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Constructive Alignment of Basic Design Education: Students' Approaches to Learning and Perceived Learning Demands in Online Distance Education

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ABSTRACT
This study investigates the constructive alignment (CA) on students' approaches to learning and their perceived learning demands in online basic design education. In response to the coronavirus pandemic (COVID_19), face-to-face education has become distance education as an essential and best available method in higher education. Therefore, the curriculum of the current form of the face-to-face educational model of basic design education has been modified following online distance education. A study was conducted with first-year students of basic design education within the 2020-2021 academic year of the fall semester. Students were given an Online Survey, and a total of 56 students voluntarily participated in the study. The study results indicate that the basic design education was constructively aligned in online distance education in terms of the intended learning outcomes, alignment of teaching-learning activities, alignment of assessment tasks, and feedback effectiveness. The teaching-learning activities of the basic design education were the main contributor to the intended learning outcomes of online distance learning. Additionally, online basic design education was well related to students' deep approaches to learning. The findings also support that the dimensions of constructive alignment were associated with various parameters of students' perceived learning demands.
Keywords: basic design education, online distance education, constructive alignment (CA), intended learning outcome (ILO), students' approaches to learning (SAL), coronavirus pandemic

1 INTRODUCTION

The ongoing global pandemic of coronavirus disease (COVID-19) has affected every region of the world. This pandemic continues to impact social, cultural, economic, and educational life around the world. In response to the coronavirus pandemic, finding and projecting several alternatives for face-to-face education became inevitable through the progression of the pandemic. Replacing face-to-face education with adopting distance education has been the most substantial change. Briefly, distance education is an institutional-based formal teaching-learning system in which students learn individually at their own rate. The teaching and learning in distance education include pre-produced study materials and non-continuous communication between students and tutors. Pre-produced materials are self-instructional; they provide asynchronous learning using audio and video recording presentations and other remote media resources. Non-continuous communication entails correspondence between students and tutors through video conferencing, teleconferencing, live voice, and, in some cases, face-to-face contacts (Holmberg, 1995). Distance education has been utilised in many higher education disciplines, including design education (Jones et al., 2020). However, at the beginning of the outbreak, emergency remote education with the application of distance learning had been contemplated as a tool to maintain education uninterruptedly. As the pandemic persisted, emergency remote education has become distance education as an essential and best available method in our university as in many parts of the world.

With the start of the new academic year, basic design education was scheduled through distance learning for the first time. Therefore, the current face-to-face curriculum of the

course was modified following distance education. However, this approach of the educational method is distinct in many aspects concerning the current context of distance education. Since basic design students are subjected to the peculiar characteristics of design education for the very first time in their lives, mainly through online distance learning, the introduction of this course's teaching and learning system has the substantial potential to be investigated. To this end, this study aims to examine the constructive alignment of the basic design education, the relationships between constructive alignment and students' approaches to learning, and their perceived learning demands through online distance learning.

Accordingly, the following questions are addressed:

1. Is online basic design education constructively aligned with distance learning?
2. How do students' approaches to learning in online basic design studio course influence the constructive alignment of distance education?
3. How do students' perceived learning demands during online basic design studio course influence the constructive alignment of distance education?

1.1 Basic Design Education

The Bauhaus School of Design was founded in Germany in1919, and it has been recognised as a significant and influential efficacy in design education, especially in basic design education (Lang, 1998). Although the design learning and teaching model dates to the 19th century and the École des Beaux-Arts in France, the Bauhaus model has been formed for today's understanding of basic design learning and teaching (Patera, 2009). Arnheim (1974) states that the empirical adequacy of Bauhaus design education is based on the Gestalt law of perception and specific rules that affirm the design ordering principles. Basic design education is an introduction to further design education at Bauhaus, emphasising conceptual frameworks than skills. Accordingly, the basic design aims to educate perception, increase environmental sensitivity, gain artistic efficacy, improve creative and design thinking, and deepen psychological perception (Lang, 1998). Wong (1972) claims that every art/design school or university department has a basic design course, introductory design in the first year's curriculum. Basic design education is regarded as an initial phase for design students to improve themselves and learn the fundamentals of visual communication and the grammar of the visual language (Wong, 1972; Akbay, 2003; Ural et al., 2017).

