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The effect of COVID-19 lockdown on design studio learning and architecture students' performance.

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THE EFFECT OF COVID-19 LOCKDOWN ON DESIGN STUDIO LEARNING AND ARCHITECTURE STUDENTS' PERFORMANCE

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Abstract. The first UK lockdown halted all facets of life and quickly became the greatest challenge the education system has ever faced. In order to continue teaching curriculums remote learning was promptly adopted as the emergency method as a substitute learning environment to continue teaching curriculums. Discussions surrounding the effectiveness of remote teaching emerged after the initial year of the lockdown with many studies worldwide surveying universities and student performance across all courses. Study findings claimed no change in performance however the lack of specific research and different pedagogies in architecture compared to typical lecture-based learning subjects suggests otherwise. This paper explores the adaptability of architecture in remote learning, in comparison to face-to-face, and its effect on students' academic performance.

This study targeted British architecture-based students and their experience with remote learning surrounding the UK lockdowns and subsequent hybrid learning methods. The nuanced differences between architecture-based pedagogies were explored through an extensive literature review of fundamental, modern and current pedagogies. In a remote learning environment, the said pedagogies were affected, and design studio did not translate well to the remote teaching style.

When surveyed, over $\frac{3}{4}$ of respondents established links between their performance and the lack of traditional face-to-face learning. There was a prevailing negative view of exclusively remote learning and a preference towards a hybrid approach. Despite this, many recognised the benefit of remote learning however only in scenarios such as lectures. Research concluded that the likely external factors, economic and digital poverty, appeared ineffectual according to respondents. Findings suggest potential damage to academic performance within architecture disciplines and in wider applied learning disciplines. Future predictions surrounding higher education see technologically based pedagogies taking precedent as the benefits surrounding hybrid learning have been discovered with its flexibility and accessibility to students and educators

Keywords: Architecture, Design Studio, Pedagogy, Remote Learning

1. Introduction

University teaching methods have used the person-to-person lecture and discipline practice formats since the earliest evidence of academic institutions. Universities have since evolved learning methods and pedagogies to integrate technology and online learning for a blended method. The blended method offers material to students on and off campus to provide support in a flexible and adaptable format (Kaushik. M, 2016). Emergency remote learning, a result of Remote learning, as we know it, was introduced in the 1980's but didn't become widespread in universities until the 2000's (The History of Online Schooling, n.d.). However, the UK COVID lockdown in 2020

forced an immediate mass migration to emergency remote teaching with a select few disciplines teaching in-person. The hasty transition to online learning methods saw an intensified workload for teachers as they transferred their current curriculum to an online delivery method and become adept in the necessary software's and services (Allen, Rowan and Singh, 2020).

Design courses, such as architecture, are heavily dependent upon collaboration between peers and their teachers in a design studio, mimicking professional practice (Emam, Taha and ElSayad, 2019). COVID-19 has compelled isolation of remote learning which has reduced the effectiveness of the collaborative pedagogy, implicating the opportunity to develop these skills have been missed. Waite (2021) surveyed architecture students revealing a significant portion of students were feeling lonely and found working in isolation challenging, thus suggesting that the performance and output of the students had not reached full potential productivity nor quality.

Debates have sparked concerning student performance under COVID-19 circumstances and in an online learning environment. Emergency remote learning and its effectiveness in design disciplines such as architecture, is open to discussion concerning its adaptability from traditional face-to-face to an online setting. Some academics hypothesize that the impact on student performance to be negligible (Watson, 2020). However, opposing research concerning students and teachers received a mixed reception to online learning and its adaptation to design-based courses (Ibrahim, Attia, Bataineh and Ali, 2021).

1.1 RATIONALE

The implications COVID-19 has had on education is a current and under-examined crisis with sparse research conducted on specific design disciplines in education, such as architecture. Education at all levels, had been replaced with emergency remote learning to prevent education halting all together as the COVID-19 crisis saw no clear end. In this short time, educators had to transfer their curriculum to a suitable online delivery method that was as effective as traditional blended learning (Allen, Rowan and Singh, 2020). Design subjects have suffered with students expressing their difficulty to learn in the new remote learning environment, absence of studio, collaboration, and socialising (Waite, 2021).

Research conducted by El Said (2021) regarding grade difference between face-to-face and remote learning semesters suggests there was no significant grade change in higher education. However, there are limitations on the macro-scale of only one university being the basis and the micro-scale with all disciplines being measured on tests and quizzes, a less applicable format for design subjects such as architecture. Disciplines that rely heavily on coursework and projects may provide differing results due to their different learning environment. Opposing El Said's conclusion is Watson's (2021) survey of architecture students and their perceived challenge with online learning thus implying the possibility of students performing poorer academically.

The research conducted holds relevance to the current ongoing COVID-19 circumstances and the future of higher education online learning. The current effect

on higher education through its dependence on remote/hybrid learning due to COVID-19 and in the future, as universities are predicted to integrate technology and digital learning into courses for flexible teaching methods and a more accessible learning strategy (Lederman, 2020).

1.2 AIM

This paper aims to investigate the effect of online/blended learning methods on higher education architecture students' academic performance and overall well-being. The absence of traditional design studio and in-person teaching will be scrutinised, and compared with online teaching methods, to ascertain the impact on students perceived performance and grades.

1.3 OBJECTIVES

- Critically review different student learning pedagogies and assess their capability in a remote teaching environment
- Identify the importance of design studios and collaborative student learning
- Examine the benefits and hindrances of remote learning, a result of COVID-19's university closures, on design students
- Review student perception of remote learning, its adaptability to online and the advantages or disadvantages it presents
- Establish the importance of design studio and student collaboration and its application to the online methods in relation to student learning and performance

2. Literature review

2.1. LEARNING PEDAGOGIES

Learning pedagogies is defined as “how we teach—the theory and practice of educating” (Persaud, 2021). Various or customised pedagogies are used by educators to adapt the curriculum to the best suited learning style for the student and subject/discipline. The intention of pedagogies is for development of cognitive and working skills whilst also teaching the student ‘how’ to learn according to their preferred method. Different pedagogical methods have been utilised by educators throughout the history of education and have been adapted to be tailor-made to the individuals and subjects. Pedagogical learning aims for the student to attain a full understanding of the subject matter or discipline beyond a superficial memorisation or shallow knowledge (Persaud, 2021).

