



Citation for published version:

Grover, R & Wright, A 2020, *National Design Studio Survey: Initial Results*.

Publication date:

2020

Document Version

Publisher's PDF, also known as Version of record

[Link to publication](#)

Publisher Rights

CC BY-NC-ND

University of Bath

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

NATIONAL DESIGN STUDIO SURVEY

Initial results

07 July 2020

Prof. Alex Wright^a and Dr Robert Grover^{a*}

^a *Department of Architecture and Civil Engineering, University of Bath, Bath, UK*

* r.j.grover@bath.ac.uk

This report is protected by original copyright

© Alex Wright and Robert Grover, 2020

Copyright

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

INTRODUCTION

The University of Bath has undertaken a survey of the impact of COVID-19 on studio teaching in architectural education. Students and teaching staff at 25 schools of architecture responded to the questionnaire. This allowed us to construct an overview of the challenges and opportunities faced in a post COVID-19 world and provide insight into how schools of architecture might respond.

We wish to thank the Standing Conference of Heads of Schools of Architecture (SCHOSA) for their financial support of the survey and the use of their network in distributing the questionnaires. We would also like to thank all respondents. Without your time and effort, we would not have such a rich and extensive set of data

Across all items surveyed satisfaction among students had decreased following the move to remote teaching. Most significantly affected was the ability for students to learn from each other, to feel part of a community and to access the emotional and motivational support of their peers. This was echoed in responses from tutors.

While in many cases universities were commended for adapting to online teaching, the absence of a physical workplace resulted in an overall detrimental impact on student learning. There was a 58% fall in student satisfaction after the move to online learning and only 7% of students preferred online delivery over its face-to-face equivalent.

The story was similar for teaching staff. While 58% of tutors were satisfied with their online teaching experience, this fell from 94% satisfaction of in person delivery. Only 4% of tutors preferred online delivery to its face-to face equivalent.

This report describes the initial findings of the largest design studio survey of its kind. It examines the challenges faced by students and staff in responding to the national closure of physical design studios and explores opportunities for the future. In the likelihood that social distancing measures will continue into 2021, these findings provide information that may help schools of architecture develop appropriate responses in the post-COVID 19 environment.

1 BACKGROUND

1.1 The design studio

The design studio is the primary learning environment for architectural education in the UK. The accreditation provided by the Royal Institute of British Architects (RIBA) explicitly requires that all validated RIBA part 1 and part 2 courses should have design studio projects constitute a minimum of half of all assessment (RIBA, 2014). It is the “signature pedagogy” of the profession, dominating the preparation of future architects encouraging them to think (like an architect), perform (like an architect) and to act with integrity (Shulman, 2005).

Yet the design studio is more than just the site for this learning. While Donald Schön’s seminal work (Schön, 1985) focussed on the formal interactions between student and tutor in the studio setting, more recent scholars have critiqued this limited conception of learning (Webster, 2008) and emphasised the complex, interdependent pedagogy of the studio (Brown, 2020). In a meta-study of design studios in architecture and the arts Corazzo (2019) identified six key themes that the material space of the design studio enabled: a place to make artefacts; a bridge between academic and professional contexts; to provide meaning to educational activities; to enable or constrain experience and interaction; to provide the background to learning; and to shape disciplinary identities. An implicit belief in a resultant “studio culture” has governed the pedagogic approaches of architectural education institutions in the UK despite a limited definition of its parameters (Vowles, Low and Doron, 2012). Nevertheless, the design studio is widely accepted to be a rich learning medium which nurtures peer interaction and independent learning (McClellan, 2009; Vowles, Low and Doron, 2012).

The closure of design studios in March 2020 in response to the COVID-19 pandemic posed a unique threat for architectural education. Modern digital communications technologies have allowed many formal teaching interactions to move to online. Tutorials and seminars are conducted through *Skype*, *MS Teams* or *Zoom*, while recording technologies such as *Panopto* have allowed lectures to be recorded, streamed or recycled. Many students also engage in predominantly digitised workflows. 2D drafting and 3D modelling software has in many cases negated the need for large scale drawings or even physical modelling. Despite the increasing prevalence of virtual design processes, the spatial dimension of the studio has still remained central to the signature pedagogy of the architectural profession (Corazzo, 2019; Brown, 2020).

Attempts to replicate the design studio experience remotely have often focussed on generating digital spaces where students can share work and interact asynchronously (Lotz, Jones and Holden, 2015). While there have been reported success in virtual online studios (Abbasi et al.; Lahti and Seitamaa-Hakkarainen, 2014; Salman et al., 2017; Lotz, Jones and Holden, 2019; Jones, Lotz and Holden, 2020) and blended approaches (Mohammed, 2017; Rodriguez, Hudson and Niblock, 2018), these typically utilise formal online spaces (such as e-portfolios or Moodle databases) to simulate peer interaction. The authors are unaware of any studies which take a sample of students familiar with the physical design studio and compare this with a move to remote learning. This provides a unique opportunity to enhance both remote and face-to-face learning through a comparative understanding of the successes of each mode of delivery.

1.2 Methods

1.2.1 Sampling

A sample of 798 students and 121 tutors from 29 UK universities were surveyed. The questionnaire was sent to all members of SCHOSA to distribute in their respective schools. Demographic data were also collected to enable categorisation and re-sampling after collection.

1.2.2 Survey questionnaire

The survey utilised a range of different question types depending on the data being collected. These are outlined in table 1.1.1. All surveys were administered online through an independent online platform.

Table 1.1.1: Question types and uses.

Question type	Use
Multiple choice	Used for questions with limited number of possible options (such as types of teaching activity) or questions with predefined categorisation (such as gender or ethnic group).
Likert scales and items	Used for comparative questions on satisfaction. Individual items focussed on specific activities or event. These were grouped to form multi-item Likert scales relating to a theme.
Limited text	Used for questions requiring continuous scales (such as time or distance) or short answer responses (such as which University the respondent attended).
Open text	Used for open ended responses to questions about the student and tutor experience.

The primary mode of data collection was through Likert scales, a collection of individual items based around a single theme which can be aggregated to form an overall opinion (Harpe, 2015). Each item was divided into a 'stem statement' and a 'response scale' (Johns, 2010), in most cases asking for the respondent's level of satisfaction with each metric. These metrics were grouped into themes which constituted individual Likert scales.

1.2.3 Analysis

This report presents an initial analysis focussing on cumulative responses to individual items and treats the data as ordinal (Boone and Boone, 2012). Data are presented in mostly graphical form. Likert items are assumed to be non-parametric and are presented using descriptive statistical measures such as cumulative responses, differences between related items and total satisfaction. When using terms such as satisfaction, the survey sums all positive responses ("fairly satisfied" and "very satisfied") without weighting them which would imply magnitude or interval data.