Basic design's teaching and learning theory encompass the principles of two- and three-dimensional design, comprising the knowledge associated with basic design education (Boucharenc, 2006). The primary goal is to provide students with the skills to create aesthetically pleasing and functionally proficient designs, considering the ability to conceptualise, coordinate and implement the ideas of two-dimensional forms and three-dimensional spaces. Design elements, including conceptual (point, line, plane, volume), visual (shape, size, colour, texture), relational (direction, position, space, gravity), and practical (representation, meaning, function) elements and their geometric definitions, design ordering principles (rhythm, balance, emphasis/dominance, contrast, proportion and scale, variety, and unity) are attained through Gestalt law of perception. These are transformed into techniques for supporting visual language formulations, efficient methods of organising visual information brought together in two-dimensional and then three-dimensional organisations (Feldman, 1987; Laurer & Pentak, 1995; Zelanski & Fisher, 1989). The main educational strategies used in many design schools are learning by doing and learning through practice (Schön, 1985), which has its origins in Bauhaus. According to the nature of this strategy, the educational approach is compatible with the studio-based learning system. This approach refers to the physical learning and teaching spaces where students develop their ideas, concepts, and projects essential in studio environments (Cunliffe-Charlesworth, 2006), which leads to project-based learning. The given assignments are problem-based projects in which students learn basic design skills by experimenting with their own versions using a combination of visual perception and conceptual abstraction (Patera, 2009; Denel, 1979). The definition of space with an

underlying relationship between design elements and design ordering principles are necessary to carry out the projects. According to Schön (1985), problem-based learning in the design process is about problem-finding rather than problem-solving, exploring specific issues concerning the subject matters of the assignments.

The nature of studio-based learning and teaching methods in design education aligns with the educational theory of constructivism, which states that learning is a process based on the learner's construction of new knowledge and understanding of their own beliefs (Lee, 2009). Basic design education is responsible for assisting students in learning some fundamental skills, building their own design process, and developing their personality as autonomous, sensitive, vital individuals with their own set of values (Farivarsadri, 1998). Assessments through critiques and feedback are also part of basic design education, which encourages a deep approach to the learning and designing processes (Patera, 2009).

1.2 Constructive Alignment

Constructive alignment (CA) is an effective model for improving quality learning outcomes in higher education. The outcome-based approach to teaching and learning is integrated into a constructive alignment, which clearly describes what students are to learn and how they can articulate their learning experiences before teaching takes place (Biggs, 2003). Constructive alignment is based on the constructivist theory that learners construct their own knowledge through teaching and learning activities and the principle of aligning teaching and learning activities with the curriculum's intended learning outcomes and assessment tasks (Biggs & Tang, 2011). In other words, Biggs and Tang (2010) assert that "Constructive refers to the idea that students construct meaning through relevant learning activities; alignment refers to the situation when teaching and learning activities, and assessment tasks, are aligned to the Intended Learning Outcomes" (p.23). Biggs (2003) states that the main idea behind the teaching system is to align all components, including the curriculum, its intended learning outcomes, the teaching strategies used, and the assessment tasks. Biggs and Tang (2011) describe four stages of constructive alignment in aligning curricula as follows:

a. Defining the course's intended learning outcome (ILO) by describing its object content and context, as well as the expectation that students required.
b. Creating a learning environment using teaching/learning activities (TLA) to achieve the course's intended learning outcome,
c. Using assessment tasks (AT) to evaluate how well students' performances confirm the learning, and
d. Standardising the evaluation criteria for the judgements.