In the modern age of higher education and its ever-reflective nature, an emerging student-centred approach is becoming the exemplar, with innovative and technology infused pedagogies reflecting this shift to create the “optimal learning environments with technology enriched spaces” (Giridharan, 2016). Kaushik (2016) expanded upon

Giridharan's observation of the technological trends further by addressing the requirement for modern pedagogies to integrate technology in order to create a better work environment and workflow for students. This would result in a more flexible, communicative, motivating, engaging and conscientious work environment. Modern pedagogies in design disciplines such as architecture have modernised and evolved to become better suited to the advancements in the industry towards a mostly digital work environment, with the widespread adoption of Computer-Aided-Design (CAD), Building Information Modelling (BIM) and 3D modelling software. These digital aids have revolutionised the construction industry and higher education pedagogy was adapted to integrate the new methods with traditional learning ahead of the curve.

Of the different pedagogical methods, some take priority over others or aren't the priority in a design studio environment. As such, some methods won't be included as they are deemed irrelevant by the author.

The relevant methods include Socratic - students learn through critical thinking, reason, and logic; Problem-Based Learning - students solving real world problems; Collaborative - peer-to-peer interaction and interpersonal management; Integrative - making connections between concepts and experiences and Reflective - reflecting upon lessons, projects, and assessments (Persaud, 2021).

Socratic learning in design studios can be found in the nature of a student logically interpreting a brief and critically thinking how to allocate time and resources to produce the necessary outlined project outcomes. Problem-based teaching sees projects and assessments relating to real world briefs and challenges that the student will encounter in their careers. Collaborative learning is seen throughout the entire design studio process with constant peer-review between student to student and student to educator; additionally correcting their peers/own work as a collective in the class. Integrative teaching sees students on trips to construction sites and existing structures, learning concepts whilst experiencing them in real time. Lastly, reflective learning concerns individual students evaluating past projects, assessments etc. and analysing what work/study methods are effective and where there is room for improvement.

2.2 ARCHITECTURE & PEDAGOGY

Architectural design courses are taught in a manner similar to real world practice with collaboration, realistic design problems and refining design through discussions and reviews. Education mimics the real-world design process as an integrative pedagogy with the initial conceptual stage, drafting and detailing of concept, CAD views and rendering of design and finalisation. "The design is then conveyed to those involved in the construction and development process, and construction begins" (Architectural Design Process and Phases | BluEntCAD, n.d.).

Soliman, A.M. (2017) conducted research detailing the necessary number of hours required from an architectural design course and broke down all fundamental segments of the learning methods for a comprehensive understanding of the design process. Design communication, design skills and design studio management

strategies are described as the main pillars that contribute to a holistic understanding of the design process.

Table 1. Appropriate teaching and learning strategies for the architectural design process in pedagogic design studios (Soliman, 2017)

Design Communication	Design Skills	Design Studio Management
Use of technology	Problem seeking	Group Discussions
Sketching	Analysis of Design	Interdisciplinary Teamwork
Physical Modelling	Developing Concept Designs	Realistic Design Problems
	Testing and Evaluating Design	
	Reflection	

Under usual circumstances all methods are possible, however, emergency remote learning complicates communication and impedes the conventional studio collaboration. This made it necessary for teachers to adapt the curriculum to an online method and a suitable delivery format.

Despite the sudden altered environment, multiple studies on remote learning demonstrate a positive impact on students. Gopal, Singh, and Aggarwal (2021) surveyed a high satisfaction rate from students and teachers in a remote learning environment with no links to performance being affected. A small survey of dental students and instructors, a course more dependent upon in-person learning, were satisfied with the transition to remote learning and their online curriculum. Instructors and students had even exhibited preference to remote learning for a better work-life balance (Rad, F. A. et al. 2021). Ceylan, S. et al. (2020) conducted an examination of architectural design studios during the COVID-19 outbreak which analysed student reception to online learning across varied course/programme stages. The survey when asking about remote learning saw an overall positive attitude from students, with a variation of third year and fourth-year students having a slightly less positive view, which the Authors linked it to the pressures of graduation. The criticism in the survey surrounded the lack of socialisation from physical studio and the absence of peer/instructor review that occurs naturally when working in studio. Concluding, Ceylan, S. et al believe that digital and remote learning is the next step for education and the COVID-19 pandemic merely accelerated the evolution in architectural design education.

2.3 THE IMPORTANCE OF DESIGN STUDIO

Design studio is the centre of collaboration and learning, a central pedagogy of the architectural design discipline. Peer-to-peer and student-to-educator exchanges in design studio as described by Dinham, S. M. (1987) are criticisms that lead to reflective, analytical, and constructive attitudes by students. Schon, D.A. (1987) developed a collaborative style coaching known as Schon's model that can be attributed to the design studio pedagogy. It is a model that "...has the strength of

considering reflection in action (event/experience) with those that happen in hindsight (after the event)” (LibGuides: Reflective writing: Schön, n.d.). Fundamentally design studio refines architectural design through trial and error, experiencing failure and challenges to build student knowledge and train the complex method of problem seeking, analysis of design and reflection on past work.

As mentioned in section 2.2, evidence suggests that design studio can be adapted to a digital format, but it somewhat loses the collaborative and social aspect. Frambach, J. M. et al. (2014) discussed pre-COVID, how student communication in class was affected by cultural, contextual and personality factors. Group relations, uncertainty, hierarchal relations, and competition were all contributing factors that inhibited an ideal collaborative discussion between students and teachers. An anxiety to question or contribute to a lesson hinders the application of design studio, with collaboration being the core aspect. In a COVID-19 remote learning environment, the communication has been further affected by moving from in-person to digital communication such as video conferencing, e-mails, and messaging, changing person-to-person interactions majorly. With this transition comes challenges that affected students and teachers in an online environment; Adedoyin and Soykan (2020) examined these challenges. Challenges of technology, assessment and supervision, and digital competence were apparent in a remote setting that affected the learning environment. These challenges, affecting remote learning, were attributed to the lack of preparation for a crisis event like COVID-19. Connectivity problems that induced delay and disconnection leaving conversations stilted and one sided, added further complications. Progress and development of the best suited methods can be assumed as they have become tried and tested by educators over the 2 years since the widespread lockdowns in the world (Torre Arenas et al., 2020), and a consensus of the best suited methods had been deliberated upon.

