailed in the following sections.

METHODS AND MATERIALS

Focusing on different dimensions and underlying factors influencing e-Learning effectiveness in architectural education, this study examines their relation to various outcome variables compared to face-to-face instruction. This paper aims to identify key factors affecting the efficiency of distance architectural education and to investigate participant satisfaction in reference to the particular courses that were delivered online. The main stages of the research, which aimed to identify key factors affecting the efficiency of distance architectural education considering participant satisfaction, were (i) construction of conceptual research model; (ii) development and employment of survey instrument; and (iii) data analysis and evaluation, all of which will be described briefly in the following subsections. The research model proposed and adopted in this study was based on relevant literature and utilizes quantitative analysis methods. A survey instrument was employed for data collection, and the questionnaire was designed in association with the selected factors in the model.

Conceptual Framework

The conceptual framework adopted, shown in Table 2, presents ten potential factors influencing e-Learning performance and implementation, which are covered under four dimensions identified. Certain potential factors, in particular, age and gender, have been repeatedly identified in literature, while some exceptional ones, i.e., prior acquaintance with the lecturer, were considered noteworthy to be explored by the authors and included in the research. The components of an effective e-Learning implementation, to be observed and measured through survey method, are accordingly nominated as overall substitutability level, cognitive performance, social interaction and engagement, student comprehension and comfort, personal preference, and learners' satisfaction.

Table 2. Potential factors affecting the e-Learning efficiency

SELECTED DIMENSIONS	POTENTIAL INFLUENCING FACTORS
Course characteristics	Distant Lecture Level
	Distant Lecture Subject
	Distant Lecture Method
	Grading Policy
Participant characteristics	Gender
	Age
	Previous experience on Distant Lecture
e-Learning environment	Distant Lecture settings
Acquaintance	Acquaintance with the lecturer
	Acquaintance with her/his face-to-face lecture

Survey Instrument

Survey method employed to conduct this research involves two main steps: (i) questionnaire design, and (ii) execution of distant lectures and data collection.

Design of Questionnaire

The questionnaire employed in this paper was substantially developed by the RMB- Istanbul Technical University (ITU) team within the framework of RMB, aforementioned Erasmus+ partnership project that ran between 2016-2019. The project's consecutive outcome, a joint master programme to be established, was strategically designed to facilitate and contribute to the international collaboration of partner universities, with a particular emphasis on e-Learning and adoption of remote teaching formats (Altintas Kaptan et al., 2021). In this context, a survey form was designed to explore and understand participants' (i.e., students') experiences and perspectives regarding the distant education sessions executed in line with the project's objectives. The survey form comprises a total of 10 questions (Figure 1), addressing several evaluands and influencing factors (Table 2) through multiple-choice questions, Likert scale questions, and open-ended text boxes.

The first set of questions includes multiple-choice questions and free text boxes, intended to collect demographic information and to identify the characteristics and setting of the distant lecture attended. The influencing factors identified (Table 2), except for grading policy, were addressed via questions 1 to 6 (Figure 1). The grading policy, though not explicitly integrated into the questionnaire, was investigated as an additional factor within the study, based on student-evaluation approach used during the distant lecture. The second part of the questionnaire was designed to investigate the effectiveness of both theoretical lectures and design studios attended in an online environment and other online experiences, if any, to be explored through several themes formulated as; overall substitutability level, cognitive performance, social interaction & engagement, student comprehension & comfort, personal preference, and satisfaction (Figure 1). 5-point Likert-scale questions were adopted to measure respondents' agreement with various statements compared to traditional face-to-face learning (see Table 4 in Analyses and Findings for the statements). In the scale, 1 stands for 'strongly disagree', 3 for 'neutral', and 5 for 'strongly agree'. Additionally, the option of 'undecided' was included to eliminate and minimize blank or inconsistent answers. Still, there were several participants who preferred not to answer some questions, although in fewer numbers. The third and last part of the questionnaire was reserved for any feedback and input from respondents regarding the distant lecture attended, provided through a free text box.

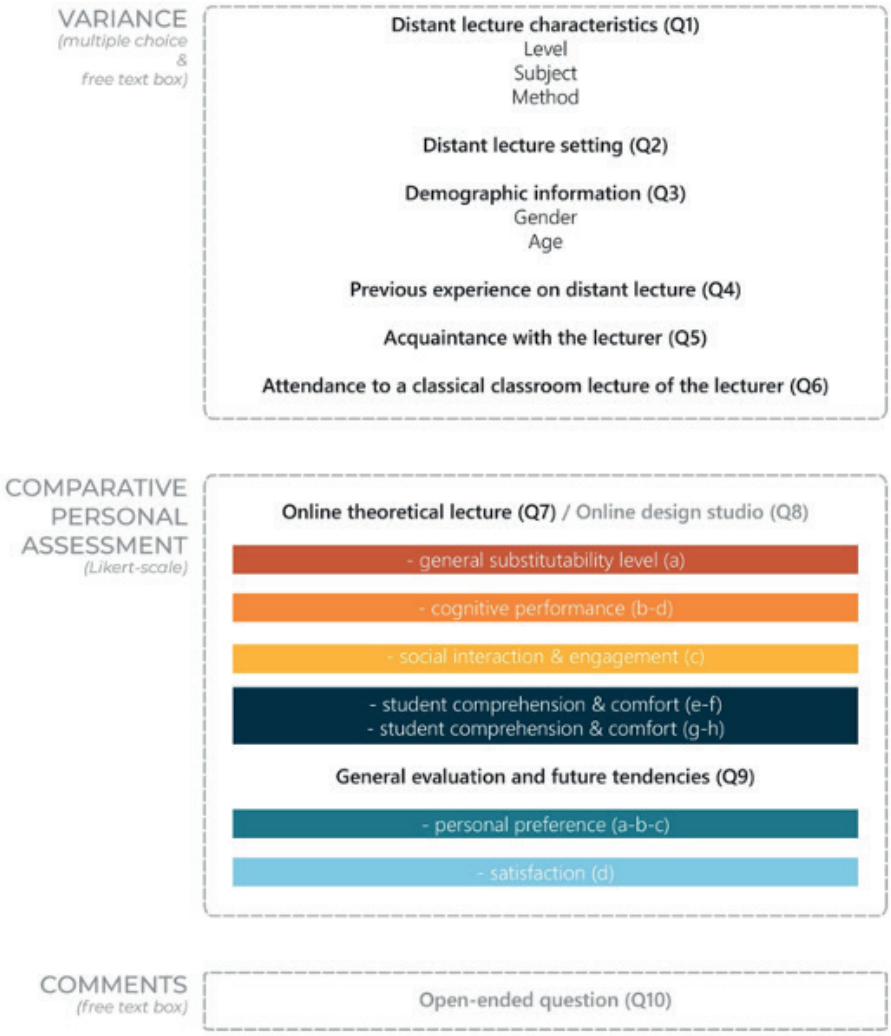

Figure 1. Questionnaire structure (Altintas Kaptan et al. (2021), revised by authors)

Delivery of Distant Lectures and Data Collection

At ITU, synchronous online seminars, lectures, and a design studio have been organized - some in collaboration with partner universities - with reference to the RMB project, to explore and experience distance teaching strategies in design education (Altintas Kaptan et al., 2021). Starting from 2017-2018 spring semester until the end of 2019-2020 fall semester (i.e., the last semester before the Covid-19 pandemic), a total of seven distant lectures with varying characteristics and participant populations were conducted either as part of a semester-long course or as independent events. Except for the student workshop lecture on 'history', all online lectures executed were of either at the undergraduate or graduate-level, and the main subject covered was 'technology'. In the student workshop, both undergraduate and graduate-level students participated together. The teaching method adopted in the majority of distant sessions executed was of 'theoretical lecture'; there was only one lecture delivered as a 'design studio'. All online sessions were performed using Adobe Connect. The list of distant lectures executed, together with their characteristics, is presented in Table 3.

After each session, the questionnaire was distributed to collect attendee feedback and, eventually, to identify the determinants of online architectural education efficiency through participant evaluation. It was a self-administered, voluntary, and anonymous questionnaire, and was completed by 122 respondents participating in online synchronous lectures.

Table 3. The list of distant lectures executed

Distant Session #	Semester	Session language[a]	Level[b]	Subject	Method[c]	Setting[d]	# of responses	Grading Policy
DS1	17-18 spring	Eng	UG	Technology	TL	s3	13	No grade (part of a course)
DS2	17-18 spring	Tr	MS	Technology	TL	s1	14	No grade (part of a course)
DS3	18-19 fall	Eng	SW	History	TL	s1	36	No grade (part of an event)
DS4	18-19 fall	Tr	MS	Technology	TL	s1	10	No grade (part of a course)
DS5	18-19 fall	Tr	UG	Technology	DC	s5	5	No grade (part of a course)
DS6	18-19 spring	Tr	MS	Technology	TL	s1	13	No grade (part of a course)
DS7	19-20 fall	Eng	UG	Technology	TL	s3	31	Graded (part of a course)

[a]: *English (Eng); Turkish (Tr)*

[b]: Undergraduate (UG); Master's (MS); Student Workshop (SW)

[c]: Theoretical lecture (TL); Design class (DC);

[d]: s1 (Classroom lecture given by a distant lecturer using classroom's data show/projector screen); s3 (Distant connection to an online theoretical web lecture); s5 (Design review using a web-based platform with screen sharing feature)

Data Analysis and Evaluation

In this study, 117 of 122 collected responses were used. Although the teaching method potentiality was initially intended to be investigated, data collected from DS5 were excluded due to the limited participation. Therefore, statistical analyses on respondents' comparative assessments of online design studios (Q8) were not computed. Assessment of the data collected through Q10, the open-ended question for participant feedback and comments, were also excluded since they were previously evaluated in another study (Altintas Kaptan et al., 2021).