1.2.4 Research ethics

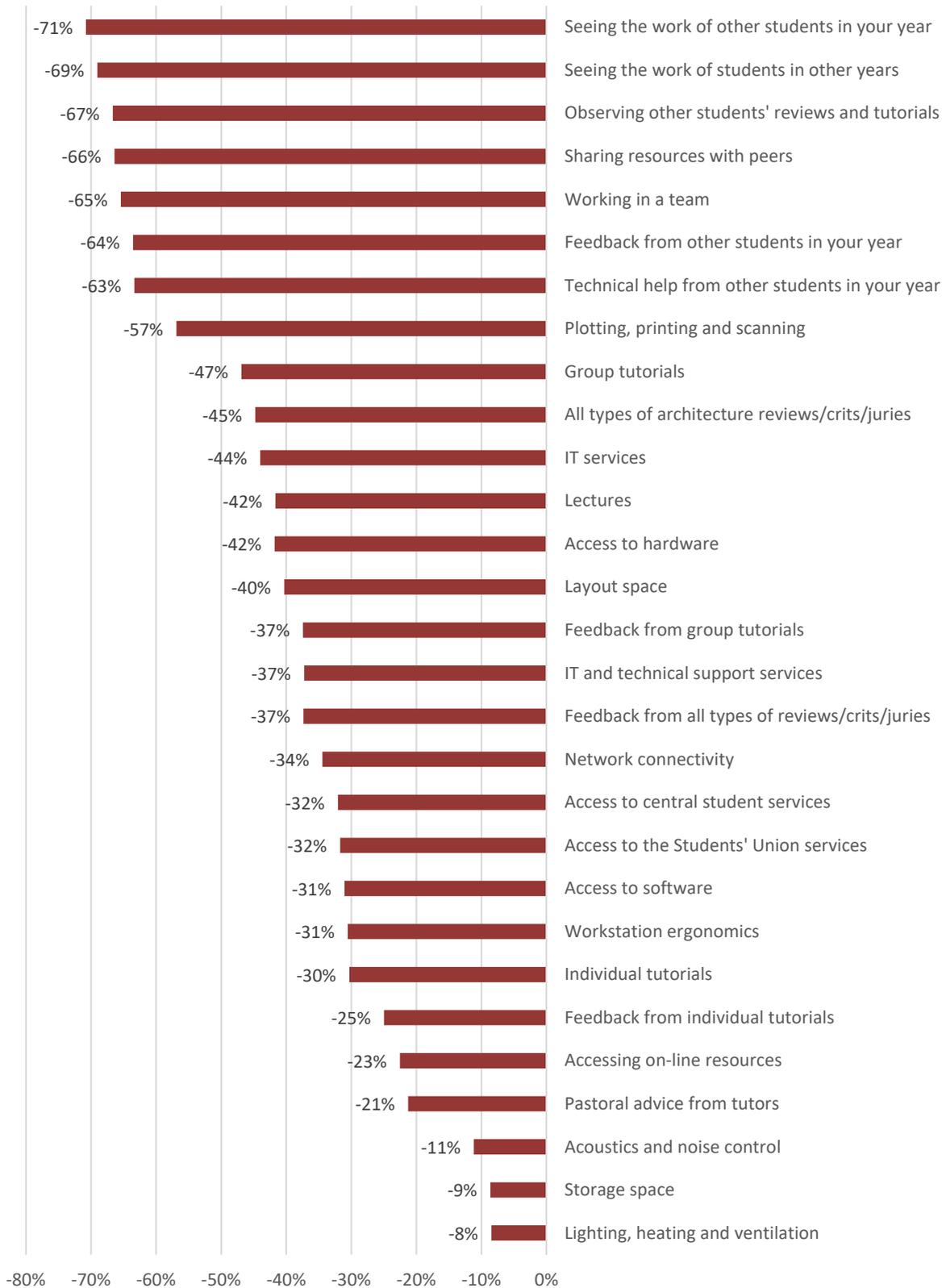
All data were collected anonymously, and responses contained no data which could identify individuals. Individuals were made aware of the data storage practices at the start of the research and it was made clear they could withdraw from the survey at any point before submitting. Due to the anonymous collection procedure, data could not be removed relating to an individual after submission. Individuals could not be directly nor indirectly identified so the data were excluded from the GDPR.

2. STUDENT RESPONSES

2.1 Summary

- 798 students responded to the survey from 25 universities.
- On average, they spend 26.4 hours a week in the studio.
- Overall satisfaction with learning fell by 58% following the move to remote teaching.
- Only 7% of students preferred remote delivery to face-to-face teaching.
- Every factor questioned was considered to have been negatively affected by the move to online teaching.
- Peer learning and peer support were most negatively affected by the closure of the design studios.
- All aspects of studio life surveyed were significantly negatively impacted. Students' sense of being part of a community, interacting with other year groups and motivation support from others were especially impacted.
- Students highlighted the essential social nature of architectural education facilitated by the design studio and recognised it as necessary to their learning.
- The impacts on mental health brought about through isolation and lack of peer support were emphasised.
- Working remotely highlighted the disparity in resources available to students necessary for delivering an architectural curriculum remotely.

Figure 2.1.1: Change in student satisfaction of all metrics after moving from the physical architecture studio to remote working.



2.2 The studio environment

Figure 2.2.1: Student satisfaction with environmental factors in the architecture studio and working remotely.