Social presence within the online environment has been explored to analyse communication in the remote setting. “Social presence refers to the degree to which one perceives the presence of participants in the communication” (Wut, and Xu, 2021). The discipline explores how a person’s psychological perception conveys their presence via different forms of media by their visual and verbal cues. Certain types of social communication can convey superior social presence such as video calls or telephone, rather than simple methods such as e-mail. Social presence is fundamental to how we build relationships whilst being an alternate method to physical contact (Zelkowitz, 2011).

Wut and Xu (2021) conducted a social presence study based upon a previous study regarding online classroom management by Li and Beverly (2008) but in the COVID-19 setting. The study investigated the challenges for student-to-student and student-to-instructor interactions through remote online methods. Findings conveyed the lack of natural communication distanced students from each other and their instructors, affecting motivation of both parties. The lack of challenging others’ views, and the usual discourse found in face-to-face meant that the crucial cognitive and social development was absent in online classroom. Recommended solutions provided by

Wut and Xu include more pro-active online methods of teaching. Encouragement, incentives and break out rooms were found to be effective at facilitating interactions between the groups mentioned. Wut and Xu noted other factors that inhibited online communication which included teachers that weren't adept in online delivery software, larger class discussions failing to translate to online methods and the lack of engagement from students in online lessons. Given that communication has seen somewhat of a negative impact in the remote learning environment, it can be considered that the online design studio will have suffered also. Design studio historically has been dependent upon communication and collaboration, so one can speculate upon the effectiveness of studio in the remote setting. With the fundamental pedagogy, communication and collaboration hampered, performance may also be affected.

Studies from Asia Pacific (Allen, Rowan, Singh, 2020), Europe (Lischer, Safi, Dickson, 2021), Asia (Goppal, Singh, Aggarwal, 2021) and the US (Zalat, Hamed, Bolbol, 2021) all discussed the benefits and the obligation to move towards remote learning implementation. Whilst remote learning is not a new trend, the general consensus from these studies acknowledges the global shift, or rather integration, to remote learning in the future. This was suggested by the positive student and educator perception towards online learning and the 'crisis breeds focus' mentality that brought attention to remote learning application. Even in the unlikely scenario that remote learning is not integrated into future learning, it will be reserved as a solution for another similar crisis that may threaten to halt education.

2.4 EXTERNAL FACTORS IMPACTING STUDENT PERFORMANCE

The two major factors impacting students were digital poverty and economic poverty.

In the online environment, an emerging 'digital poverty' was revealed to affect students of all levels of education. In higher education within the UK "52 percent of students said their learning was impacted by slow or unreliable internet connection, with 8 percent 'severely' affected. According to the poll of 1,416 students, run for the OfS by Natives" ('Digital poverty' risks leaving students behind - Office for Students, 2020). Digital poverty includes students being unable to find suitable/quiet study spaces, be provided with the appropriate online course materials or lacked access to a computer/laptop/tablet for their work. This was simply another obstacle that students were faced with in the online learning environment. In an architecture setting, this is especially important for students to have a comfortable study space, with long hours at desks spent on projects, dissertations, and digital models. The extent at which digital poverty has affected students and their academic performance is difficult to quantify, so the impact of digital poverty on university students remains widely unknown.

Students also experienced economic poverty and issues regarding the facilities and resources readily available to them. Architectural design courses require computers with medium to high end graphical and RAM performance with large storage devices to smoothly run the required software and programs for digital projects and assignments. Whilst mainstream software packages such as AutoCAD, SketchUp and

REVIT offered free educational licenses, some rendering software or image editing packages had, at best, a discount that may not be an expense capable by a student in poverty (Russell, Thompson, and Jones, 2021).

The New Policy Institute (NPI) carried out a survey of student poverty in 2015, and their findings showed 1.3 million young people were in poverty, in full-time education and not living with their parents (Poverty Among Young People in the UK, 2015). In the context of COVID-19 the unemployment in people 16 and older increased from 3.8% at the beginning of 2019 to 4.2% in 2021, still higher than the last 3 to 4 years. The working student will have had many factors impacting their ability to pay for resources or time to allocate to studies fearing the loss of employment (Unemployment rate (aged 16 and over, seasonally adjusted) - ONS, 2021). Economic poverty poses the greatest external challenge to remote students with its cost to student time and the mental strain, linked to the diminished academic performance (Giusti et al., 2021).

Digital poverty merely implies that the effect on students may have impacted academic performance whereas economic poverty studies convey strong likelihoods of poorer academic performance when students suffer (Giusti et al., 2021). No conclusive evidence can be drawn to state an effect in academic performance without an in-depth study within the current remote learning time frame. But with the improvement of hybrid learning and steady return to classroom teaching, the gap of research may not appear worth further investigation. Despite this, the transition to the emerging trend of online learning is evident and, as discussed in section 2.1, poses the opportunity to address these challenges to students and provide future solutions.

2.5 FUTURE PROSPECTS OF REMOTE LEARNING

Student perception of remote learning has altered over time, as seen in studies conducted in the early weeks of the remote learning transition with students reporting 'life becoming more difficult (Almendingen et al., 2021) comparatively with the improved results (October/November 2020) found in the Cranfield et al. (2021) study. As remote users became more adept to online learning and the most appropriate delivery methods were decided upon, a general improvement to remote learning could be found in conjunction with improved student reception. Whilst section 2.3 deliberated upon the difference in design courses and their remote learning, it can be assumed that with time they too have improved their methods. However, a report by The National Student Survey: Student experience during the pandemic (Office for Students, 2021) upsets this theory with data showing a slight decline in satisfaction agreement rates. With a huge range of over 332,000 core respondents in their annual survey of UK university students, the data is high quality and is hard to argue against. OfS acknowledged that the results could be short lived, and a circumstance of students weary of their situation. On the other hand, the results could be an indication of student reception to prolonged remote learning, a circumstance that has yet to impact students with only 2 years overall of exposure to remote learning and as such has yet to be studied.

The common advantage of remote learning noted by students is the ‘convenience’ or flexibility of time and location in accordance with their studying (Kemp and Grieve, 2014). Whilst this may suit some students, poverty-stricken students that cannot afford the necessary technology suffer academically as a result (Dhawan, 2020).