The data collected were analyzed using IBM SPSS Statistics 27 software. Initially, descriptive statistics were utilized for simpler data interpretation. Subsequently, parametric tests (i.e., independent samples t-tests and ANOVA) and non-parametric tests (i.e., Mann-Whitney U test and Kruskal Wallis) were carried out to determine any significant relationship between evaluation themes and influencing factors. The statistical significance (alpha) level accepted to determine a relevant relationship was 0.05. Whenever a significant relationship was observed, boxplot graphs were leveraged for a detailed assessment of the change in responses.

ANALYSES AND FINDINGS

The distribution of influencing factors covered in Q1-Q6 is presented in Figure 2. Accordingly, a relatively homogenous distribution among course variance has been achieved in distant lecture (DL) level, participants' prior acquaintance with the lecturer, and grading policy; whereas, a dominance favoring one variant can be observed in other cases. The DL method, which could expectedly impact respondents' evaluation, is not presented here since all distant lectures covered in this study were theoretical. Regarding participants' age, the habitual differences of age cohorts as referred to in generations were followed instead of certain age intervals. The exact year ranges that comprise certain generations vary according to different researchers—demographers. In this study, the age range defined by Pew Research Center (Dimock, 2019) had been used. Hereunder, participants born between 1965-1980 are grouped within Generation X. The accepted birth range for Millennials and Generation Z is between 1981-1996 and 1997-2012, respectively. All calculations are based on the age data provided on the online session day.

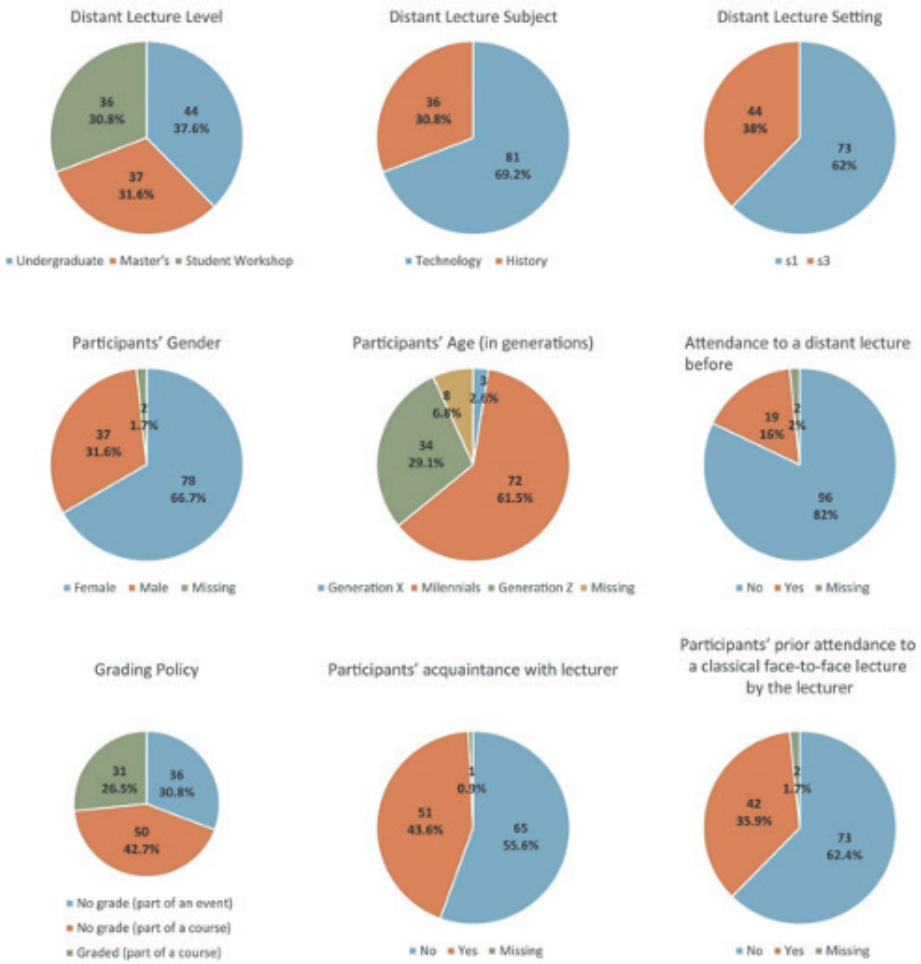

Figure 2. Descriptive analysis of influencing factors (frequency and percentage distribution)

Descriptive statistics on each statement article of Likert-scale questions are provided in Table 4. The responses to Q7e, Q7f, Q7g, and Q7h are fewer in number as those were conditional questions, where respondents are to answer if they met the specified criteria. A remarkable point observed relating to Q9d and Q9b is that attendees mostly agree (%45.2) with article Q9d, demonstrating their approval of DL advantages regarding being free from location-dependent restraints. Still, article Q9b suggests there is a considerable proportion of participants (%31.3 and %11.3) who reported a preference for attending a classical-classroom lecture.

Table 4. Descriptive analysis of Likert-scale assessment statements including frequency (f) and percentage values (%)

Question No	Statement		Responses*						
			Strongly disagree - 1	Disagree - 2	Neutral - 3	Agree - 4	Strongly agree - 5	Undecided - 6	Total # of responses
Q7a	"Distant lecture was not different from the other in general"	f	7	36	30	32	12	0	117
		%	6.0	30.8	25.6	27.4	10.3	0.0	
Q7b	"Distant lecture technique did not have any positive or negative effect on my understanding the subject"	f	12	48	26	17	9	3	115
		%	10.4	41.7	22.6	14.8	7.8	2.6	
Q7c	"I felt comfortable in asking my questions during the distant lecture"	f	7	13	12	35	38	7	112
		%	6.3	11.6	10.7	31.3	33.9	6.3	
Q7d	"I could easily concentrate on the lecture without distraction during the distant lecture"	f	8	18	24	38	27	0	115
		%	7.0	15.7	20.9	33.0	23.5	0.0	
Q7e	"To get to know the lecturer previously did not have any effect on my understanding the subject or feeling comfortable during the distant lecture, etc."	f	6	9	14	14	5	4	52
		%	11.5	17.3	26.9	26.9	9.6	7.7	
Q7f	"Not to get to know the lecturer previously did not have any effect on my understanding the subject or feeling comfortable during the distant lecture, etc."	f	1	7	6	23	24	1	62
		%	1.6	11.3	9.7	37.1	38.7	1.6	
Q7g	"To attend a classical lecture of the lecturer previously did not have any effect on understanding the subject, or feeling comfortable during the distant lecture, etc."	f	3	8	13	11	6	1	42
		%	7.1	19.0	31.0	26.2	14.3	2.4	
Q7h	"Not to attend a classical lecture of the lecturer previously did not have any effect on understanding the subject, or feeling comfortable during the distant lecture, etc."	f	1	6	14	24	21	4	70
		%	1.4	8.6	20.0	34.3	30.0	5.7	
Q9a	"If there is any other distant lecture/design studio, I want to attend it"	f	5	7	22	33	40	4	111
		%	4.5	6.3	19.8	29.7	36.0	3.6	
Q9b	"If the same lecture/design studio is given both at the classical classroom environment and as distant lecture, I prefer to attend the distant one"	f	11	33	23	17	24	2	110
		%	10.0	30.0	20.9	15.5	21.8	1.8	
Q9c	"If there is a master's degree programme with some distant courses, presence of distant courses does not affect my opinion/wish about this programme"	f	7	17	22	34	20	10	110
		%	6.4	15.5	20.0	30.9	18.2	9.1	
Q9d	"I found distant lecture/studio advantageous since it allows following the course wherever I want, even at home."	f	6	8	15	21	47	2	99
		%	6.1	8.1	15.2	21.2	47.5	2.0	

*: The numbers following the response options indicate the values used for each in the box-plot diagrams.

Parametric and non-parametric tests conducted demonstrate that, of the ten factors hypothesized to affect e-Learning outcomes (Table 2), only seven were found to be in significant relation with the evaluation themes (effective e-Learning components) for further investigation (Figure 3). The identified diffractions and relations in the respondents' opinion are further elaborated and presented together with the descriptive analysis results in the following subsections, which are organized as per designated evaluation themes.