All components discussed above should complement one another in a constructively aligned system. The intended learning outcome specifies what is to be learned and how and to what standard it is to be learned, and this should be addressed in the teaching/learning activities and the assessment task (Biggs & Tang 2011). Thus, Biggs and Tang (2011) claim that the courses with constructively aligned intended learning outcomes, teaching-learning activities, and assessment tasks influence students' learning approaches through either encouraging or discouraging students' learning strategies. Biggs (1987) categorised students' approaches to learning into deep and surface learning types based on how they perceive the course. Deep and surface approaches to learning are regarded as reactions to the teaching environment. The deep approach "arises from a felt need to engage the task appropriately and meaningfully, so the student tries to use the most appropriate cognitive activities for handling it" (Biggs & Tang, 2011, p. 26). When students take a deep approach to a task, learning becomes a pleasurable experience, and they develop positive feelings and interest in courses. On the other hand, the surface approach "arises from an intention to get the task out of the way with minimum trouble, while appearing to meet course requirements" (Biggs & Tang, 2011, p. 24). This approach results in a low cognitive level when higher-level activities enable students to complete tasks. The surface approach emphasises factual detail over structural relationships in the data to be learned, including feelings of frustration, dissatisfaction, boredom, or dislike (Biggs, 1987).

Accordingly, it is claimed that the courses constructively aligned would also influence students' perceived learning demands. Stamov Roßnagel et al. (2020) state that constructively aligned teaching and learning affect students' perceptions of demanding a task's workload. A study by Leber et al. (2018; cited in Stamov Roßnagel et al., 2020) found that students feel low pressure when the teaching-learning activities are in the aligned condition. Experienced workloads illustrate the impact of completing a task on a student. Students might perceive workloads differently; hence, the pressure under which a task is performed, the amount of effort expended, success in meeting task requirements, or the psychological and physiological implications of the task all influence students' learning demands (Hart, 2006). Hart (2006) assumes that an individual's total workload experience is defined by a combination of mental, physical, and temporal demands, effort, performance, and frustration dimensions. Mental demand refers to the mental and perceived activity of a task, physical demand refers to the physical activity of a task, and temporal demand refers to the time pressure that is paced with a task (Hart, 2006). Hart (2006) describes effort as the level of mental and physical hardness, performance as the degree of task success, and frustration as the degree of feeling during the task. According to Stamov Roßnagel et al. (2020), the intended learning outcome is associated with mental demands, teaching-learning activities are related to temporal demands.

2 METHOD

2.1 The Educational Context

This study was carried out with freshman students in the 2020-2021 fall semester within the 'Basic Design' studio, abbreviated 'Studio 101', in the Department of Interior Architecture of Çankaya University, Ankara, Turkey. The Department's educational approach includes both a studio-based and a project-based learning framework. The 4-year undergraduate curriculum at the Department of Interior Architecture consists of eight semesters, with two semesters offered each year. The education begins with 'INAR 101 Basic Design' studio in the fall (first) semester of the first year, followed by 'INAR 102 Introduction to Interior Design' studio in the spring (second) semester and a total of six 'Interior Design Studio' courses in three consecutive years. In a 14-week academic semester, each studio course is scheduled for eight hours, with four-hour sessions twice a week. Studio 101 introduces students to design language through assignments with lectures and hands-on exercises, emphasising learning by doing and learning through practice while driven by theoretical knowledge. Basic Design studio is organised around the main ideas and principles of the Bauhaus approach and Gestalt principles of perception. The goal is to guide students in cultivating the confidence to think abstractly, which serve as the framework for design studies in the subsequent years. To provide them with the requisite basic knowledge to generate new ideas and concepts, to provide knowledge to find the right solutions to convey their ideas, and to introduce design elements and principles and organisation schemes. The learning outcomes of this studio course are for students to be able to use basic design elements and principles to construct visual language to restructure their subjective perceptual experience into a proper understanding of the environment. Additionally, to transfer their perceptual experience into a verbal language for further designs and evaluate the space using both verbal and visual-spatial formations.