TABLE 2. *Face-to-face or face-to-screen? Undergraduates’ opinions and test performance in classroom vs. Online learning (Kemp and Grieve, 2020)*

Advantages of Remote Learning	Disadvantages of Remote Learning
Convenience	Lacking in engagement
Wider contributions	Feedback (depending on form) is not immediate
More detailed online responses	Discussions lack flow due to delay/digital feedback
Less judgment in asking questions	Easier to review paper documents
More time to think	No need to read classmates’ comments

No definitive conclusion can be drawn on remote learning applicability and the hierarchy of needs in terms of advantages and disadvantages. Though, the noted disadvantages specifically effect the pedagogy of design studios as mentioned in section 2.1. Lacking a clear advantage over traditional F2F, remote learning is unlikely to become the new norm, but it does have its place. Remote learning has been compared and studied under the guise of a replacement for teaching, though it presents solutions to challenges faced by F2F learning and as such should be treated as a supplement. A hybrid pedagogy of online and F2F, a holistic and balanced learning approach can be offered to students.

Despite any negativity, students have expressed their preference towards online learning with the most mentioned benefit being how ‘flexible and convenient’ it is for students (Miller, 2019). Students appear open to the prospect of online learning as a method with the caveat that they have some form of blended or F2F as mentioned by Wut and Xu (2021). Remote learning is suggested as not a ‘one size fits all’ solution, but to be combined with other learning strategies and methods as a supplement for a robust curriculum.

2.6 SUMATION OF LITERATURE

The literature reviewed conveys the lack of student collaboration and difficulty in communication is apparent. Of the reviewed student groups, generalised, dental, architecture and medical, only architecture and medical students have voiced moderately negative opinions towards remote learning. As mentioned in section 2.1 & 2.2 collaboration and communication are fundamental to architectural design and design studio pedagogies. The architecture discipline is an anomaly within the student groups and lacking relevant studies conducted within architecture courses, so no immediate trends can be formed.

The adaptability of remote learning to architecture in academia, as investigated in objective 4, is subject to criticism with a lack in relevant studies and weaknesses found in the absence of critical pedagogical methods. The gap in research presents an oversight in generalised studies that has overlooked nuanced disciplines with different methods of learning. Remote learning in architecture exhibits possibilities of an impact on students' academic performance that warrants further investigation.

3. Methodology

To verify the initial hypothesis within the literature review, a triangulation of data will be achieved through a mixed-methods approach. Open-ended survey questions regarding students' perception of remote learning in conjunction with a defined statistical survey from the same students coalesce in an insightful perspective from the respondents. Both sets of data will be used to confirm or deny the researchers hypotheses.

The survey consists of two main forms of questions, a 1 to 5 satisfaction scale/multi-choice questions and a subsequent open-ended question for students to explain their reason behind their answer. This will help identify motives and establish trends in the findings. From the initial literature investigation, the survey will focus upon meeting these objectives:

- Investigate student perception on remote learning as an alternative to traditional face-to-face
- Identify how the curriculum adapted to remote learning
- Examine external challenges, if any, students faced when working remotely
- Survey students' predictions for the future of remote learning
- Identify the preferred learning method according to course

Through these objectives, a comprehensive and discipline focused survey will be conducted to compare against the 'generalised surveys' previously mentioned. This aims to confirm or deny the initial hypothesis of overlooked subjects in generalised studies leading to sweeping claims that do not consider alternate learning pedagogies for disciplines such as architecture. The survey was conducted during the period between November and December.

4. Results, Analysis & Discussion

4.1 INTRODUCTION

This section examines the data collection results from the online survey, a combined method of qualitative and quantitative data. These outcomes are compared to and contrasted with previous findings from section 2 of the literature review and elaborated upon. Key findings are highlighted, and all results analysed and expanded upon in relation to the set objectives.

4.2 SURVEY RESPONDENTS' PROFILES

Survey respondents numbered 51 in total across 27 universities, with 26 respondents from architecture or design courses that completed the design studio section of the survey. The other respondents hailed from a variety of courses; these data sets are utilised comparatively to highlight differences in architecture subjects from other courses.

TABLE 3. Survey Profile, Universities (Author, 2021)

Which University do you attend?	Percentage of Respondents	Number of Respondents
Robert Gordon University (RGU)	25.4%	13
University of Leeds	7.8%	4
Brunel University London	5.8%	3
University of Portsmouth	5.8%	3
University of Aberdeen	3.9%	2
University of the Highlands and Islands (UHI)	3.9%	2
Liverpool John Moore's University	3.9%	2
Other	39.2%	20
Prefer Not to Say	3.9%	2

TABLE 4. Survey Profile, Course's/Programme's (Author, 2021)

Which Course/Programme are you enrolled in?	Percentage of Respondents	Number of Respondents
<u>Architectural Technology</u>	29.4%	15
<u>Architecture</u>	9.8%	5
<u>Building Surveying</u>	3.9%	2
<u>Landscape Architecture with Urban Design</u>	1.9%	1
<u>Construction</u>	1.9%	1
<u>Interior Architecture</u>	1.9%	1
<u>Applied Design in Architecture</u>	1.9%	1
Other	49%	25

Respondents make up a total of 26 different courses, 7 of which are architecture related and highlighted in table 4 with a spread in the course/programme stage, as

shown in figure 1. This is a desired outcome to gather a varied perspective according to course stage.

A diverse range of student stages have experience in a remote setting. As expected, stages 3 and beyond having experienced most, if not all facets of learning typologies. Of the 26 students in architecture-based subjects, nearly all had experienced hybrid learning, in part with the gradual return to campuses at the time of the survey.