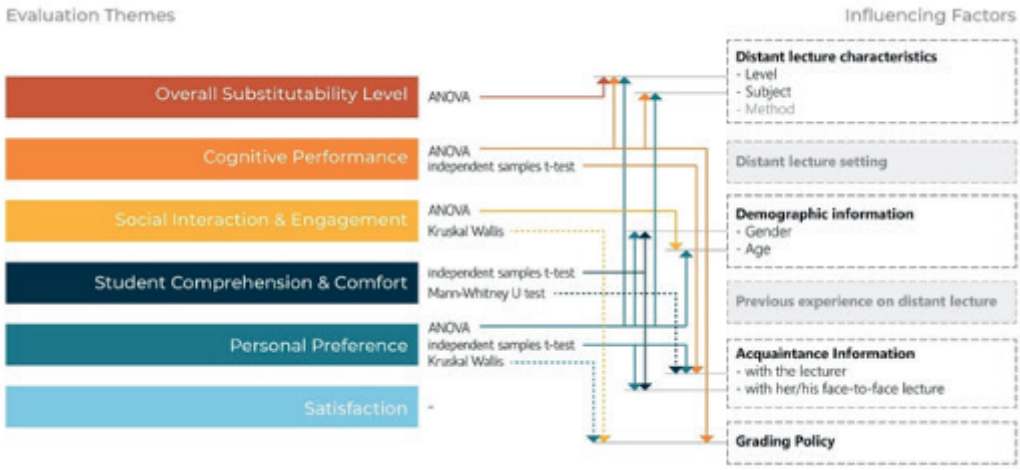

Figure 3. Significant relations network based on parametric and non-parametric tests

Overall Substitutability Level

Overall substitutability level (Q7a) indicates similarity and interchangeability levels of online and face-to-face courses in general. The response distributions in Table 4 and Figure 4 indicate that the ratio of respondents finding online sessions different from a face-to-face class is similar to those finding no difference (i.e., 36.8% and 37.7% respectively), yet, those strongly disagree are slightly greater than those strongly agree. Conversely, almost one-quarter of the respondents reported being neutral (25.6%) to the statement.

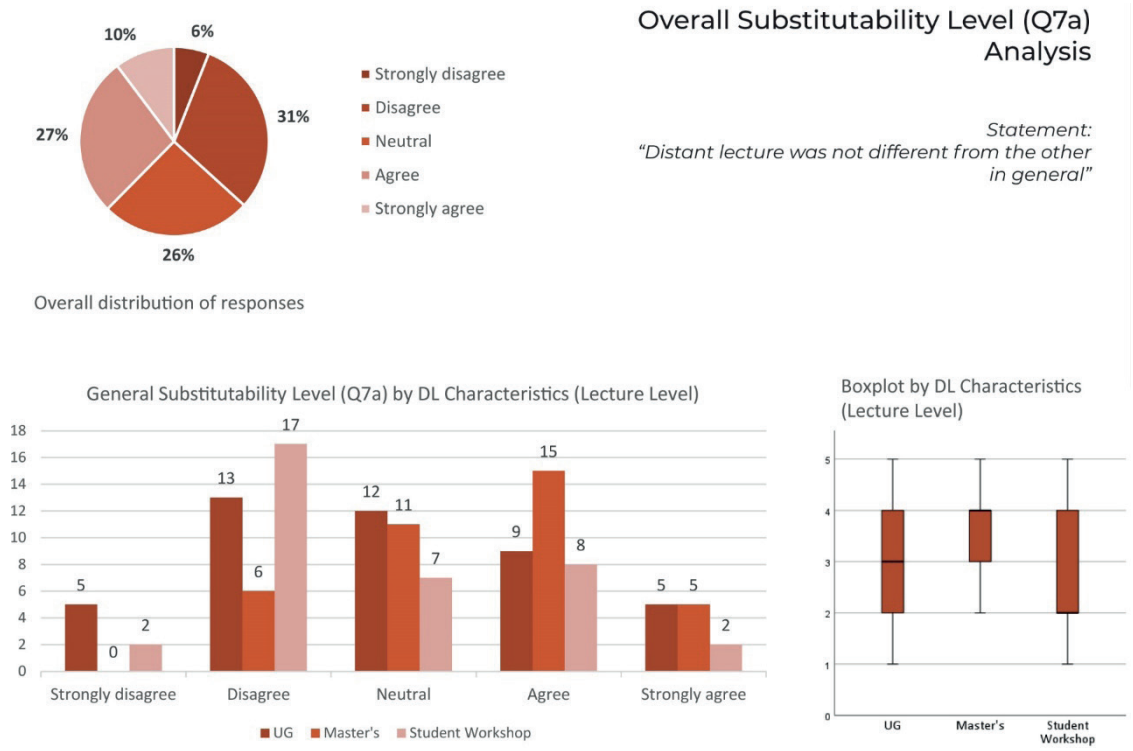

Figure 4. Overall substitutability level (Q7a) by DL Characteristics (Lecture Level)

Regarding the significant relation found between overall substitutability level and DL level, the box-plot diagram demonstrates the variation in the interquartile range (IQR) of responses and medians by DL level. The responses are more concentrated here, IQR is narrower and median value is at 'agree' for the master

level, while it is at 'neutral' for the undergraduate level, and at 'disagree' for the student workshop with a wider IQR, specifically with more dispersed results. Accordingly, the overall response patterns indicate students of master level lecture consider DL as a substitute for face-to-face lecture, whilst workshop attendees mostly acknowledge a distinction between instructional formats (face-to-face vs. distant). Students of the undergraduate lecture, contrarily, were neutral on the investigated issue.

Cognitive Performance

Cognitive performance attempts to identify participants' mental abilities regarding understanding (Q7b) and concentration (Q7d). The response distribution given in Table 4, Figure 5 and 6, indicate that majority of participants (52.1% as the summation of 'strongly disagree' and 'disagree') report on the possible positive or negative impact of distance education on their understanding. Conversely, relating to concentration, over half of participants (56.5% as the total of 'agree' and 'strongly agree') declared they could stay focused during online lectures.

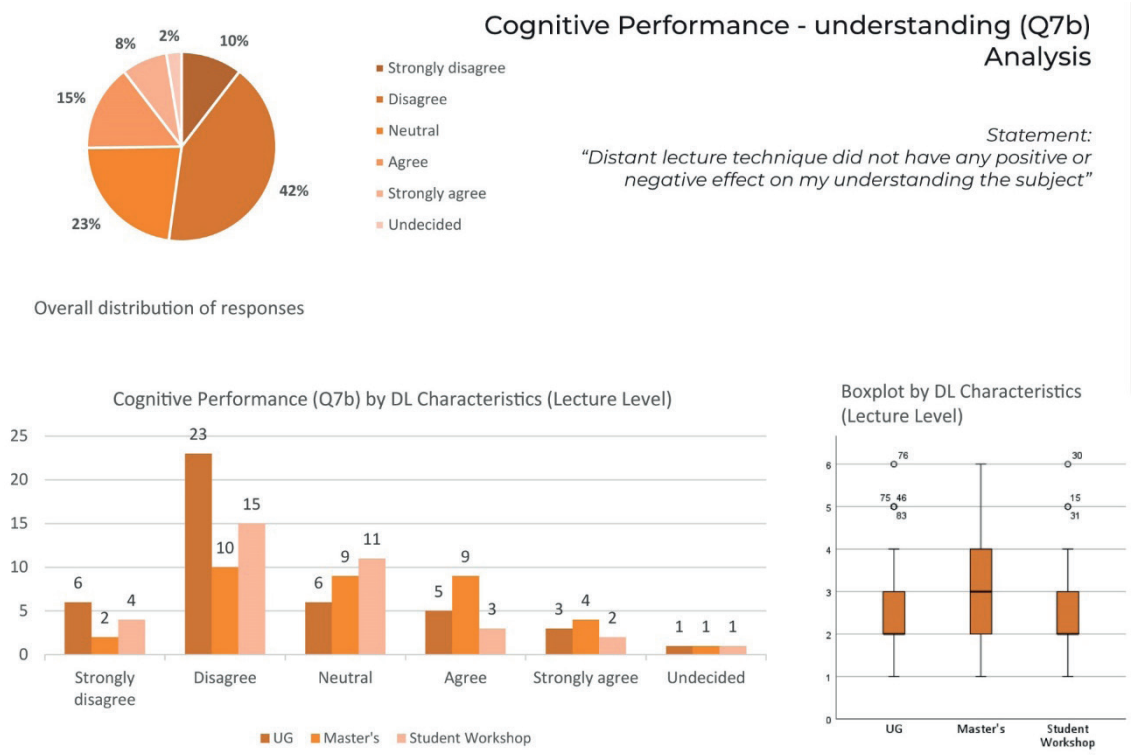

Figure 5. Cognitive performance – understanding (Q7b) by DL characteristics (Lecture Level)

Referring to the significant relation detected between understanding and DL level, the overall response patterns observed through box-plot diagramsshow that master students follow a neutral trend with a median value at 'neutral' and IQR extending to 'agree'. Yet, the median is at 'disagree' both for undergraduate level lectures and the student workshop with an IQR reaching just to 'neutral'. Apparently, undergraduate students and workshop attendees have experienced certain impacts of DL techniques on their understanding. Although, whether this effect is positive or negative is not addressed within the scope of this question, pairwise comparison of each participant's response to Q7d indicates that the effect may be positive for undergraduate students, since 78% of those who strongly disagreed or disagreed responded either as strongly agree or agree to not having a concentration problem. Yet, it is the opposite for workshop attendees, since 58% among strongly disagreed or disagreed stated a concentration problem.