In response to the coronavirus pandemic, the University Board agreed to conduct all educational activities for the 2020-2021 fall semester synchronously online through distance learning and face-to-face where appropriate. Synchronously online distance denotes that both theoretical and applied courses were held at the predetermined periods in the weekly schedule of the courses. Here, face-to-face means that some of the parts of the applied courses (laboratories, studios, etc.) would only be carried out face-to-face in the final three weeks of the semester. Studio 101 was carried out synchronously online via distance learning throughout the semester with six instructors. Again, the semester was 14 weeks long, and the course was scheduled for eight hours a week, with four-hour sessions twice a week, for 112 hours. The course's online synchronous meetings with video connections were held during the semester using Zoom software (Zoom, 2021), which

Çankaya University licensed to all instructors. In addition, the University's WebOnline distance learning system was used to manage the course announcements, follow-up submissions to both studio and homework assignments, interim jury, pre-jury, and final jury requirements. Although online distance learning and teaching modes have replaced conventional physical modes of basic design education, we took care of organising the course material with its teaching and learning activities in the same way that face-to-face design education does, with online activities during the course still referred to as studio assignments in this context.

This online education consisted of 16 studio and homework assignments, a sketch problem, an interim jury, and a final project with pre-jury and final jury. The semester started with the two-dimensional activities and ended up with a final three-dimensional project. Students were given exercises through assignments to complete either online during the course or as homework. Although each assignment was consecutive, they varied in subject matter and were assessed using their own criteria. The two-dimensional assignments started with the basics, discussing, and practising the terms design field, design elements (point, line, plane, volume), figure-ground relationship, geometric interpretations, abstraction, Gestalt law of perception (proximity, similarity, grouping), loss of identity. Then, the assignments progressed to more complex subjects, including two-dimensional organisation and colour harmony principles in an 8-week course period. The two-dimensional organisation exercises paved the way for the relief and final 3-dimensional assignment. The relief lasted one week and was finalised with the interim jury. The final assignment was a three-dimensional project based on spatial organisation principles (central, axial, radial, linear, gridal, etc.) in which the terms spatial flow, spatial hierarchy, spatial relations, and colour use with harmony principles were explored. This project progressed to five weeks with one pre-jury and was followed by the final jury after the semester ended. Students were not allowed to use any digital media to create their assignments except for the PowerPoint presentations; all provided assignments were paper-based and involved using the cut-and-paste technique.

Via synchronously online Zoom meetings, basic design education progressed with one-to-one, formative, and group crits for each assignment, and summative crits were used at the grading stage of the assignments. Students were required to photograph their works and/or scan their drawings before uploading them as files to the WebOnline system on the designated date and time through the studio course. This uploading submission was used as one of the course requirements for accepting crits. Students received feedback by sharing their computer screens and projecting their photographed/scanned assignment on Zoom. During the crits, the Zoom Annotate tool allowed both students and instructors to draw on the same screen simultaneously, enhancing the interactive value of the basic design course. Like the crits, the juries were also held through Zoom meetings. Students had turned their home settings into studio environments through online design education. Although this new setting had placed them in a situation devoid of a social studio-based environment, especially for studio work, opening Zoom video connections while working on their assignments had provided an alternative opportunity to communicate.

2.2 Participants

In the fall semester of 2020-2021, 66 freshman students of the Department of Interior Architecture were enrolled in the INAR 101 Basic Design studio course. Two of the undergraduate students did not attend the course during the semester. The questionnaire was then given to the 64 students, and a total of 56 students voluntarily responded to the questionnaire and were admitted as participants in this study. Of the participants, 35 were female, and 21 were male, with an average age of 20.45, ranging from 19 to 25.

2.3 Measures and data collection procedure

This study employed three different questionnaires: a. Constructive Alignment Questionnaire (CALEQ) (Fitzallen et al., 2017), b. Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001), and c. NASA Task Load Index (NASA-TLX)

(Hart & Staveland, 1988). The CALEQ was used to evaluate the constructive alignment of the online basic design studio course. It consists of 20 items, which are divided into four dimensions: Intended Learning Outcome (ILO Clarity) (sample item: "I was given a clear idea of what I needed to be able to do with the topics learnt"), Alignment of Teaching/Learning Activities (TLA alignment) (sample item: "The teaching and learning activities helped me learn what I was supposed to learn"), Alignment of Assessment Tasks (AT alignment) (sample item: "It was explained clearly to me how the assessment tasks were related to what I was supposed to learn"), and Feedback Effectiveness (sample item: "I received feedback that was clear and specific to what I was supposed to learn") (Fitzallen et al., 2017, pp. 14-17). Again, each of these four dimensions consisted of five items, and all items were rated on a 5-point Likert scale from one 'strongly disagree' to five 'strongly agree'.