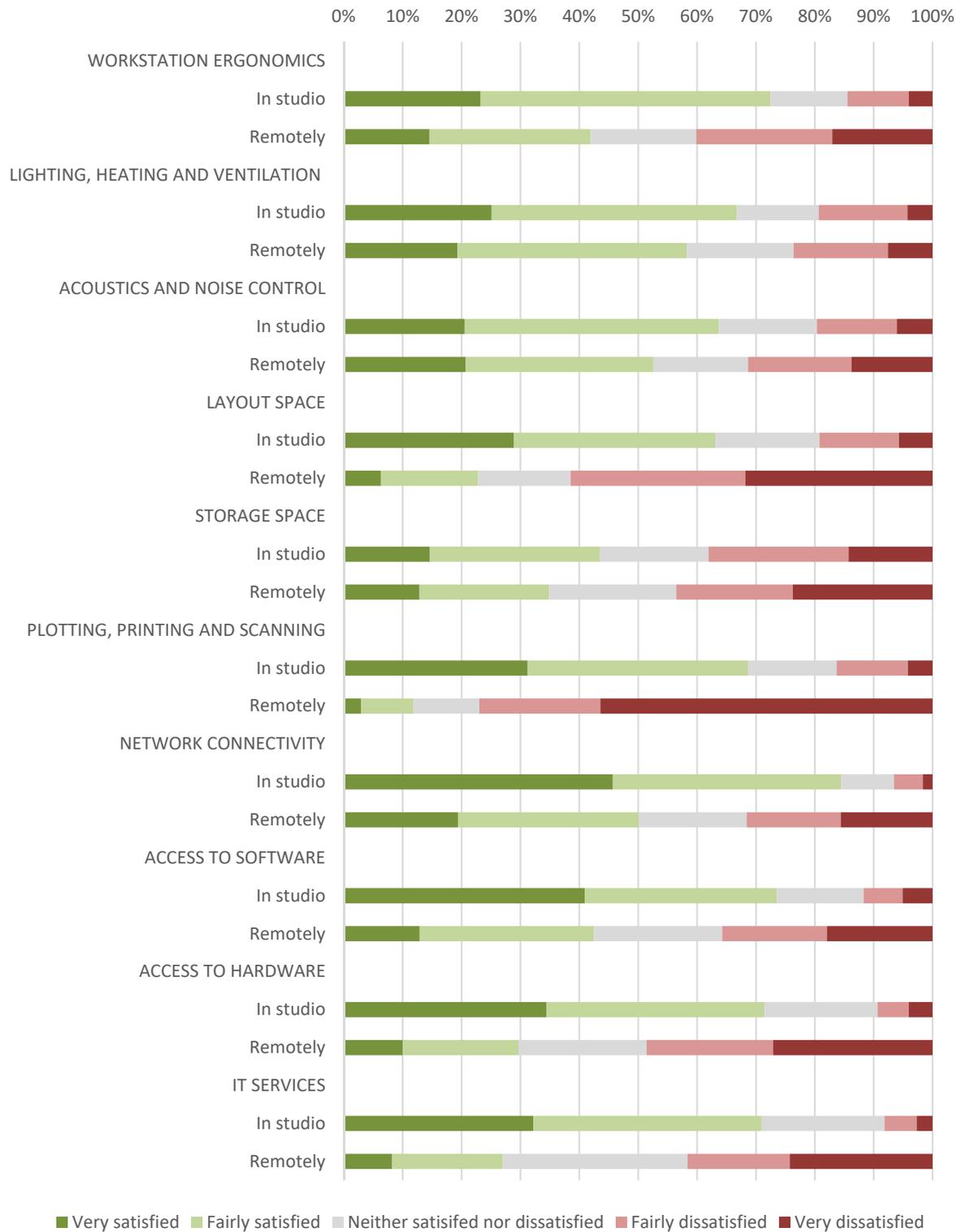


Table 2.2.1: Percentage of students satisfied with their working environment in the architecture studio and working remotely.

Factor	Satisfaction *	
	In studio	Remotely
Workstation ergonomics	72%	42%
Lighting, heating and ventilation	67%	58%
Acoustics and noise control	64%	53%
Layout space	63%	23%
Storage space	44%	35%
Plotting, printing and scanning	69%	12%
Network connectivity	85%	50%
Access to software	74%	42%
Access to hardware	71%	30%
IT services	71%	27%

* respondents answered very satisfied or fairly satisfied

Representative quotes

“...it is unfair to assume we all have the resources to do this. The difference in access to resources creates inequality in terms of the work we are able to produce.” (1st year, Part 2 student)

“[The biggest disadvantage is] no resources or space to work. No laptop or computer so very difficult to do work I would normally do using the university computers.” (1st year, Part 1 Student)

“...if we do not have the software at home it is a massive handicap, from talking to a few people this has massively effected the output of their final work.” (1st year, Part 2 student)

2.3 Learning opportunities

Figure 2.3.1: Student satisfaction with learning opportunities in the architecture studio and working remotely.

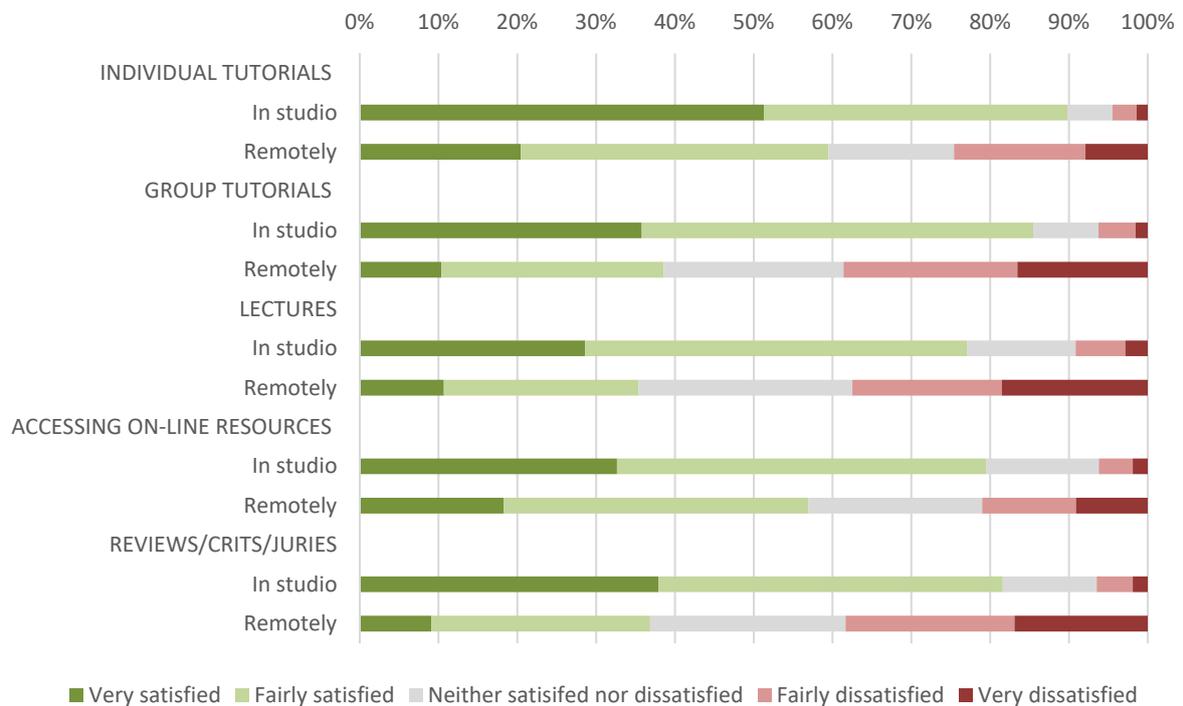


Table 2.3.1: Percentage of students satisfied with different learning opportunities in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Individual tutorials	90%	60%
Group tutorials	85%	39%
Lectures	77%	35%
Accessing on-line resources	79%	57%
All types of architecture reviews/crits/juries	82%	37%

* respondents answered very satisfied or fairly satisfied

Representative quotes

“Online school is not the same. There is not the same connection between tutor and student. Harder to communicate ideas. IT IS NOT THE SAME.” (1st year, Part 1 student)

“I think the studio days are really not working well and many tutors are not technically advanced enough.” (3rd year, Part 1 student)

“[The biggest challenge is] not [being] able to have proper crits or presentations in person, can’t present physical models effectively.” (2nd year, Part 1 student)

“[The biggest challenge is to enable] contacting/speaking to tutors in depth at any point, not having to schedule a meeting.” (3rd year, part 1 student)

2.4 Feedback activities

Figure 2.4.1: Student satisfaction with feedback activities in the architecture studio and working remotely.