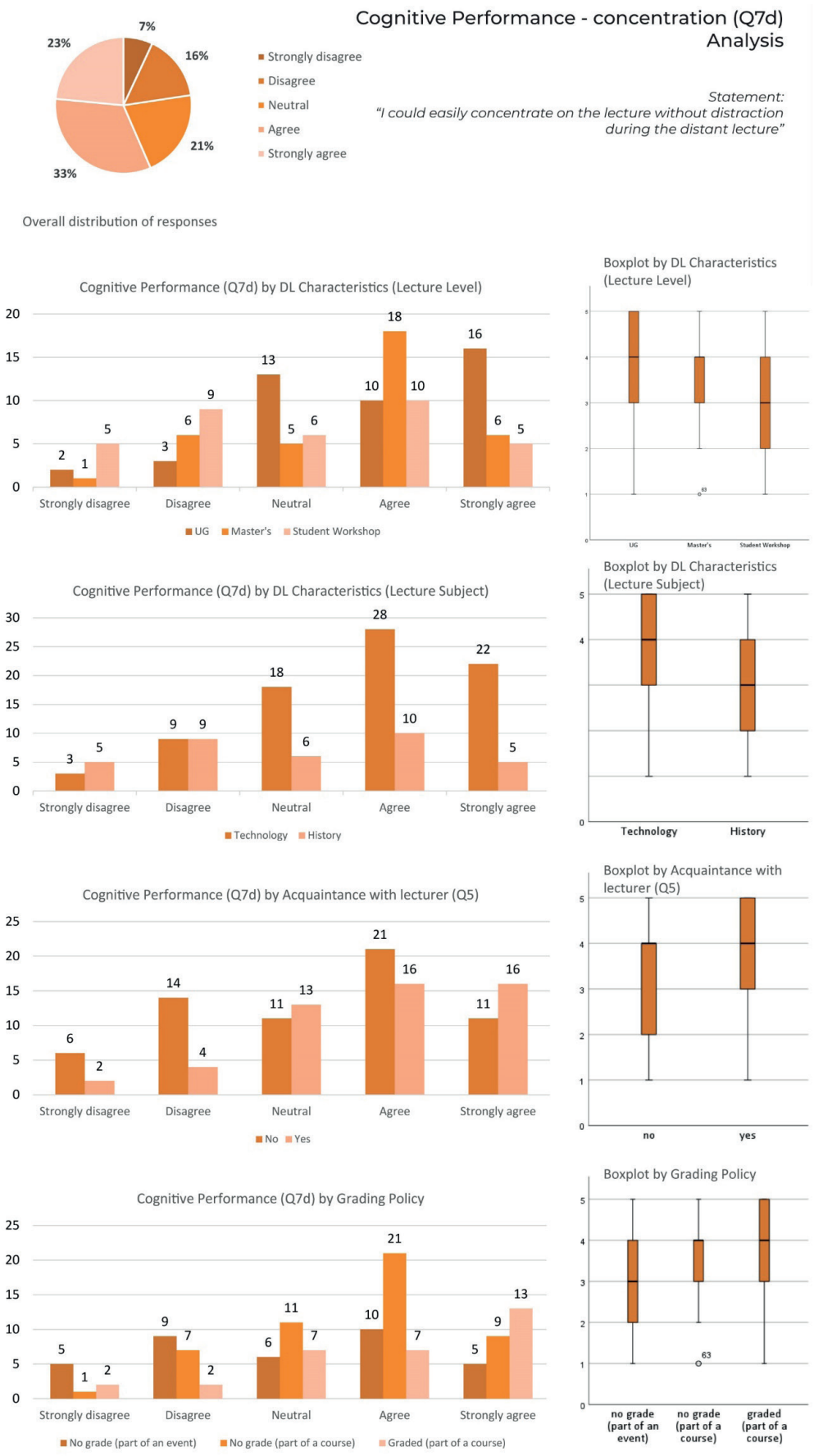

Figure 6. Cognitive performance – concentration (Q7d) by DL characteristics (lecture level and subject), acquaintance with the lecturer, and grading policy

Apropos of concentration, significant relations were observed with DL level, DL subject, acquaintance with lecturer, and grading policy. For DL level, half of master students (50%) state they could easily concentrate during DL without any distraction, and the median is at 'agree'. Undergraduate students' responses follow a similar trend with a median at 'agree' but IQR is wider, reaching 'strongly agree', indicating that concentration was not considered a significant problem among undergraduate students. However, workshop attendees' responses present a different pattern with a median value at 'neutral', and a ranging IQR between 'disagree' and 'agree'. Accordingly, balanced distribution between 'disagree' by 26% and 'agree' by 29% is observed, whereas slightly fewer responses were 'neutral' (17%). The overall response pattern signifies relative concentration issues to some extent. This concentration problem during the workshop may stem from the large hall in which DL (i.e., workshop lecture) was broadcasted to a large audience, namely due to session setting and its technical possibilities.

Based on DL subject, lectures of technology can be considered less prone to concentration and focus difficulties, with a median at 'agree' while 23% of respondents reported 'neutral' on the investigated issue. Participants of the history lecture, however, expressed more scattered views; 'disagree' by 26%, 'neutral' by 17%, and 'agree' by 29%, where median value is at 'neutral'. These findings imply that depending on lecture subject, participants' concentration levels may alter, thereby, student-interactive lectures that demand active participation may be opted for. Audience involvement needs to be encouraged specifically to make lectures more engaging.

Regarding participants' acquaintance with the lecturer, a slight effect on concentration has been observed. In both cases; i.e., participants who are previously acquainted with the lecturer and those who are not, most responses approved the statement, with a median value at 'agree', however, the distribution of views differs. For those with no previous acquaintance with the lecturer, IQR lower limit extends to 'disagree', where 22% of responses concentrated on 'disagree'. The majority of respondents with a previous acquaintance with the lecturer expressed their approval of the statement by 63% (as in summation of 'agree', and 'strongly agree'), and IQR upper limit for those extends to 'strongly agree' relatedly. This slight difference among the IQR range of two groups suggests that previous acquaintance with the lecturer enhances students' concentration in online lectures, supported by the higher ratio of negative responses (i.e., total of 'disagree' and 'strongly disagree') by those without an acquaintance versus those acquainted (32% and 12% respectively).

Relating to effects of grading policy on concentration, median value is at 'neutral' for the ungraded lecture as part of an event, and the response ratios for 'disagree', 'neutral' and 'agree' scales are 26%, 17%, and 29% respectively. Meanwhile, median for the respondents from ungraded lecture as part of a semester-long course is at 'agree', and those who reported to 'agree' with the statement have a higher ratio of 43%. The median of responses from participants attending a graded lecture as part of a course is also at 'agree', but with a considerable concentration around 'strongly agree' by 42% and 'agree' by 23%; besides, unlike others, its IQR extends to 'strongly agree'. Therefore, it could be argued that grading policies of online lectures may have an impact on participants' concentration; such that grading of participation and performance during a lecture can actually have a positive influence on students.

Social Interaction and Engagement

Social interaction & engagement (Q7c) refers to communication and involvement among participants and lecturer in an online environment. The response distribution given in Table 4 and Figure 6 indicates that over half of participants (65.2% as the total of 'strongly agree' and 'agree') reported feeling comfortable asking questions in an online learning environment.