The R-SPQ-2F was used to assess students' approaches to learning (SAL). It consists of 20 items, which are divided into two main categories: Deep Approach (DA) and Strategy Approach (SA), both of which have two indicators: DA has deep motive (dm) (sample item: "I work hard at my studies because I find the material interesting") and deep strategy (ds) (sample item: "I find most new topics interesting and often spend extra time trying to obtain more information about them"), while SA has surface motive (sm) (sample item: "I do not find my course very interesting so I keep my work to the minimum") and surface strategy (ss) (sample item: "I generally restrict my study to what is specially set as I think it is unnecessary to do anything extra") (Biggs et al., 2001, p. 148). Each of these four subscales consisted of five items, and all items were rated on a 5-point Likert scale from one 'only rarely true of me' to five 'always true of me'.

NASA-TLX was used to assess the task load that student perceived during their online basic design education. The questionnaire has six questions divided into six categories: Mental Demand (item: "How mentally demanding was the task?"), Physical Demand (item: "How physically demanding was the task?"), Temporal Demand (item: "How hurried or rushed was the pace of the task?"), Performance (item: "How successful were you in accomplishing what you were asked to do?"), Effort (item: "How hard did you have to work to accomplish your level of performance?"), and Frustration (item: "How insecure, discouraged, irritated, stressed, and annoyed were you?"). Students were asked to rate the questions on a 5-point Likert scale from one 'very low' to five 'very high'.

All three questionnaires were compiled into a single questionnaire, and participants were given an Online Survey with 46 items at the end of the semester. All questionnaires were used in their original English versions since English is the language of instruction at Çankaya University. There was no time limit for students to complete the questionnaire, and the online survey was closed after one week.

3 RESULTS AND DISCUSSION

The statistical analysis of the collected data was carried out using the IBM SPSS Statistics 23.0 software. The data were checked for normality, indicating that the data were normally distributed (sig. = 0.90, $p > 0.05$). To what extend the obtained data was consistent, 46 items assessed the internal consistency reliability where the scale had a high-level of internal consistency, with a Cronbach alpha coefficient of 0.87. Descriptive statistics were used to make some observations about the data. Participants rated the questionnaire on a 5-point Likert scale, including the CALEQ, R-SPQ-2F, and NASA-TLX, where the mean value was relatively close to the midpoint (M = 3.29, SD = 0.428). Table 1 shows the questionnaire's descriptive statistics and its minimum and maximum rating distribution on each scale.

Table 1. Descriptive statistics of the questionnaire

Scale	N	Min.	Max.	Mean	Std. Dev.
CALEQ	56	2	4	2.95	0.339
R-SPQ-2F	56	1	5	3.46	0.831
NASA-TLX	56	3	5	3.86	0.495

One-way between groups of variance (ANOVA) and multiple linear regression were conducted to address the research questions of this study. The results were explored in the following subsections: a. constructive alignment (CA), b. constructive alignment and students' approaches to learning (SAL), and c. constructive alignment and students' learning demands.