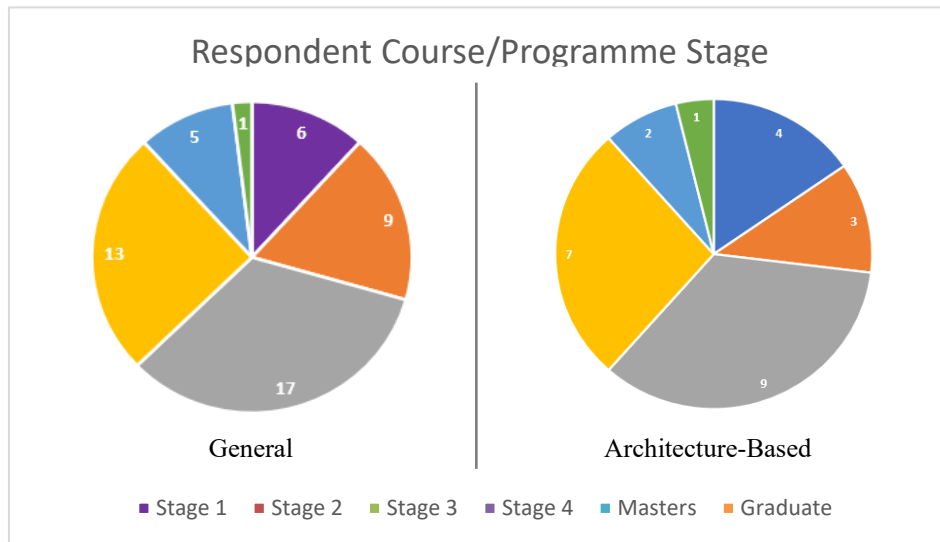


Figure 1. Course/Programme Stage (Author, 2021)

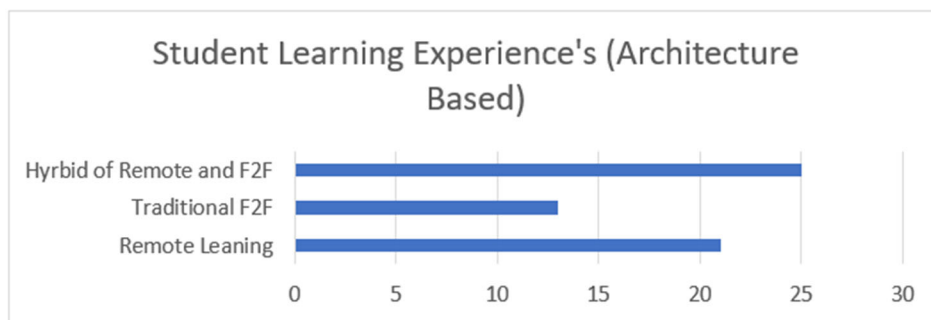


Figure 2. Experienced Learning Environments by architecture-based students (Author, 2021)

4.3 SURVEY FINDINGS

Qualitative findings were collected in the form of open-ended questions gathering student opinions and experiences with quantitative questions collected in the form of closed option answers to create distinct statistics.

When asked to compare the quality of remote learning from the beginning of lockdown to current remote teaching, students saw a definite increase in quality and stability in their online courses, as seen in figure 4. Whilst there was an increase, especially with students citing hybrid learning as a solution to remote learnings defects, some students believe that the remote learning experience to have plateaued

mentioning how “[it] still feels like the course is not totally catered to online”. This may be a result of a select few courses neglecting remote learning with an optimistic outlook with no further lockdowns thus need for remote learning methods. Satisfaction rates coincide with the generalised studies of student satisfaction surrounding remote learning and its improvements, much like the prevailing positive attitude reported by Ceylan, S. et al. (2020). Architecture-based respondents report a similar percentage for satisfaction with Scale 5 (S5) showing a 34.6% response, general S5 showing a 35.2%. In both cases, nearly all responses reported an increase in quality with only a small portion claiming no improvement, see figure 6.

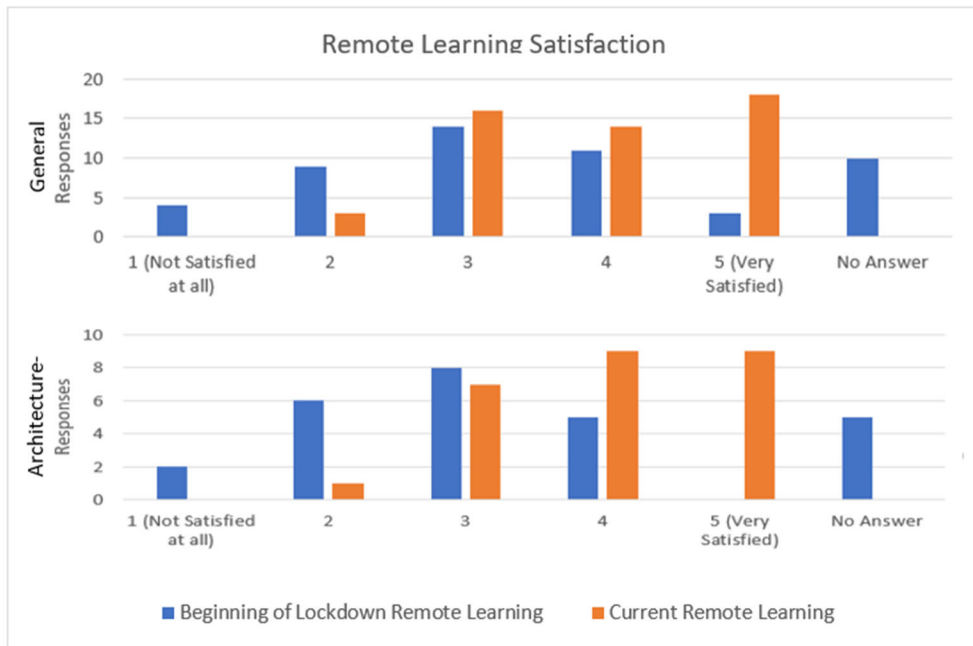


Figure 3. Compared Satisfaction Rates with Remote Learning (Author, 2021)

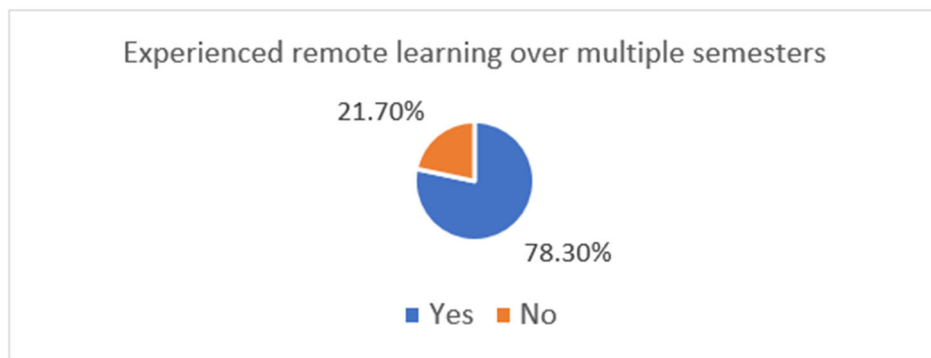


Figure 4. Student Perceived Remote Learning Improvement (Author, 2021)

To understand student opinion around remote learning, respondents were asked to list their perceived preferential attributes and disadvantages of remote learning. Of the 47 responses a commonality was drawn from the 3 most common answers of each.