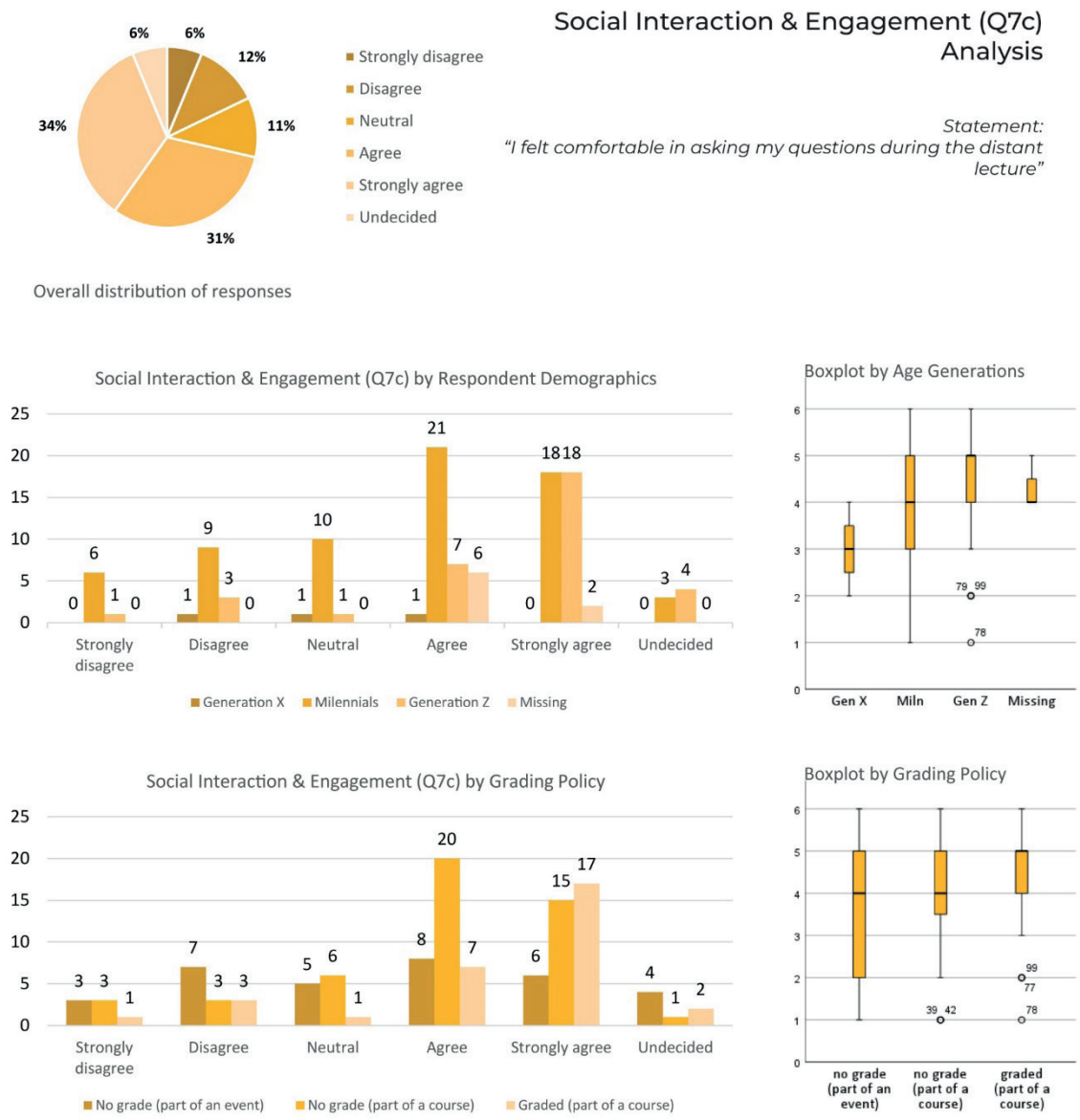

Figure 7. Social interaction & engagement (Q7c) by respondent demographics (generations) and grading policy

Regarding the significant relation between social interaction & engagement and generations, the total number of Generation X participants are too small to make any coherent comments. Between Millennials and Generation Z, a variance was observed clearer in box-plot diagrams; median value is at 'agree' for the Millennials with an apparent distribution of views towards neutral and disagreement whereas, it is at 'strongly agree' for the Generation Z with a narrower IQR, indicating that the latter group is more comfortable in in asking questions, in other words in interaction and engagement.

Based on grading policy and involvement, no considerable difference was spotted regarding social interaction and engagement among respondents of ungraded lecture as part of an event, where nearly a homogenous distribution among options were observed. In other two cases (ungraded and graded lectures as part of a semester-long course), general view of the participants was on the positive side, indicating no major issues with feeling comfortable in asking questions during DL. However, a slight distinction among cases is noted here; where the median value is at 'agree' for ungraded lectures as part of semester-long course whereas, it is at 'strongly agree' for the graded lecture with a slightly narrower IQR. These indicate that the grading policy of DL may create a positive impact on students to involve and participate in online lectures.

Student Comprehension and Comfort

Student comprehension & comfort investigates the ability to understand the lecture and to manage social anxiety in an online environment based on several conditions; previous acquaintance with the lecturer (Q7e) or no previous acquaintance (Q7f), and previous attendance to a classical-classroom lecture of the lecturer (Q7g) or no previous attendance (Q7h). The articles discussed in this section were responded by a limited number of participants due to the question prerequisites.

The response distributions of Q7e and Q7f given in Table 4 and Figure 8 indicate that the opinions of respondents with previous acquaintance with the lecturer (Q7e) were more dispersed (e.g. 17% 'disagree', 27% 'neutral' and 27% 'agree') whereas, those of with no previous acquaintance with the lecturer (Q7f) were more concentrated. Nearly their three-quarter (75.8% as the total of 'strongly agree' and 'agree') reported no effect of previous acquaintance on their comprehension and comfort, indicating that their understanding or confidence levels in DL was not dependent on being acquainted. The general opinion among respondents with previous acquaintance with the lecturer was also in support of the statement however, with a slight hesitation.

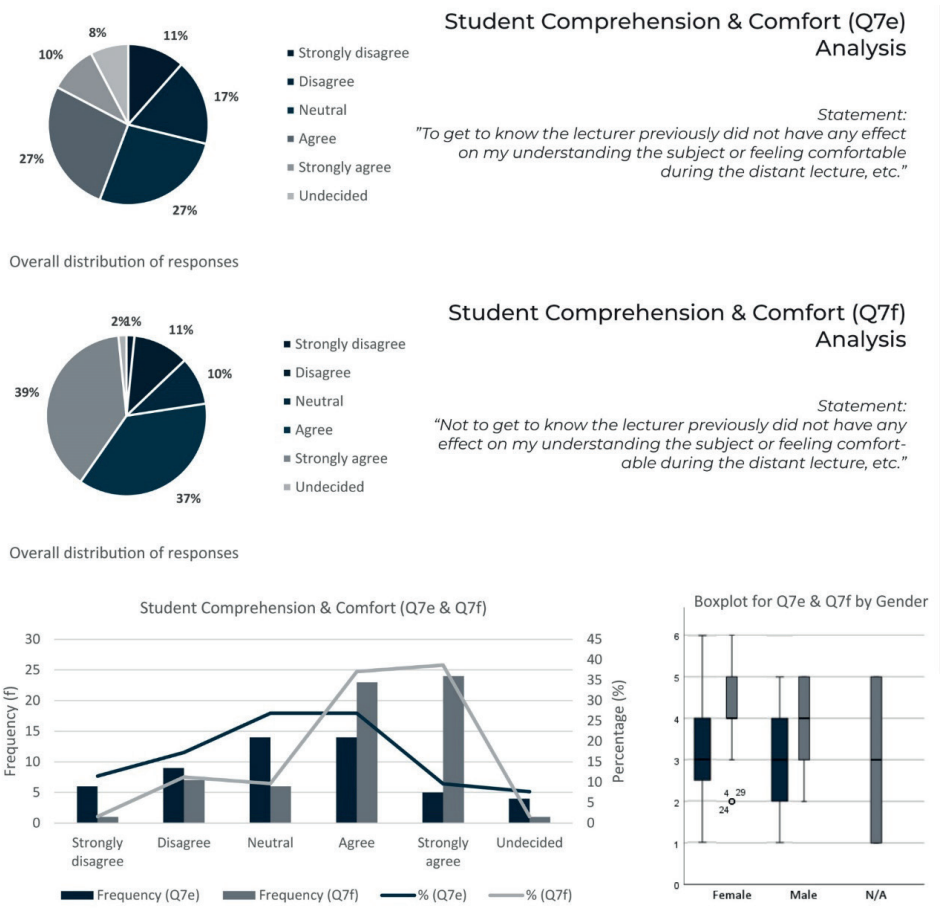

Figure 8. Student comprehension & comfort comparative analysis (Q7e – Q7f) and evaluation by respondent demographics (gender)

Relating to the significant difference detected between student comprehension & comfort and gender, findings indicate that median value for participants with previous acquaintance with the lecturer is at 'neutral' for both females and males. Whilst, it is at 'agree' for participants with no previous acquaintance, again for both genders. Yet, IQR of responses vary slightly gender-wise for both with and without previous acquaintance. The IQR lower limit is observed to extend to 'disagree' for male participants who are previously acquainted with the lecturer and to 'neutral' for male participants who are not whereas, their respective lower limits for female participants do not extend nearly as much comparatively. This slight difference among the IQR range of genders provides an insight that prior acquaintance or lack of acquaintance may be an issue for males rather than females.

The response distributions of Q7g and Q7h given in Table 4 and Figure 9 show that the responses from participants with prior attendance to a classical classroom lecture of the lecturer (Q7g) distributed almost evenly among 'disagree', 'neutral', and 'agree' (i.e., 19.0%, 31.0% and 26.2%, respectively). Whereas, among those without any prior attendance (Q7h), over half of the participants (64.3% as the total of 'strongly agree' and 'agree') reported no effect on their comprehension and comfort during DL, with a tendency towards approval of the statement that says their understanding or feeling comfortable in DL was not relevant with the state of prior attendance. The general opinion among respondents who have attended a classical-classroom lecture was also in support of the statement however, with a slight hesitation.

Regarding the significant difference detected between student comprehension & comfort and gender, findings indicate that median value for participants with a prior attendance to a classical lecture of the lecturer is at 'neutral' for both females and males, whilst for those with no prior attendance, it is at 'agree' for female and at 'neutral' for male participants. Nonethless, IQR of responses vary considerably gender-wise among both groups. For female participants who have previously attended a classical-classroom lecture of the lecturer, IQR is wider with a lower limit extending to 'disagree' whereas, for male participants with previous classroom attendance, IQR is narrow and concentrates between 'neutral' and agree'. In the case of no prior attendance, eventhough IQRs have the same width, their concentration ranges are different for female and male participants, i.e., ranges between 'agree' to strongly agree', and between 'neutral' to 'agree' respectively. These differences among genders provides an insight that prior attendance to a classical-classroom lecture of the lecturer may be an issue for females rather than males.