3.1 Constructive alignment of online basic design studio course

ANOVA was conducted to explore whether the online basic design studio course was significantly constructively aligned during the semester in CA's four dimensions: ILO Clarity, TLA Alignment, AT Alignment, and Feedback Effectiveness. Effect sizes were computed using eta squared (η^2). The constructive alignment of the studio course was statistically significantly different at the $p < 0.001$ level in all four dimensions: F (16, 39) = 7.08, $p = 0.000$, $\eta^2 = 0.74$ for ILO clarity, F (16, 39) = 40.70, $p = 0.000$, $\eta^2 = 0.94$ for TLA alignment, F (18, 37) = 20.25, $p = 0.000$, $\eta^2 = 0.91$ for AT alignment, and F (17, 38) = 27.88, $p = 0.00$, $\eta^2 = 0.93$ for feedback effectiveness. This result indicates that the basic design studio course was constructively aligned with the CA's four dimensions with online distance learning. The studio course's teaching design was constructed following Biggs and Tang's (2011) suggestion of four conceptual frameworks. Students were given a course syllabus at the beginning of the semester that outlined the course's intended learning outcomes, teaching and learning assignments, assessment, and grading policies. This included the description of basic design and the essentials of basic design education. Students were specifically identified as to what knowledge they would acquire from the course and the skills they would have attained by the end of the course. Each assignment clearly defined the problem of the exercise, the subjects to be addressed in terms of that specific assignment, the procedure and materials to be used, and the assessment criteria. Before the final submission of each assignment, students received relevant feedback through one-to-one, group, formative, and summative crits. This statistical finding suggests that students perceived the basic design studio course constructively aligned with online distance learning.

Additionally, a paired-samples t-test was conducted to evaluate the differences between these four dimensions of constructive alignment. The results show that there were statistically significant differences in scores on ILO clarity (M = 3.32, SD = 0.84) and feedback effectiveness ($M = 3.68$, $SD = 0.98$), t (55) = -3.11, $p < 0.005$); TLA alignment ($M = 3.45$, $SD = 0.97$) and feedback effectiveness ($M = 3.68$, $SD = 0.98$), t (55) = -2.67, $p < 0.05$); and AT alignment ($M = 3.38$, $SD = 0.95$) and feedback effectiveness ($M = 3.68$, $SD = 0.98$), t (55) = -3.91, $p < 0.001$). Feedback effectiveness was associated with ILO clarity, TLA alignment, and AT alignments in online basic design education. Biggs and Tang (2011) state that effective feedback informs students about their success in the course. Feedback is regarded as the most powerful learning method because it allows students to cultivate and improve themselves while also providing insight into their learning processes and progresses (Harvey, 2011). Crit is the most important tool for providing effective feedback in design education; however, it is also one of the assessment methods. During the online basic design education, students were given various types of crits on Zoom for feedback and assessment purposes based on the content of the problem assigned. While one-to-one crits were the face-to-face discussions between a student and an instructor, group crits were led by students and more than one instructor. Students projected their work on computer screens in front of their peers and instructors. Formative crits were run during the interim stage of assignments before the final assessments, while summative crits occurred during the formal assessment sessions like pre- or final juries

where a grade was assigned after the student received feedback. Therefore, feedback in the form of crits is a crucial factor in the teaching and learning process of design education. The findings indicate that effective feedback was significantly related to all three dimensions of the constructive alignment of the studio course, which corresponded to the intended learning outcome, alignment of teaching/learning activities, and alignment of assessment tasks of the studio course.

A multiple linear regression model was used to investigate the effect of TLA alignment, AT alignment, and feedback effectiveness on the ILO clarity of the studio course. In terms of the model, TLA alignment (beta = 0.654, $p < 0.001$), which explained 42.7% of the variance, made a significant unique contribution to ILO clarity, indicating the more aligned teaching/learning activities of the studio course, the clearer intended learning outcomes of online basic design education. This finding suggests that the basic design education's teaching/learning activities (assignments) were the main contributor to the intended learning outcomes of the online studio course.