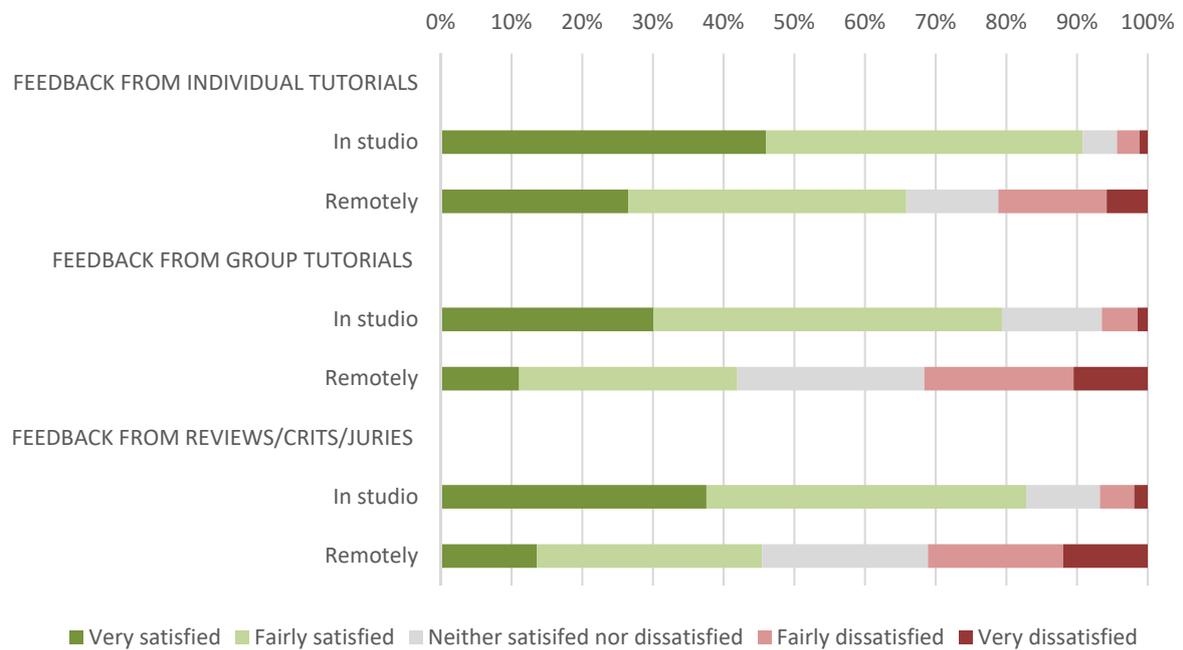


Table 1.4.1: Percentage of students satisfied with feedback activities in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Feedback from individual tutorials	91%	66%
Feedback from group tutorials	79%	42%
Feedback from all types of reviews/crits/juries	83%	45%

* respondents answered very satisfied or fairly satisfied

Representative quotes

“[The biggest challenge is] the level of feedback on tutorials and the ability to explain ideas and get good advice.” (1st year, Part 2 student)

“Tutors’ feedbacks are delayed and difficult to understand when not explained thoroughly as would be in studio.” (2nd year, Part 1 student)

“[The biggest challenge is the] lack of being able to see presented work as a collective pin up and receive feedback and critique, the process of crits seems much more disjointed online.” (2nd year, Part 2 student)

“No feedback, no discussion, poor university experience.” (2nd year, Part 1 student)

2.5 Student support

Figure 2.5.1: Student satisfaction with support services in the architecture studio and working remotely.

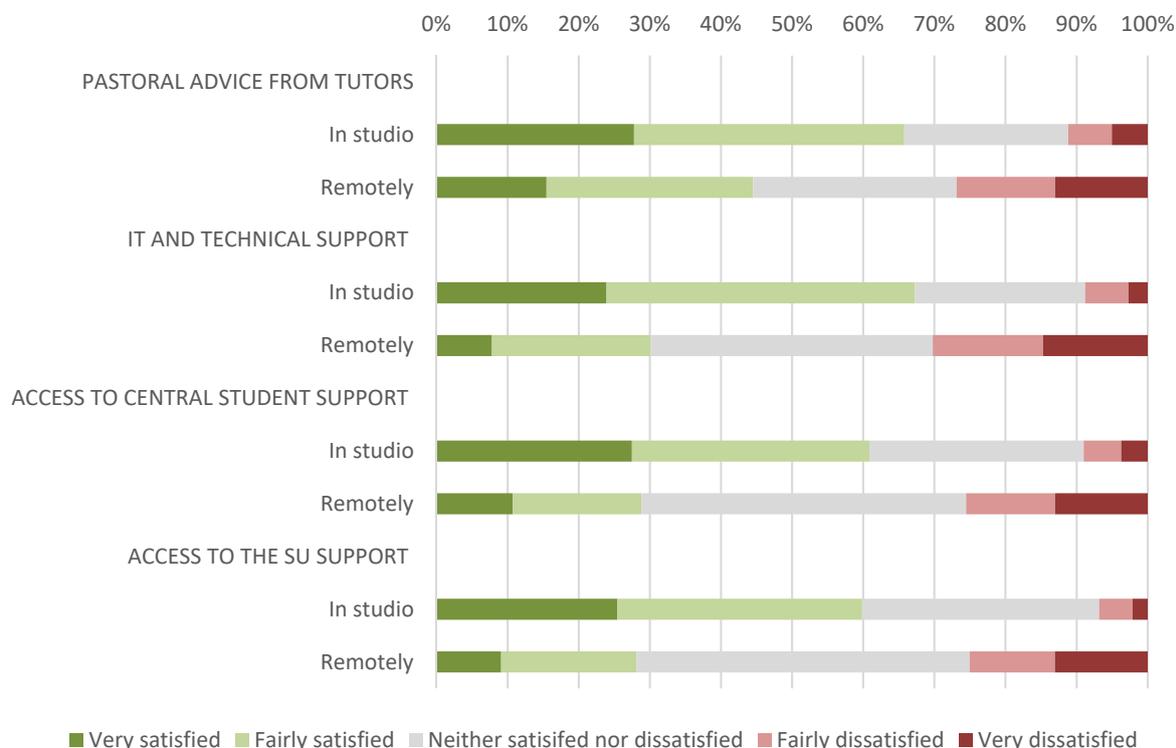


Table 2.5.1: Percentage of students satisfied with support services in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Pastoral advice from tutors	66%	45%
IT and technical support services	67%	30%
Access to central student services	61%	29%
Access to the Students' Union services	60%	28%

* respondents answered very satisfied or fairly satisfied

Representative quotes

“[The biggest disadvantage is] my mental health deteriorating resulting in less motivation to work and not being able to do anything about it because it got brushed off as “we’re all in this together so let’s just give everyone the same extension cuz we’re all the same” (1st year, Part 2 student)

“My mental health has massively deteriorated, my understanding of what I’m doing has dropped and I am in a constant state of confusion.” (2nd year, Part 1 student)

“At uni I had people around me to help with things I find difficult because I’m registered blind.” (1st year, Part 1 student)

“Cannot build a personal relationship with the tutor. Heart breaking!” (2nd year, Part 2 student)

2.6 Peer interaction, learning and support

Figure 2.6.1: Student satisfaction with peer learning in the architecture studio and working remotely.