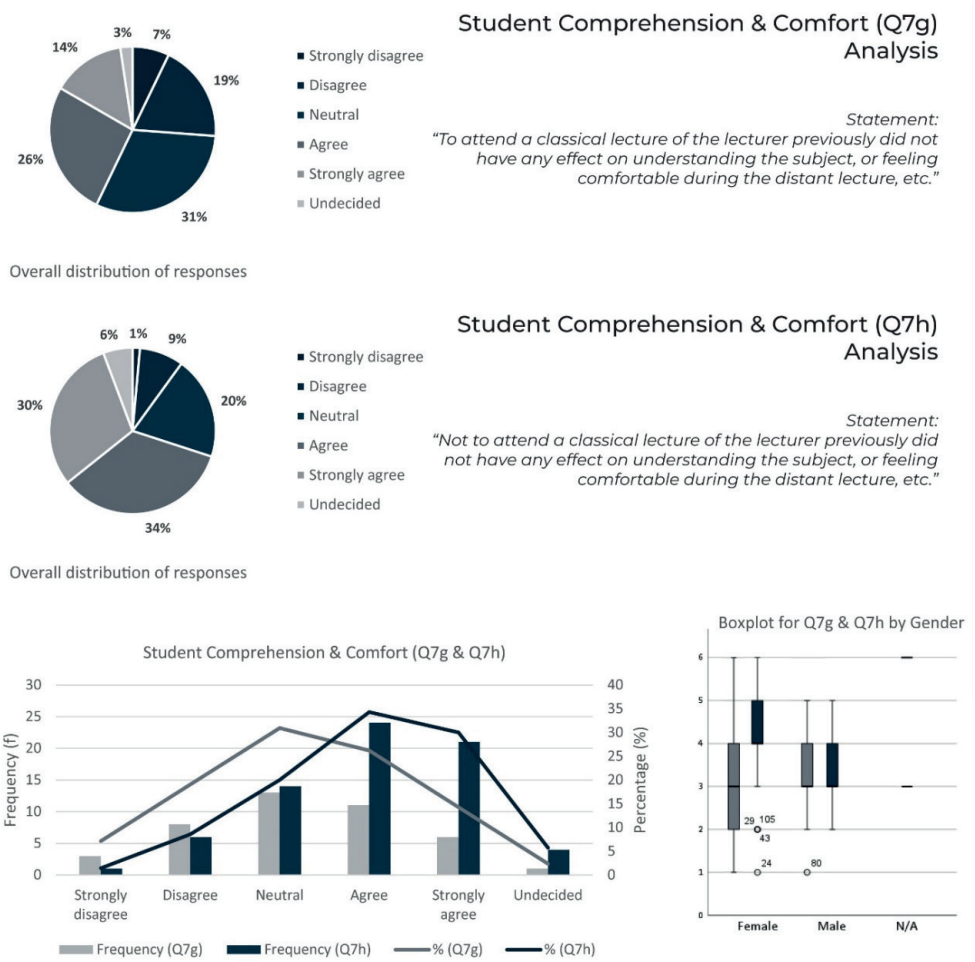

Figure 9. Student comprehension & comfort comparative analysis (Q7g – Q7h) and evaluation by respondent demographics (gender)

Personal Preference

Personal preference, as the name suggests, indicates the particular opinion or choice a person might prefer distinguished from others. This issue is assessed relative to participants' tendency towards attending other online lecture possibilities in future (Q9a), preferred delivery method (face-to-face vs. distant) for the lecture attended (Q9b), and choice on selecting a master's degree programme with distant courses included (Q9c).

The response distribution of tendency towards attending another online lecture in future (Q9a) shown in Table 4 and Figure 10 indicates that over half of the participants (65.8% as the total of 'strongly agree' and 'agree') reported being willing to attend any possible distance course in future. Regarding its significant relation to grading policy, in-depth analysis demonstrates that, although the medians of the responses from no grade lectures are both at 'agree', the IQR of ungraded as part of a semester-long course is wider, and extends to 'strongly agree'. This might imply an increased willingness compared to the ungraded as a part of an event. Graded lecture, however, revealed a more noticeable emphasis of positive reactions for future possibilities, 67% of respondents expressed their willingness to attend any other DL in future by marking 'strongly agree', and in turn the resulting median is at 'strongly agree'. These results indicate that the grading of class participation has a positive impact which increases their willingness to attend future DL/studio possibilities.

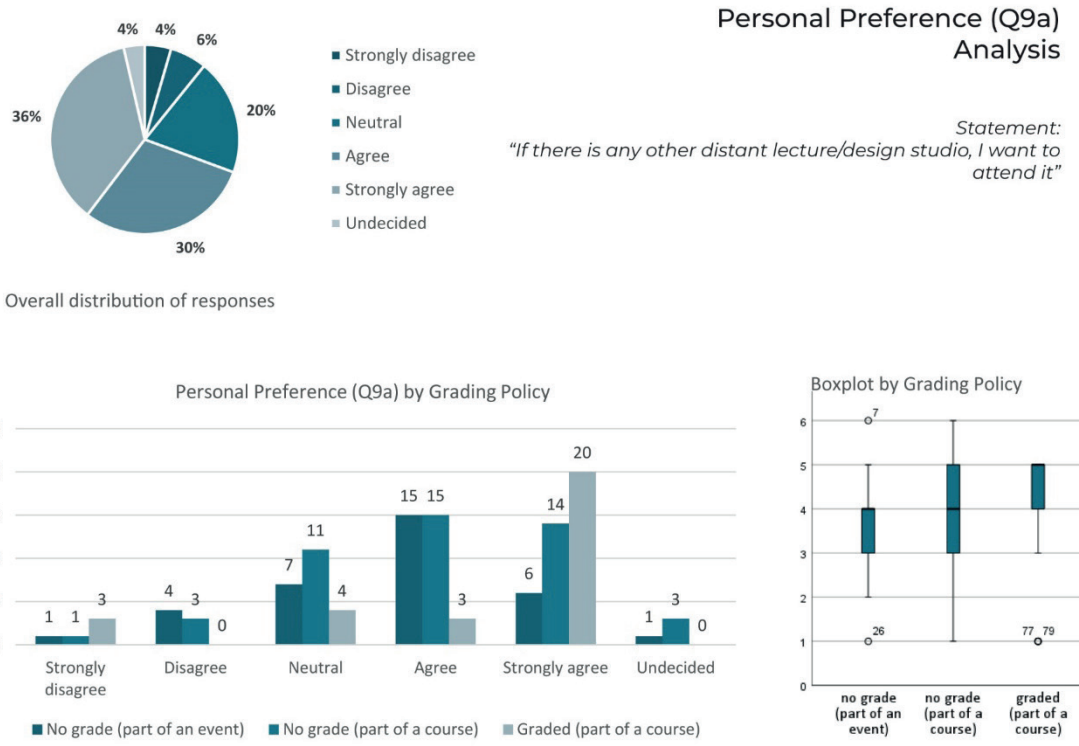

Figure 10. Personal preference to attend a future DL/studio (Q9a) by grading policy

The response distribution of preferred delivery method (face-to-face vs. distant) for the lecture attended (Q9b) given in Table 4 and Figure 11 initially suggests no prominent tendency since responses distribute almost equally among those oppose and those approve the statement given (44% and 41% respectively). However, parametric and non-parametric tests conducted revealed certain significant relations and diffractions for DL level, DL subject, respondent demographics (age in generations), grading policy, acquaintance with the lecturer, and attendance to a classical-classroom lecture of the lecturer.