3.2 Constructive alignment and students' approaches to learning

ANOVA was used to determine whether there were significant differences in the students' deep and surface approaches to learning (SAL) in the constructive alignment of the basic design studio course. The students' deep approaches to learning were statistically significantly different at the $p < 0.05$ level, $F [21, 34] = 2.12$, $p = 0.025$, $\eta^2 = 0.57$. A multiple linear regression model was conducted to investigate the effect of the students' deep and strategy approaches to learning on the four dimensions of constructive alignment. According to the model, deep strategy (beta = 0.562, $p < 0.001$) provided a unique contribution to the course's ILO clarity, accounting for 31.6% of the variance. Furthermore, only the deep motive provided unique contributions to the three CA dimensions, which were TLA alignment (beta = 0.515, $p < 0.001$, explaining 26.6% of the variance), AT alignment (beta = 0.585, $p < 0.001$, explaining 34.2% of the variance), and feedback effectiveness (beta = 0.658, $p < 0.001$, explaining 42.2% of the variance). Regarding the results, the online basic design studio course's clear intended learning outcomes increased students' deep learning strategies. Biggs (1988) explains the deep strategy as discovering meaning by reading and searching extensively while considering previous related knowledge. In addition, the online basic design education's aligned teaching/learning activities, assessment tasks, and effective feedback increased students' deep learning motive. Biggs (1988) defines the deep motive as an underlying interest in what is being learned to enhance the skills in particular academic areas. In other words, the deep learning approach is commonly associated with academic success. We expected students to have more deep learning approaches than surface learning approaches during the online basic design education. The findings indicate that students had deep approaches to learning and positive feelings about learning, and online distance learning of basic design education was well related to meaningful learning.

3.3 Constructive alignment and students' perceived learning demands

Descriptive statistics was performed to evaluate frequency distributions of the students' perceived learning demands in online basic design education (Table 2). Regarding Table 2, the 25 of the students (44.6% of the total) of 56 concerning the question "How mentally demanding was the task?" rated the mental workload of the studio course to be 'very high', and 19 of the students (33.9% of the total) rated the course to be 'high'. The intended learning outcome of the basic design education promoted students to think, decide, calculate, look, and search, which are the perceived activities of mental demand. This result indicates that more than three-quarters of the students perceived the workload of online basic design education as mentally demanding. In addition, an equal number of 19 students (33.9% of the total of each rating) of 56 considering the question "How physically demanding was the task?" rated the physical workload of the studio course to be 'very high' and 'high', and 14 of the students (25% of the total) rated the physical demand of the workload as 'neutral'. This shows that while more than two-thirds of the students considered online basic design education workloads physically demanding, one-quarter of

the total was neutral on this parameter. Temporal demand referred to the time pressure that the students paced with the workloads. Accordingly, the 23 of the students (41.1% of the total) considering the question "How hurried and rushed was the pace of the task?" rated the temporal workload of the studio course to be 'very high' and the 17 of the students (30.4% of the total) rated the temporal workload of the education to be 'high'. This indicates that three-quarters of the students perceived the workload of online basic design education as temporally demanding.

Table 2. Students' rating distributions on NASA-Task Load Index

	Mental Demand		**Physical Demand**		**Temporal Demand**		**Performance**		**Effort**		**Frustration**	
Ratings	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
very low	3	5.4	0	0.0	2	3.6	2	3.6	0	0.0	4	7.1
low	0	0.0	4	7.1	2	3.6	7	12.5	2	3.6	9	16.1
neutral	9	16.1	14	25.0	12	21.4	21	37.5	10	17.9	13	23.2
high	19	33.9	19	33.9	17	30.4	20	35.7	18	32.1	15	26.8
very high	25	44.6	19	33.9	23	41.1	6	10.7	26	46.4	15	26.8

When the question "How successful were you in accomplishing what you were asked to do?" asked the students, only six rated their level of performance on the workloads of the basic design education to be 'very high'. On the other hand, seven of the students (12.5% of the total) rated 'low' and two (3.6% of the total) rated 'very low'. While 20 of the students rated their level of performance on the workloads of the course to be 'high', 21 of the students rated their performance 'neutral'. The 26 of the students (46.4% of the total) concerning the question "How hard did you have to work to accomplish your level of performance?" rated their effort of the workloads of the studio course to be 'very high', and 18 of the students (32.1% of the total) rated their effort 'high'. An equal number of 15 students (26.8% of the total of each rating) regarding the question "How insecure, discouraged, irritated, stressed, and annoyed were you?" rated their level of frustration on the workloads of the basic design education to be 'very high' and 'high', and the 13 of the students (23.2% of the total) perceived their degree of frustration 'neutral'. This indicates that half of the students perceive themselves as annoyed by the workloads of the basic design education.