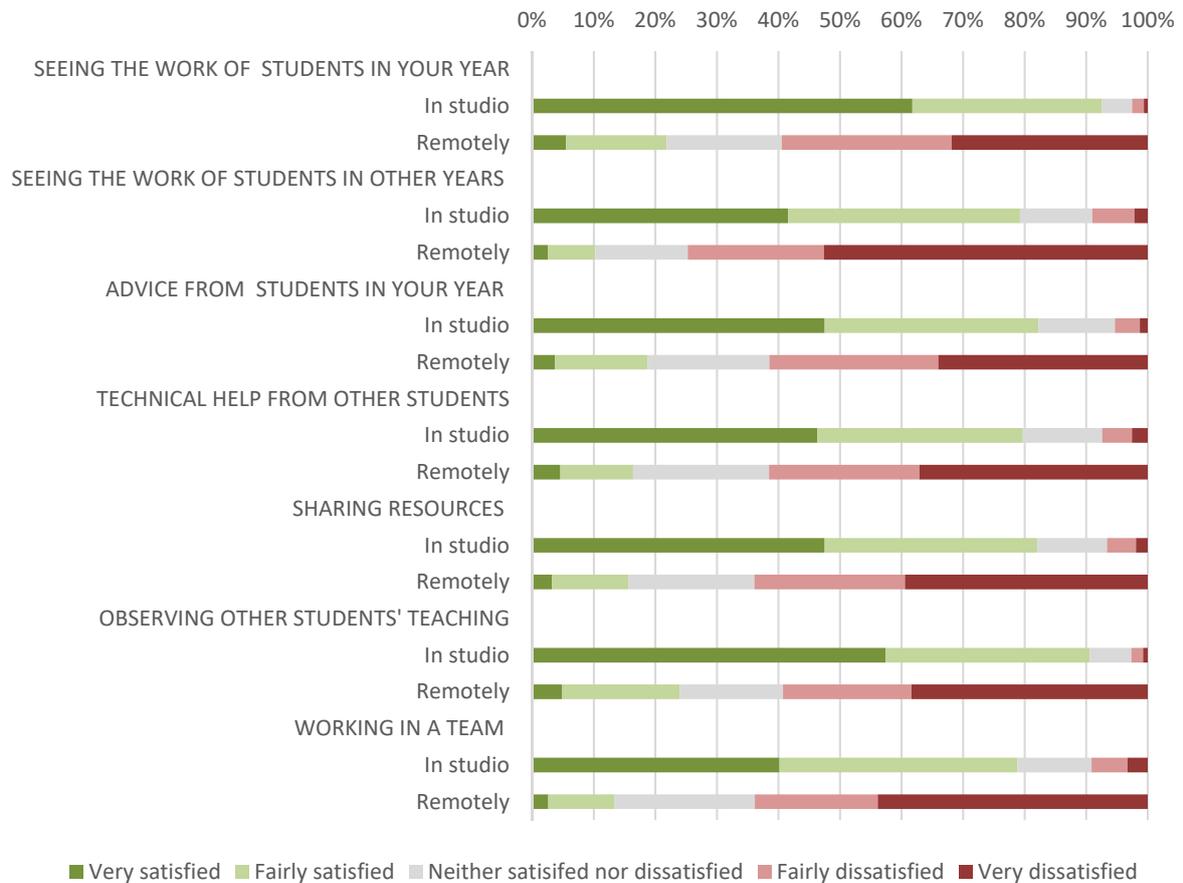


Table 2.6.1: Percentage of students satisfied with peer learning opportunities in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Seeing the work of other students in your year	93%	22%
Seeing the work of students in other years	79%	10%
Feedback from other students in your year	82%	19%
Technical help from other students in your year	80%	16%
Sharing resources with peers	82%	16%
Observing other students' reviews and tutorials	91%	24%
Working in a team	79%	13%

* respondents answered very satisfied or fairly satisfied

Representative quotes

"Not having friends/other students surrounding you. We're taught from the very early stages of our architecture education that working within the studio is highly important to benefiting our studies. "studio culture" is often referenced when talking about architecture education. It's a hard enough course to be doing, and without the moral support, help and advice of your peers, it's been very difficult to 'continue as normal' which I feel is being expected of us." (2nd year, Part 2 student)

Initial results

“I miss studio culture, being able to bump into fellow students and tutors. See random models as you walk around uni. Being inspired by other people’s work and helping each other. Also being able to gauge other people’s progress to see if you are on track.” (2nd year, Part 1 student).

“Working remotely as a whole is a disadvantage, it dulls and plateaus creativity, it doesn't allow the spontaneous conversations about projects which could better your work that the studio provides.” (1st year, Part 2 student)

“I don't want to work remotely from home, honestly it's the worst experience anyone can have. It's too distracting, there's no motivation and I can't see other people's work. How is this a good solution? How am I supposed to learn like this? ... I fear this will be the main reason I will drop out of Architecture, because no one wants to work like this.” (1st year, Part 1 student)

“Any group work next year will be very challenging both to set up and get to know the group and to organise effectively without meeting face to face.” (1st year, part 2 student)

2.7 Studio life

Figure 2.7.1: Perceived importance of aspects of studio life.

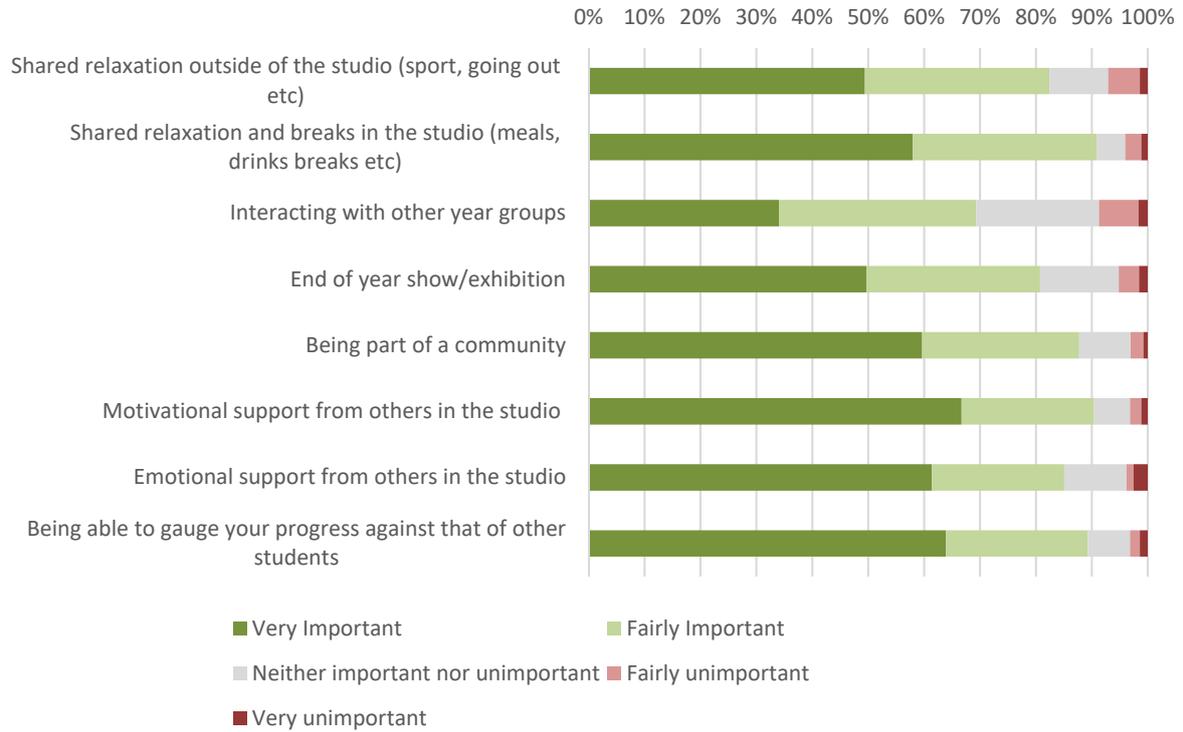
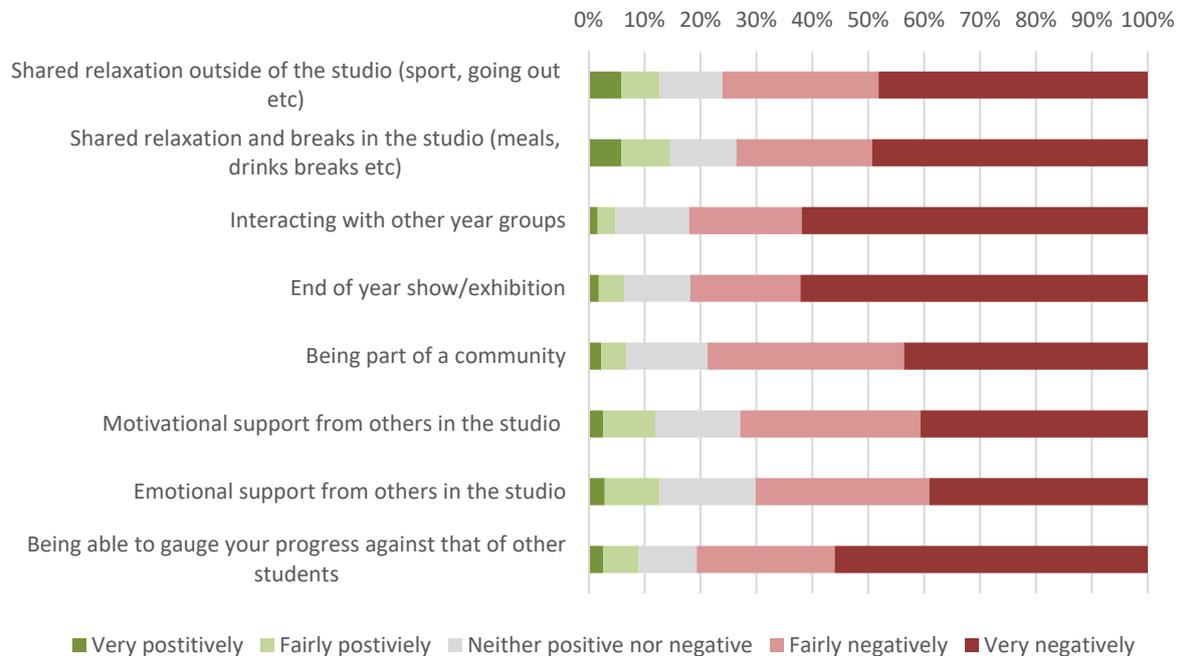