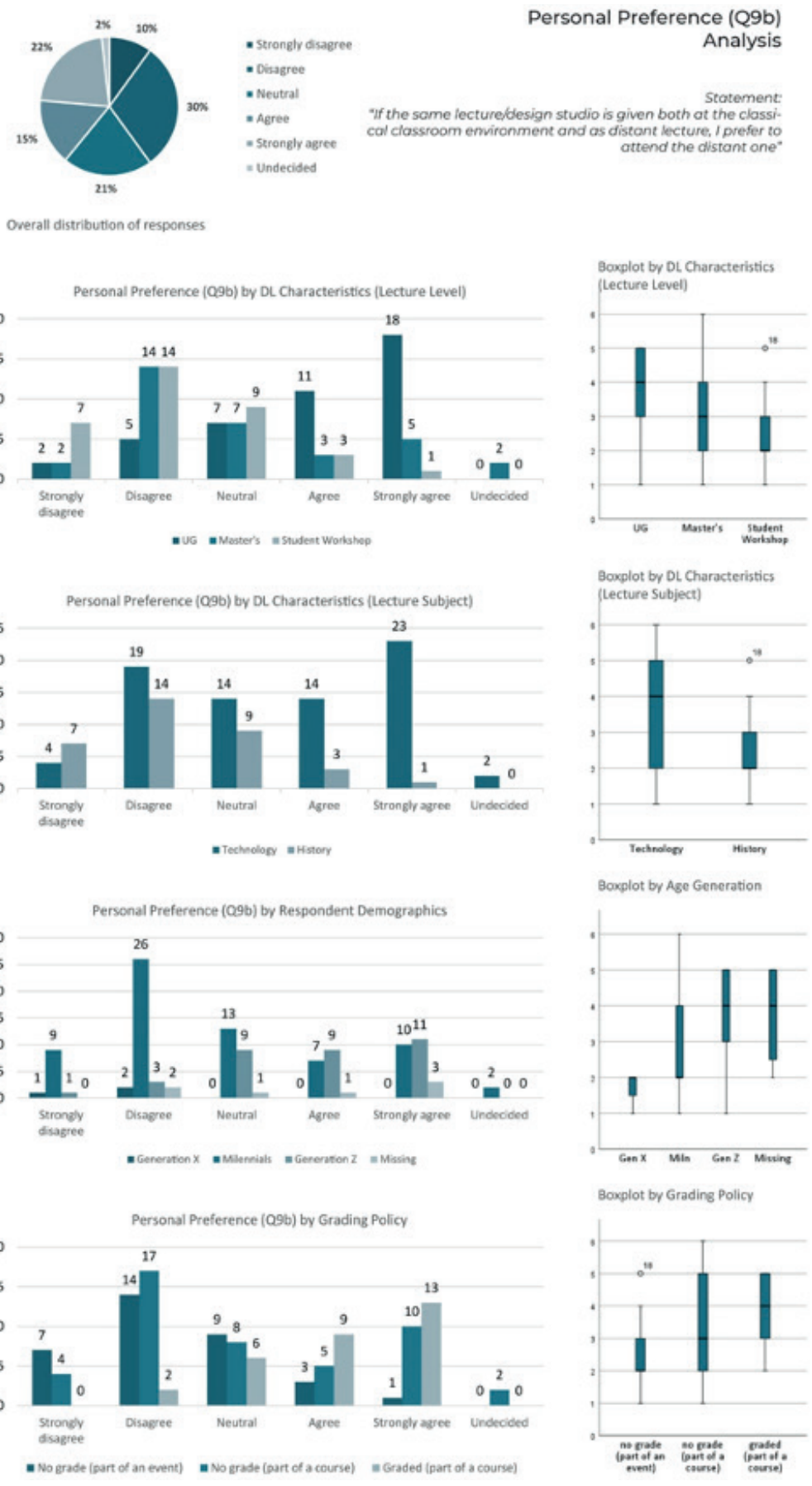

Figure 11. Personal preference regarding course delivery method (Q9b) by DL characteristics (level and subject), respondent demographics (age in generations), grading policy, acquaintance with the lecturer, and attendance to a classical-classroom lecture of the lecturer

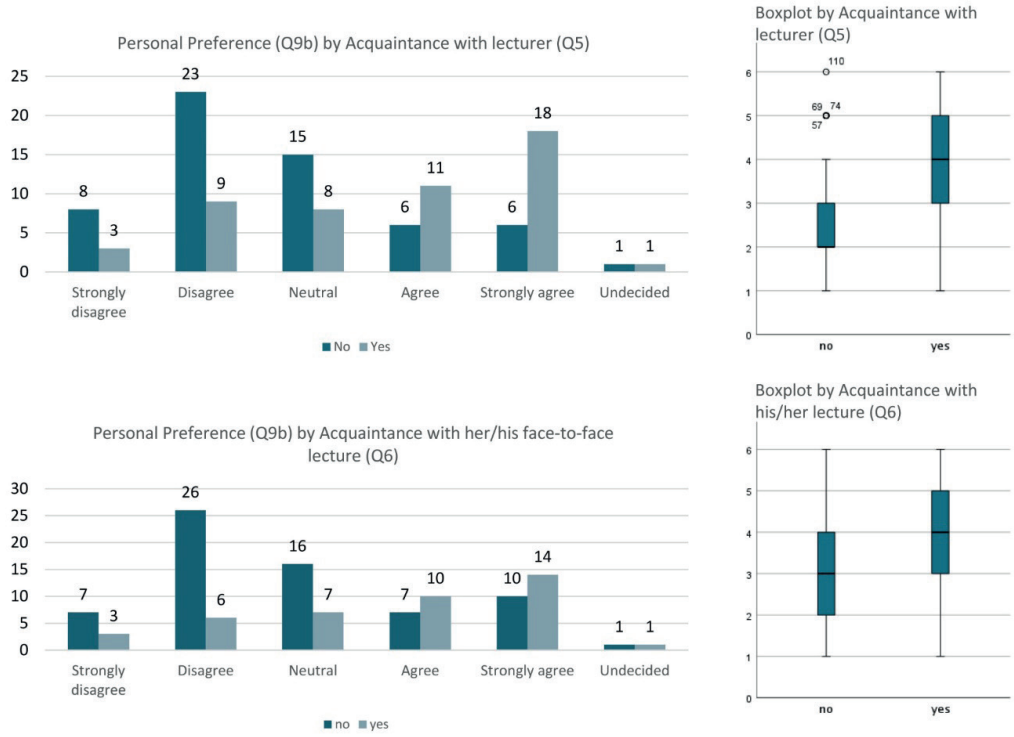

Figure 11-continued. Personal preference regarding course delivery method (Q9b) by DL characteristics (level and subject), respondent demographics (age in generations), grading policy, acquaintance with the lecturer, and attendance to a classical-classroom lecture of the lecturer (continued)

Responding to personal preference (Q9b), undergraduate students are likely to attend a distant one, even when a face-to-face option is offered, with a median at 'agree'. In contrast, for master students and workshop attendees, there is a tendency to favor a classical-classroom environment over a distant one, with medians at 'neutral' and 'disagree' respectively. Based on the overall response patterns and IQR ranges, seniority and experience levels of respondents may be cited as a reason for this variance in preference.

Apropos of DL subject, personal preference of history lecture participants indicates if both instructional formats are provided, they would opt for the face-to-face one, since the majority of them expressed reluctance for a distant option (41% 'disagree', and 21% 'strongly disagree'). This presents an identical pattern to that of workshop attendees with a median at 'disagree', because the only history lecture conducted was during the student workshop, addressing the same group of respondents. The resulting IQR range between 'neutral' to 'disagree'. Nevertheless, responses among technology lecture participants yield a balanced distribution between 'disagree' to 'strongly agree', suggesting a slightly more tendency towards distant one with a median at 'agree'. The overall patterns of responses suggest that, with a comparatively expanding IQR, students of technology lectures hold quite different opinions about their preference whereas, history lecture attendees seem to reach a consensus on favoring the face-to-face instruction format.

In reaction to personal preference, responses from all generations are spread unevenly, suggesting considerably distinct tendencies when both instructional formats are offered. Generation X was excluded from this in-depth examination due to its low number of respondents. The overall response patterns observed through box-plot diagrams indicates that Generation Z participants favor a possible distant option, with IQR ranging from 'strongly agree' to 'neutral'. Whereas Millennials reported a significant response concentration around 'disagree' by 39% with a resulting median at 'disagree', indicating that they favor more the face-to-face option.

Regarding the grading policy of lecture attended, participants of a graded course prioritize to attend a distant one when both instructional formats are offered; 30% agree and 43% strongly agree. In contrast, for students of an ungraded lecture, there is a tendency to favor a classical-classroom environment over a distant one (disagree by 41% for ungraded as part of an event and 37% for ungraded as part of a semester-long course). Still, median value is at 'disagree' for the for the former, 'neutral' for the latter. This overall response pattern reveals dissensus of ungraded lecture participants' preference, based on the attended lecture's being part of a one-off event or a semester-long course. Nevertheless, DL's grading policy may have a positive impact on performance efficiency which could explain why participants of a graded course prefer to attend a distant one.

Interestingly, a substantial difference was observed with personal preference reactions on previous acquaintance with the lecturer. The overall response patterns reveal participants who have not met the lecturer before tend to attend a face-to-face lecture if both instructional formats are available for the same lesson. It is the otherwise for those who met before. As demonstrated in the box-plot diagrams, median value is at 'disagree' for the respondents who have not met the lecturer before and at 'agree' for those who have. The results indicate the previous acquaintance with the lecturer may have a considerable impact on participants' future tendencies in attending an online lecture.

Finally, personal preference responses were also analyzed based on previous attendance to a classical-classroom lecture of the lecturer. Participants who have not participated prioritize attending a face-to-face lecture more if both instructional formats are available, with a median at 'neutral'. Those participated, on the other hand, favor more the distant one with a median at 'agree'. These findings suggest that, similar to acquaintance with the lecturer, previous attendance to a face-to-face lecture of the lecturer does actually affect the participants' future tendencies in attending online lectures.