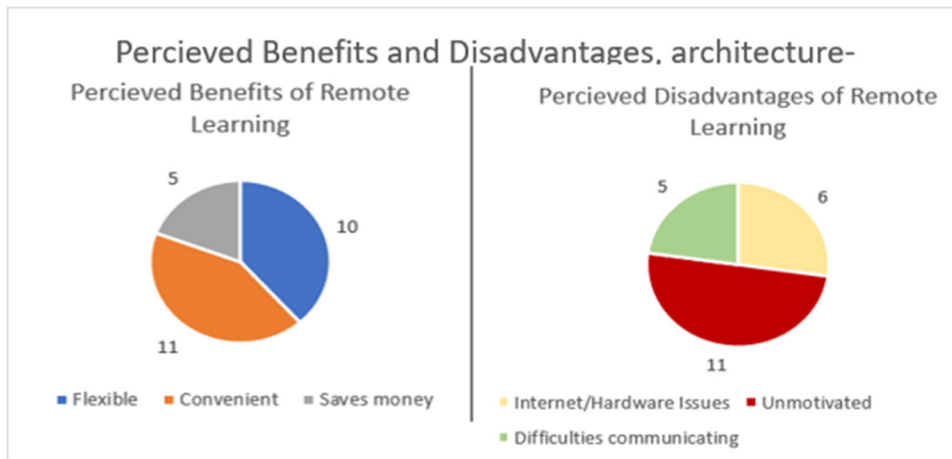


Figure 5. Perceived benefits and disadvantages of remote learning, architecture-based

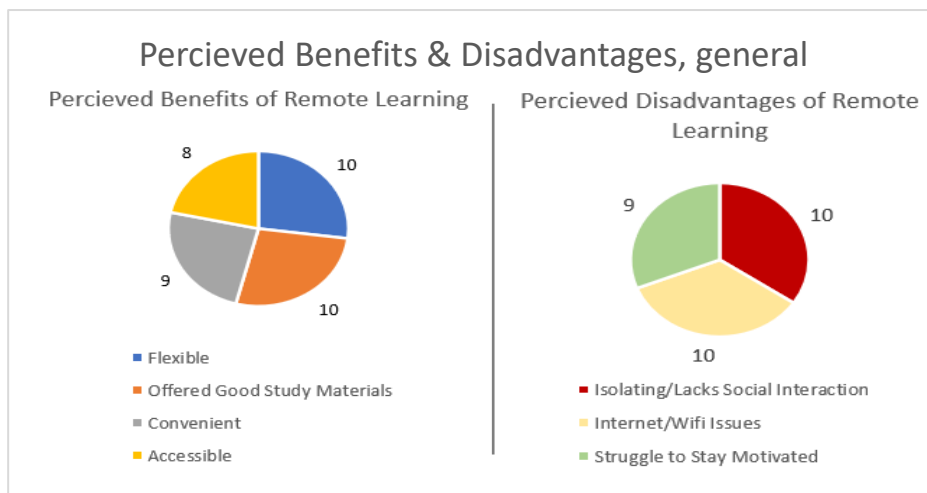


Figure 6. Perceived benefits and disadvantages of remote learning, general

Design studio is a core element for design-based subjects such as architecture. Respondents that utilised design studio were asked of their perceived effectiveness of design studio in a remote environment and more importantly if they believe it to have affected their academic performance.

All questions regarding design studio absence and its effect on academic performance saw over ¾ of the responses establishing a link between the two.

Each question subsequently asked the respondent to explain their rationale, in which another trend was discovered. Students mentioned various grievances, firstly with the refinement of work through seeing other students' output (34.6% of respondents) and

secondly, the feedback they had received felt inadequate in some way (30.7% of respondents).

Respondent X “In comparison to now with in-person studio I think it was affected... I could usually pick up on ideas other people would have that could improve my own work”.

Respondent Y “...it has affected my outlook on the course. I value groupwork a lot more than I used to. Bouncing ideas back and forth can help with complex design problems”.

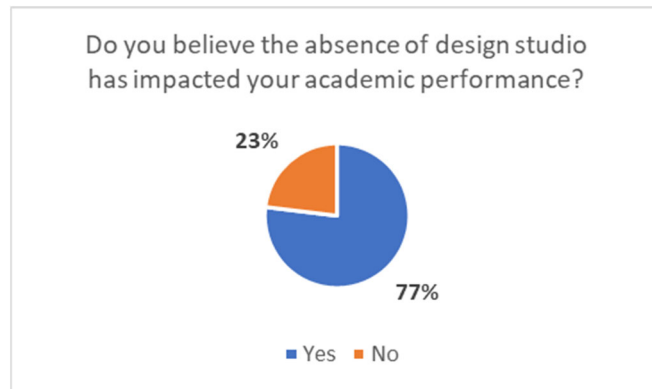


Figure 7. Design Studio Absence Chart (Author, 2021)

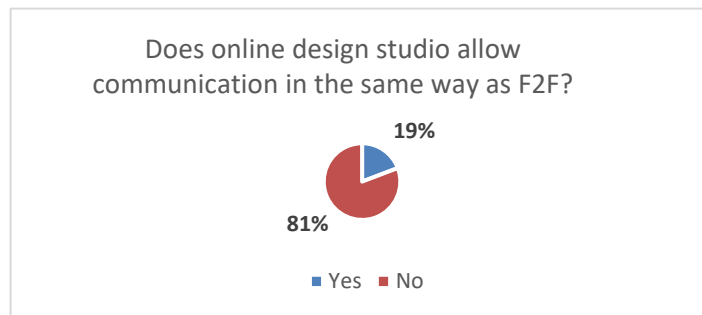


Figure 8. Online Design Studio Communication Chart (Author, 2021)

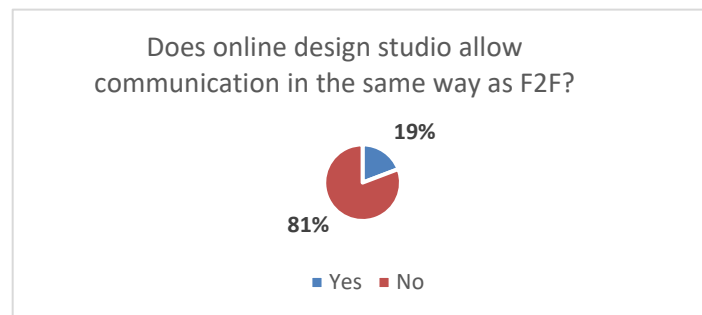


Figure 9. Student & Teacher Interaction Absence Chart (Author, 2021)

Respondent Z “Being present in the design studio you can get more feedback from tutors while in the online learning I only get a 10-minute feedback”.