Figure 2.7.2: Perceived impact on aspects of studio life.



2.8 Overall satisfaction

Figure 2.8.1: Student preference for studio delivery.

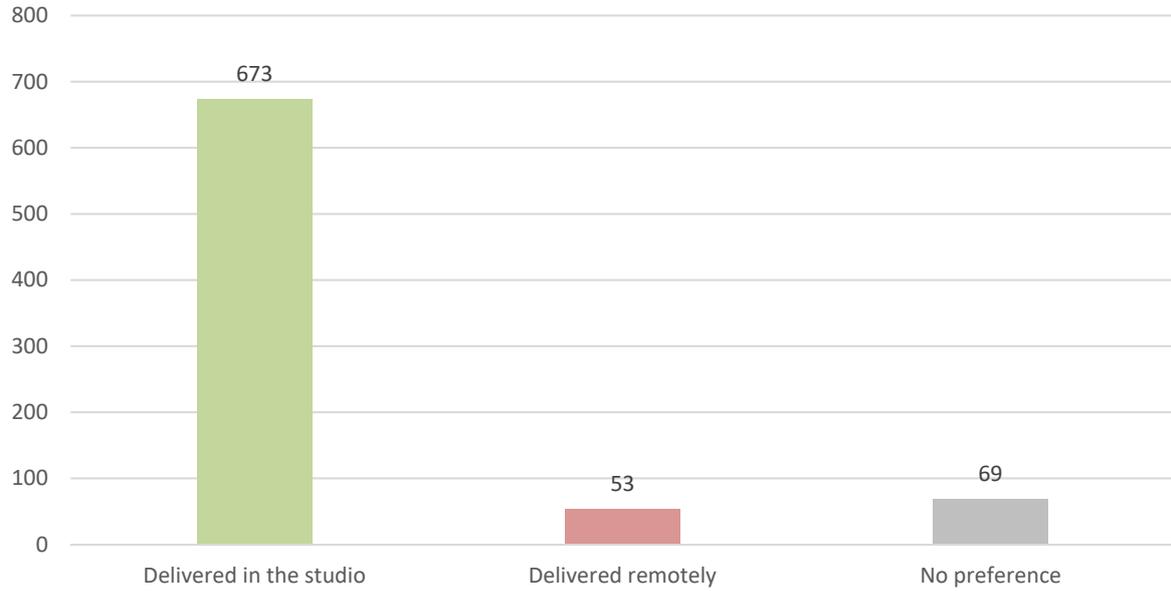
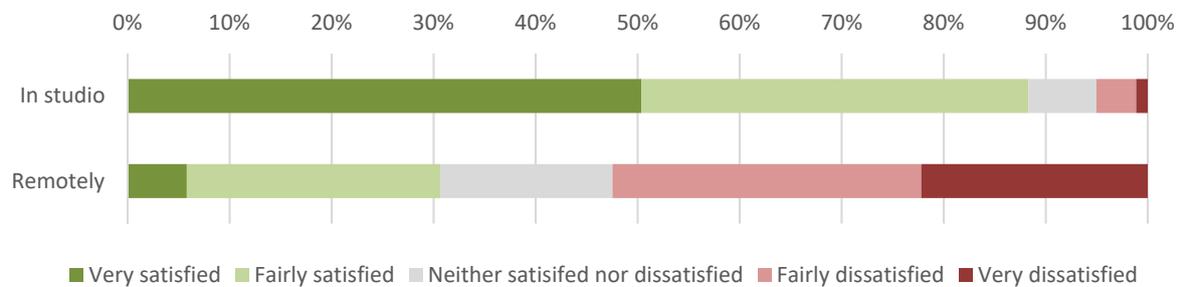


Table 2.8.1: Overall student satisfaction in the design studio and remotely.

	Satisfaction*	
	In studio	Remotely
Overall satisfaction	88.3%	30.6%

* respondents answered very satisfied or fairly satisfied

Figure 2.8.2: Overall student satisfaction with the architectural studio and working remotely.



3 TUTOR RESPONSES

3.1 Summary

- 121 tutors responded to the survey from 29 universities.
- Overall satisfaction with learning fell by 35% following the move to remote teaching.
- Only 4% of tutors preferred remote delivery to face-to-face teaching.
- Most factors questioned were considered to have been negatively affected by the move to online teaching.
- Students' ability to learn from each other and share resources were most negatively affected by the closure of the design studios.
- All aspects of studio life surveyed were significantly negatively impacted by the move to online teaching. Tutors considered shared social activities between students to have been most significantly changed.
- The limitations of technology, developing a sense of studio culture, building equal relationships with students and the fatigue of online tutoring were highlighted as key challenges for tutors.
- Several tutors cited improved lifestyles including reduced commutes as positive impacts. Others found the move to remote tutorials aided their organisation and their ability to share resources and ideas.
- Moving to online teaching had a positive impact on acoustics and noise control, student punctuality and keeping to time in tutorials.