DISCUSSION

The components of an effective e-Learning were nominated in this as overall substitutability level, cognitive performance, social interaction and engagement, student comprehension and comfort, personal preference, and learners' satisfaction. Remarkably, in regards to learners' satisfaction, none of the nine potential factors investigated that are expected to influence learner experience had significant effect on participants' satisfaction (i.e. $p > 0.05$). Among these factors, findings also showed no statistically significant difference between the groups of 'DL setting' and 'previous experience on DL' for the selected components of effective e-Learning. Yet, this might be due to the uneven distribution of responses.

Parametric and non-parametric tests conducted verifies that out of ten potential factors hypothesized, nine were analyzed and seven were proved to be significant to affect e-Learning effectiveness based on the respondents' assessments (Table 5). Investigating the impact of subdivisions among each evaluation theme by its determined significant influencing factor, diffractions for varying features surfaced as potential components of impact as well. These potential sub-influencing factors are also given in Table 5 as potential sub-factor (PS). However, the identified sub-factors were reserved for further inquiry and not covered in this research because they are thought to be subject to statistical bias due to relatively small sample population per group and/or nonhomogeneous distribution within each group.

Table 5. Significant relations matrix and potential subdivisions that needs further research

Theme			Potential factors									
			DL level (Le)	DL Subject (Su)	DL Method (Me)	DL Setting (Se)	Participants' gender (Ge)	Participants' age (Ag)	Previous experience (Ex)	Acquaintance with lecturer (Al)	Acquaintance with face-to-face class (Af)	Grading policy (Gr)
Overall substitutability level	Q7a	Primary	⭘									
		PS*					PS_{Le}	PS_{Le}				PS_{Le}
Cognitive performance	Q7b	Primary	⭘									
		PS*					PS_{Le}	P_{Le}		PS_{Le}		
	Q7d	Primary	⭘	⭘						◘		⭘
		PS*					PS_{Le}	$PS_{Le,}$ PS_{Al}, PS_{Gr}		PS_{Le}		
Social interaction and engagement	Q7c	Primary						⭘				•
		PS*	PS_{Ag}				PS_{Ag}	PS_{Gr}				
Student comprehension and comfort	Q7f	Primary					◘			■		
		PS*	P_{Ge}									PS_{Ge}
	Q7h	Primary					◘					
		PS*	PS_{Ge}							PS_{Ge}		PS_{Ge}
Personal preference	Q9a	Primary										•
		PS*					PS_{Gr}	PS_{Gr}		PS_{Gr}		
	Q9b	Primary	⭘	⭘				⭘		◘	◘	⭘
		PS*	PS_{Al}, PS_{Af}				PS_{Le}, PS_{Gr}	PS_{Le}		PS_{Ag}		PS_{Su}, PS_{Ag}, PS_{Al}

⭘: significant relation found by ANOVA

◘: significant relation found by independent samples t-test

• : significant relation found by Kruskal Wallis

■ : significant relation found by Mann-Whitney U test

*: The indices following PS indicate the associated factors using the abbreviations given in the title row.

Course structure and content design, together with other course-related subscales i.e., management, structure, and quality, were acknowledged by several researchers to have a notable contribution to successful e-Learning implementation and perceived e-Learner satisfaction (Bolliger and Martindale, 2004; Eom et al., 2006; Sun et al., 2008; Raspopovic et al., 2014; Mtebe and Raphael, 2018). Significant findings on course characteristics related variables of this study revealed the following;

- DL level is found to be a factor in the student's opinion on the overall substitutability level (Q7a) of distant lectures. The higher the level at which the course was taught, the more they thought it was a substitute for the face-to-face lecture. Concerning understanding (Q7b) and concentration (Q7d) referring to cognitive performance, master's students mostly thought that their understanding performance of the subject was affected neither positively nor negatively by the distance learning techniques, with almost no concentration problems. Undergraduate students, on the other hand, thought that their understanding performance was affected. Yet, it was most likely positive, since the ease of concentration without any distraction was referred to more in comparison to master's students. Regarding the preference for attending a DL if both instructional formats are available (Q9b), undergraduate students are observed to be more interested in distant options than neutral master students.

- DL subject is found to be a determinant of concentration levels (Q7d), where votes for ease of concentration were higher in favor of technology when compared to that of history. The impact of subject is also apparent in personal preference for attending a DL if both instructional formats are available (Q9b); respondents of technology courses showed more interest in distant lectures as opposed to those who attended a history course.
- Grading policy, i.e. grading of the lecture is observed to create a positive impact on students' comfort perception of involvement and asking questions in online lectures (Q7c). A possible impact of grading policy on concentration (Q7d) surfaced, but the additional considerable difference observed between whether the DL is part of a semester-long course or not indicated a coupled situation, thus, further surveys seem beneficial to be concrete regarding its effect. The impact of grading policies on personal preference for attendance to a future DL (Q9a) indicates that respondents' interest in future distant opportunities are positively affected by grading of class participation. Grading policy had a varying impact on personal preference concerning course delivery method (Q9b); attendees of a graded lecture show interest in attending a DL if both instructional formats are available as opposed to others. Attendees of an ungraded lecture as part of a semester-long course reported neutral on this issue and participants of an ungraded lecture as part of an event were likely to prefer face-to-face lectures.

Influence of student/learner dimension on e-Learning effectiveness, which is generally investigated through gender effects in literature, has been a highly referred aspect (e.g., Valory and Lord, 2000; Eom et al., 2006; Sun et al., 2008; Frimpon, 2012; Bhuasiri et al., 2012; Seters et al., 2012; Raspopovic et al., 2014; Kerzic et al., 2019). In addition to gender-specific characteristics, age cohorts were acknowledged as an influencing factor in this study, and findings related to both revealed the following;

- Referring to the relationship between the gender-wise comparison of being acquainted with the lecturer and student comprehension & comfort (Q7e-Q7f), a slight difference in the response distribution suggests that, in understanding the subject or feeling comfortable during DL, prior acquaintance, or lack of acquaintance, may be an issue for males rather than females. On the contrary, in regards to the effect of previous attendance to the lecturer's classical-classroom lecture on the student's comprehension & comfort (Q7g-Q7h), previous attendance may have more impact on female respondents' understanding of the subject or feeling comfortable during DL.
- The impact of age cohorts on social interaction and engagement (Q7c) signifies that Generation Z is much more comfortable communicating in distant lectures than Millennials. Similarly, Generation Z respondents prioritize attending a DL if both instructional formats are available (Q9b) whereas, Millennials reported the direct opposite.

Previous acquaintance with the instructor or prior attendance to her/his classical-classroom lectures, addressed as a prospective contributing factor in this study, has no foundations in literature. Survey results show that acquaintance with the lecturer has no substantial impact on concentration level (Q7d) though, views approving ease of concentration were increased slightly in favor of those who had met the lecturer before. Prior acquaintance with lecturer had also positive effects on respondents' tendency for attending a DL if both instructional formats are available (Q9b). Similarly, findings indicate that prior attendance to a classical-classroom lecture of the lecturer positively contributes to respondents' preference in attending an online lecture instead of its face-to-face counterpart (Q9b).

CONCLUSION

Findings of this study, which aimed to identify success factors in synchronous e-Learning through the architectural students' viewpoint, revealed that opinions for the overall substitutability level of distant vs. face-to-face lectures and cognitive performance in regards to understanding were directly associated with DL level. On the other hand, views on cognitive performance in regards to concentration were found to be affected by more than one factor; i.e., DL level, DL subject, prior acquaintance with the lecturer, and grading policy. Participants' comfort in social interaction and engagement was observed to be primarily driven by the respondents' age cohorts and grading policy of the lecture. Students' views on comprehension performance and overall comfort level in an online environment, which were queried via conditional questions, were

observed to be influenced by respondent gender only. Finally, personal preference regarding participants' tendency to attend a possible online lecture in future was primarily driven by grading policy whilst, their preference in regards to the preferred delivery method (face-to-face vs. distant) for the lecture they attended was influenced by multiple factors. In particular, DL level and subject, respondents' age cohorts, grading policy, prior acquaintance with the lecturer, and previous attendance to a traditional face-to-face lecture of the lecturer were observed as stimulating aspects of personal preference in the preferred delivery method.

Fully or blended online education, considering the opportunities it provides, will most likely remain a part of architecture education even when the pandemic is over. This study contributes to e-Learning in architecture by unveiling some success factors in its effective implementation from the viewpoint of students and introducing the significance of prior acquaintance with the lecturer and previous attendance to a traditional face-to-face lecture by the lecturer on effectiveness. The results indicate the possibility of several diffractions affecting the evaluation themes however, these potential sub-factors were reserved for further inquiry and excluded from the scope of this study.

Practical Implications

The results acquired show that graduate students approve of the substitutability potential of online courses to replace face-to-face lectures. In consideration of the learners' maturity and experience, postgraduate programs are more likely to achieve success when organized in distance education. Another inference derived from the survey results was the effects of DL subject on learners' concentration levels and preference in attending different instructional formats. This result indicates that course subject and content should be taken into account in distant education planning, and decisions on online learning/teaching methods should be made course-by-course basis. Another important result derived from this study was the significance of previous acquaintance with the instructor or prior attendance to her/his classical-classroom lectures, which suggests that the positive effect of meeting face-to-face is not to be neglected. It is recommended that in the planning of online lectures, the first introduction and encounter should be face-to-face.

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