Considering these are ‘perceived’ responses and not based on grading, it is hard to quantify. Despite this, the majority of respondents hold negative attitudes towards remote learning and deem it unsuitable or poorly adapted to the new online method.

External factors and their impact on students were evaluated to remove any additional challenges that may have been overlooked in generalised studies. Economic and digital poverty were highlighted in relation to the prevalent surge of reports concerning both factors, especially those conducted in a COVID-19 setting, particularly the OfS report (‘Digital poverty’ risks leaving students behind - Office for Students, 2020)

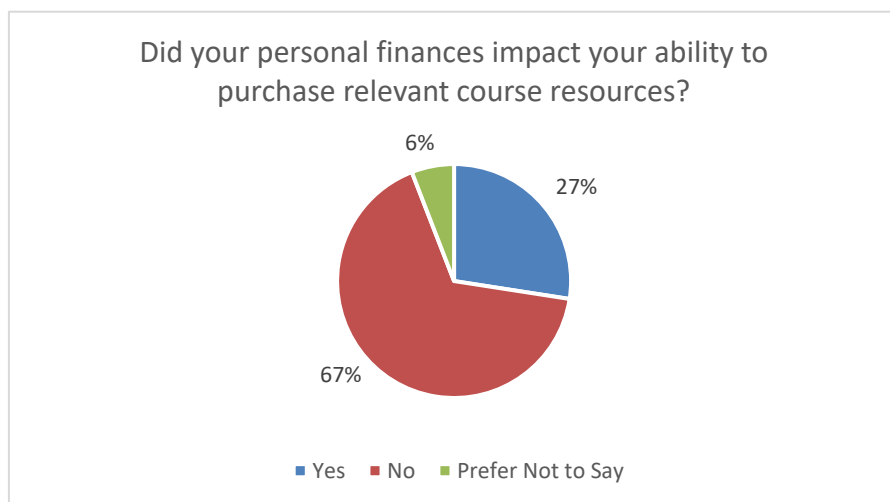


Figure 10. Personal finances impact (Author, 2021)

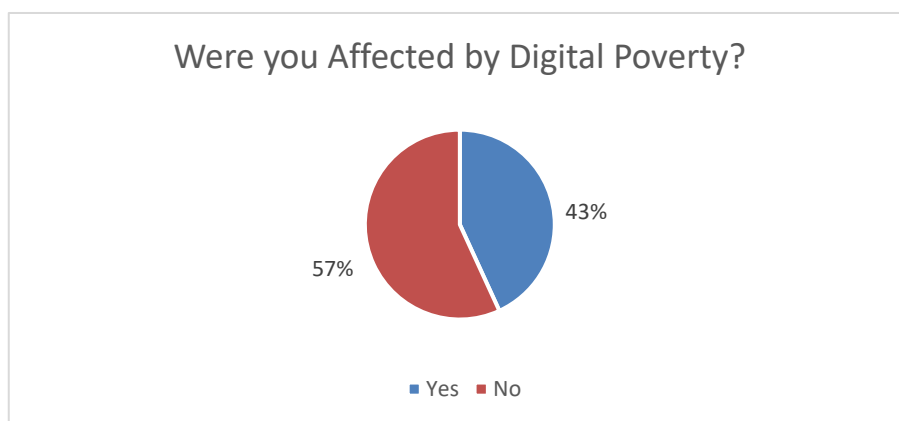


Figure 11. Digital Poverty General Chart (Author, 2021)

Findings from the survey present no significant differences or trends from economic poverty and only a slight increase in digital poverty by the architecture-

based group. Within the survey, some of the same students posed digital poverty as a disadvantage of remote learning, however, did not declare digital poverty as an external factor. The reason for this discrepancy is unknown. Evidence suggests these issues transcend from course to course and affect all student stages and disciplines. All evidence considered doesn't dispute economic or digital poverty as challenges but in this case, no external factors had affected the survey respondents.

Lastly, respondents were asked to select their preferred method of learning to summarise overall feelings towards remote learning and traditional face-to-face learning.

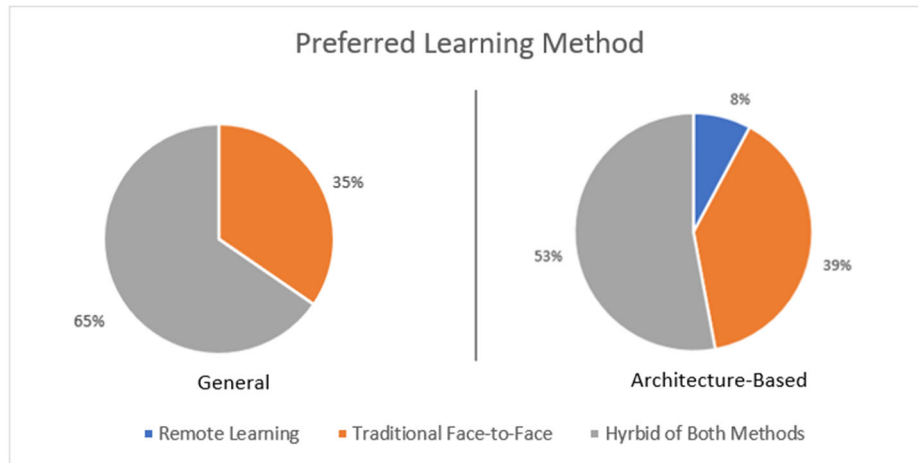


Figure 12. Preferred Learning Method (Author, 2021)

The collected responses confirm how students have responded to remote learning only, with the minority that prefer remote learning belonging to courses not reliant on applied learning such as communications and liberal arts. Many respondents, in both the general and architecture-based groups recognised the advantages of a mixed method approach with traditional face-to-face learning reserved for design studio, labs and tutorials and remote learning reserved for lectures and theory driven lessons. Responses to why they selected a hybrid approach adhere to the trend Wut and Xu (2021) observed in their own survey.