ANOVA was used to evaluate whether there were significant differences in students' learning demands on work loading across the four CA dimensions. There was statistically a significant difference at the $p < 0.05$ level in the four learning demands for the four CA dimensions. Mental demand was only statistically significant in ILO clarity ($F [3, 52] = 3.41$, $p = 0.024$, $\eta^2 = 0.16$). Temporal demand was significantly different in all four CA dimensions: ILO clarity ($F [4, 51] = 5.94$, $p = 0.001$, $\eta^2 = 0.31$), TLA alignment ($F [4, 51] = 3.64$, $p = 0.011$, $\eta^2 = 0.22$), AT alignment ($F [4, 51] = 2.71$, $p = 0.040$, $\eta^2 = 0.18$), and feedback effectiveness ($F [4, 51] = 3.09$, $p = 0.024$, $\eta^2 = 0.20$). Performance was statistically significant in ILO clarity ($F [4, 51] = 2.76$, $p = 0.037$, $\eta^2 = 0.18$) and feedback effectiveness ($F [4, 51] = 4.53$, $p = 0.003$, $\eta^2 = 0.26$). Frustration was significantly different in only feedback effectiveness ($F [4, 51] = 2.68$, $p = 0.042$, $\eta^2 = 0.17$). There were no statistically significant differences in students' perceived learning demands on physical demand and effort for any of the CA dimensions.

In addition, a multiple linear regression model was conducted to investigate the effect of students' perceived learning demands on the four dimensions of CA of the studio course. According to the model, performance (beta = 0.368, $p = 0.005$) only made a unique contribution to ILO clarity, explaining 13.5% of the variance, where the remaining learning

demands were not significant predictors. Mental demand (beta = 0.444, p = 0.021) and frustration (beta = -0.418, p = 0.005) made the largest unique contributions to TLA alignment, which explained 16.3% of the variance. Within AT alignment, mental demand (beta = 0.497, p = 0.009) and frustration (beta = -0.446, p = 0.002) were made the largest contribution, which was followed by physical demand (beta = -0.391, p = 0.022), explaining 26.2% of the variance. Feedback effectiveness emerged as a predictor of four out of six dimensions of learning demands, all of which made a great unique contribution: mental demand (beta = 0.675, $p < 0.001$), physical demand (beta = -0.519, p = 0.001), frustration (beta = -0.459, $p < 0.001$), and performance (beta = 0.437, $p < 0.001$), explaining 44.8% of the variance. The ILO clarification outcome was associated with performance, such that the online basic design studio course's clear intended learning outcomes increased students' performance. The findings confirm that the more teaching-learning activities aligned during the online basic design studio course, the higher the mental demands; however, the lower their frustration with learning. The more assessment tasks aligned during the studio course, the greater the mental demands on students; however, the lower their frustration with learning and physical demands from the assignments. Regarding the findings, the more effective students' perceived feedback to be, the greater their mental demands and performance; however, the lower their physical demands and frustration with learning.

4 CONCLUSION

In response to the coronavirus pandemic, basic design education was scheduled to be conducted through distance learning within the start of the new academic year of 2020-2021. The current face-to-face curriculum of the course was modified following distance education; therefore, the studio course's teaching and learning system had the substantial potential to be examined. This study investigated the constructive alignment of basic design education, the relationship between constructive alignment and students' approaches to learning, and their perceived learning demands through online distance education. This study suggests that the basic design studio course was constructively aligned during the online distance education in terms of intended learning outcomes, alignment of teaching-learning activities, alignment of assessment tasks, and effective feedback. Results also show that students' deep approaches to learning were the meaningful predictors of the constructive alignment of the online basic design education. The findings also support that different dimensions of constructive alignment were associated with various parameters of students' perceived learning demands. Further research is needed to understand the similarities in and differences between face-to-face education and online distance education in basic design education.

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