3.2 The working environment

Figure 3.2.1: Tutor satisfaction with environmental factors in the architecture studio and working remotely.

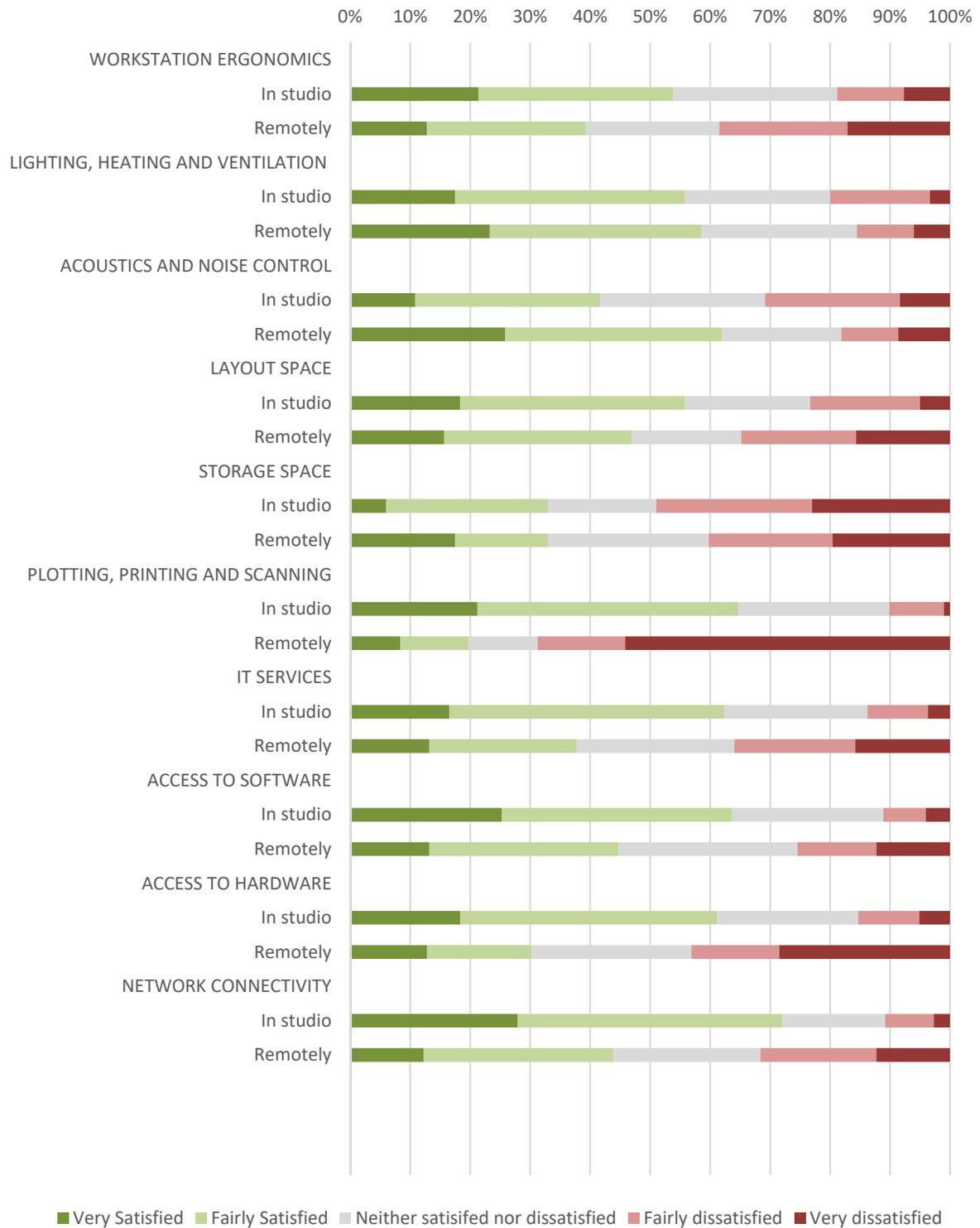
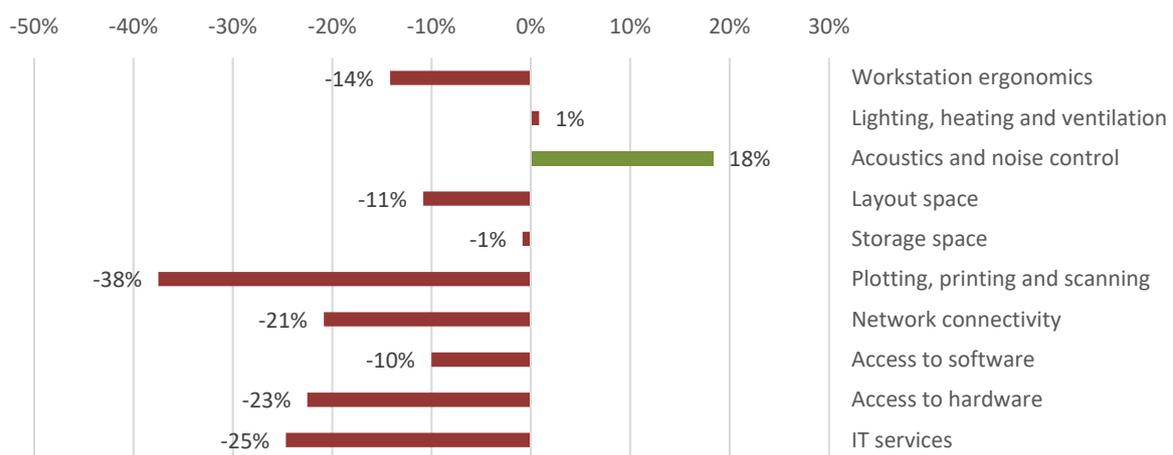


Table 3.2.1: Percentage of tutors satisfied with their working environment in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Workstation ergonomics	53%	38%
Lighting, heating and ventilation	56%	57%
Acoustics and noise control	42%	60%
Layout space	56%	45%
Storage space	28%	27%
Plotting, printing and scanning	53%	16%
Network connectivity	57%	36%
Access to software	53%	43%
Access to hardware	50%	28%
IT services	67%	42%

* respondents answered very satisfied or fairly satisfied

Figure 3.2.2: Change in tutor satisfaction with environmental factors in the architecture studio and working remotely.



Representative quotes

“It has been very stressful and time consuming. My computer had technical issues.” (Undergraduate tutor)

“[The main challenges are] connectivity issues and needing to adapt to a myriad of challenges students face that tend to be levelled when they have access to studio and school facilities/resources.” (Undergraduate tutor)

“[The biggest challenge is] being able to discuss work with sketches, diagrams. Software and hardware not currently able to deal with this. Limited physical modelling.” (Undergraduate and MArch tutor)

3.3 Student Engagement

Fig 3.3.1: Tutors' perceived quality with student engagement in the architecture studio and working remotely.