Respondent X: “Both has its positives and negatives. [A] combination of both gives you the social interactions as well alone time and convenience of [working from] your home”

Respondent Y: “I feel a hybrid [method] would be great as it would mean you wouldn't have to go into university every day which would save time and money. A hybrid method would also allow students to learn the skills needed to work from home, which will potentially create more job opportunities particularly to companies that are now advertising roles that are permanently remote”

Traditional face-to-face was still valued by both groups especially respondents from English universities, a link likely based on tuition paying students expecting access to university resources and facilities. Giridharan (2016) and Kaushik's (2016) response to university learning methods side with a hybrid method over purely traditional or remote. Their belief was that technologically rich and an advanced learning environment for students was required and, during 2016, observed a stagnation of the education system with no signs of growth. COVID-19 for better or worse has resuscitated growth and advancements within education and has forced technological integration, a result that will likely outlast the pandemic and become the 'new normal' cited by those studying COVID-19 learning methods.

4.4 KEY FINDINGS & TRENDS

- The majority of architecture-based students hold a negative opinion towards their experience with online design studio and believe it has impacted their academic performance
- Architecture-based students link the absence of in-person interactions and collaboration to their perceived poorer academic performance
- Student opinion valued hybrid learning far more than remote and with architecture course students exclusively preferring traditional face-to-face
- Differing opinions on the effectiveness of remote learning can be attributed to a course depending upon applied learning. This extends beyond architecture-based courses such as computer/digital design that also utilise applied learning
- Presumed external factors seem to pose no prominent challenge to general or architecture-based students

4.5 SUMATION OF SURVEY

The literature review implied heavily that there was no noticeable change nor impact to student grades in a remote learning environment had occurred. However, the lack of the focused studies specifically architecture-based aided by the prevalent communication flaws for remote design studio suggests otherwise. Primary data conveys a majority of architecture-based students viewed remote learning negatively and assumed the remote design studio resulted in their academic performance suffering. This confirms the initial hypothesis that generalised studies overlooked subjects that utilise varied learning methods which may result in sweeping and problematic claims. External factors, in this case economic poverty proved to be mostly absent within the study and digital poverty being far less prominent than the literature review would have suggested. A hypothesis within the literature review that was confirmed by the primary data was the advance to technologically enriched learning with over half of students preferring a hybrid learning method and foresaw the need for some form of remote learning in the future.

Research data suggests that not only architecture-based students have suffered in remote learning, but other disciplines that utilise applied learning have also been impacted. The method of applied learning can be seen in architecture-based, medicine and sport disciplines which poses a worrying neglect to focused studies. Remote learning excels when it concerns theoretical learning as a convenient and flexible option, which offers a multitude of resources to its users. It struggles to accommodate learning situations that are dependent on discussion and review, with stilted and delayed communications resulting in a poorer experience overall. Whilst the performance was not based on grades and thus lacks robustness, the major trends pose opportunities to investigate these disciplines and applied learning as a whole. Architecture and design studio present credible claims to academic performance suffering and may well have been affected.

5. Conclusions

5.1 CONCLUSION

This paper intended to investigate the potential effect remote learning has had on academic performance, specifically architecture-based subjects and those that utilise design studio.

From evaluation of literature and fundamental architecture learning pedagogies, it is apparent that there are pedagogies not suited to a remote teaching method. Comparing the findings and literature reveals communication and collaboration difficulties that hindered the typical learning in a remote setting. There is a clear possibility that remote learning adoption of architectural design pedagogies is incompatible, leading to possibly poorer learning potential, which is highly suggested by survey responses. Respondents aired grievances around their poor refinement of work and overall poorer outcomes than previous years. As such, design studio was identified as an integral part of architectural design and vital to developing student skills for real work scenarios. Additionally, findings acknowledge the importance of design studios, specifically in a traditional face-to-face format. Collaboration, peer review and communication were highlighted as crucial elements in design studio and the foundations of architectural design pedagogy. These learning pedagogies would act as preliminary professional practice scenarios with the design studio replicating real world architectural design. The remote learning environment saw benefits and hindrances from respondents. The flexibility and convenience were valued highly, however, respondents conceded the lack of social interaction and Wi-Fi/connectivity issues were substantial challenges in their learning. Architecture-based students reflected this sentiment with the addition of communication as a challenge, an expected result for architectural design students, with regard to the fundamental pedagogies highlighted. Architectural design students' overtly negative opinion of remote learning cemented it as an auxiliary and only to be utilised in specific scenarios, a complete opposite of the surveyed theoretical courses in the primary data. Traditional face-to-face is valued highly by architecture-based students with the advantages outweighing remote learnings benefits with face-to-face being crucial for design studio or desk crits. Student perception in a general sense

enjoy remote learning to an extent but prefer the option of traditional face-to-face, a trend that explains hybrid methods being the most desired learning style. Architecture-based responses subverted this claim with those that selected hybrid option expressing that hybrid methods should only be used if design studio was face-to-face.

Generalised studies have overlooked the important nuances to learning in architecture and other applied learning courses. In all academic performance questions, over 75% of architecture-based respondents believe remote design studio to have affected their academic performance. This addresses communication and collaboration challenges in a remote setting. Remote learning has not failed to adapt design studio but is merely inadequate in its current state. It is unable to allow the regular discourse, collaboration, and peer-review traditional face-to-face offers. Future implementation of remote learning should consider the extent to which a course and its modules are taught remotely or face-to-face. A balance of methods adapting the curriculum, particularly in areas where students' express dissatisfaction with remote teaching, would see courses more adequately catering to the needs of students.

5.2 LIMITATIONS & FUTURE RECOMMENDATIONS

Evaluating academic performance based solely on students' opinion weakens claims with no valid statistical evidence. With a larger group of students examined and their grades observed and compared, this would present a credible and valid study to examine the issues recognised in this paper. As time progresses from the initial remote learning during lockdown, performing this study again may prove ineffective with the stabilisation of education and the learning methods returning to normal. However, the topic may still hold relevance in future research to improve this emergency learning method as a contingency plan or to aid international learners. Whilst this paper focused upon architecture and built environment students, this format of study may also be used for other applied learning subjects. This research method could collect and review student perception to fill gaps in research of specific courses and expand upon the needs of students in applied learning.

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