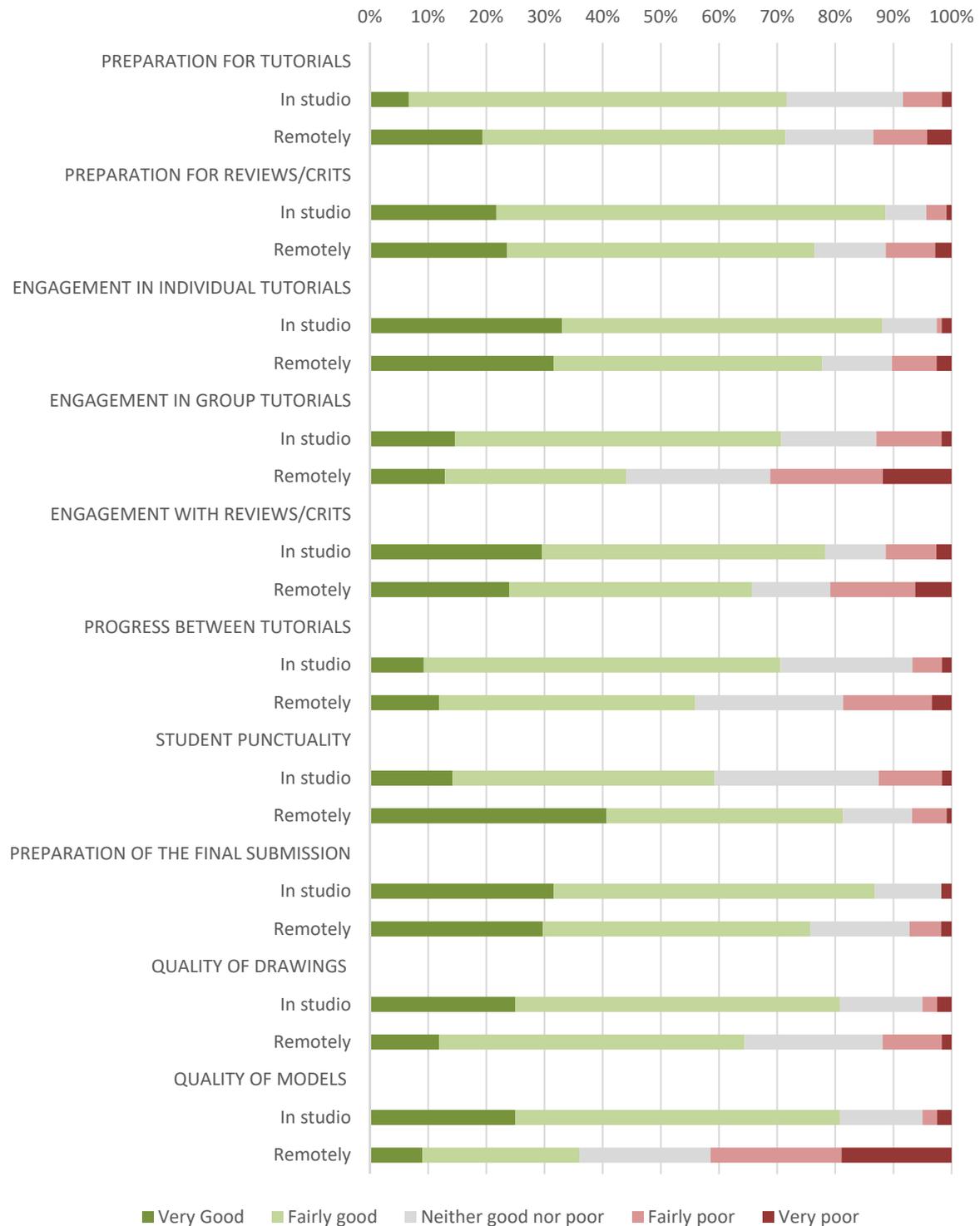
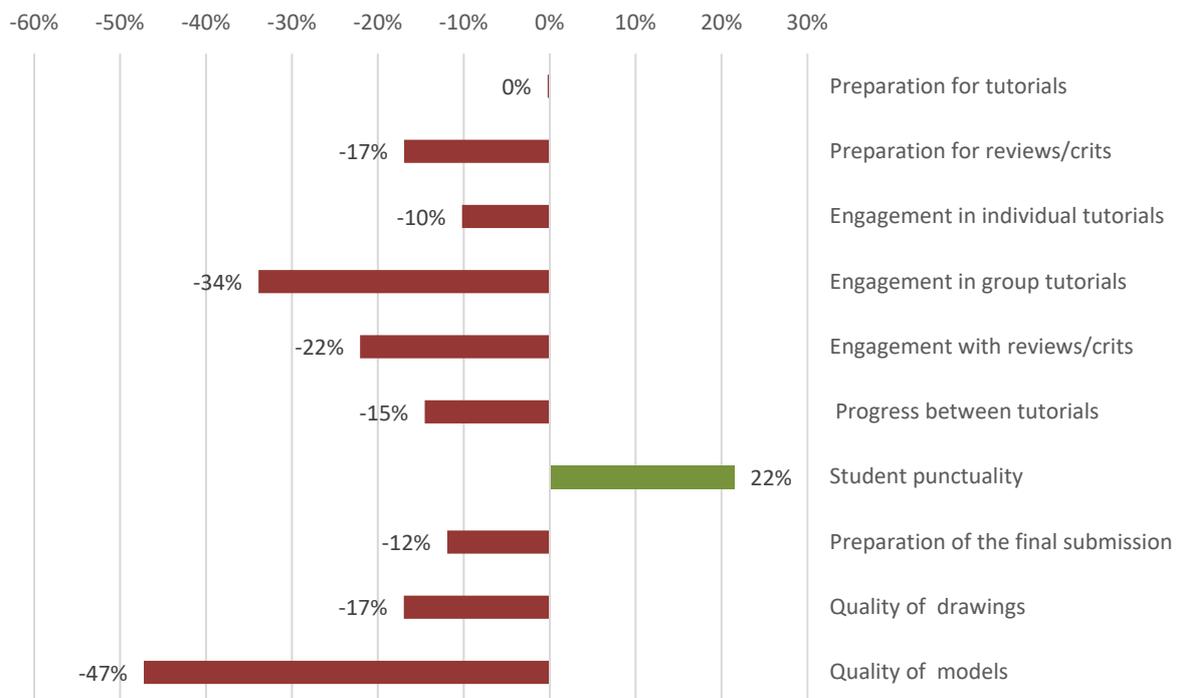


Table 3.3.1: Percentage of tutors who considered student engagement in the architecture studio and working remotely to be of good quality (answered very good or fairly good).

Factor	Considered of good quality*	
	In studio	Remotely
Preparation for tutorials	72%	71%
Preparation for reviews/crits	85%	68%
Engagement in individual tutorials	87%	76%
Engagement in group tutorials	68%	34%
Engagement with reviews/crits	75%	53%
Progress between tutorials	70%	55%
Student punctuality	59%	81%
Preparation of the final submission	83%	71%
Quality of drawings	81%	64%
Quality of models	81%	34%

* respondents answered very fairly good or very good

Fig 3.3.2: Change in tutors' perceived quality with student engagement in the architecture studio and working remotely.



Representative quotes

“Not all students attended tutorials, perhaps a more flexible approach would work here.”
(Undergraduate tutor)

“[The biggest disadvantage is the] the lack of stretched discussions and sharing opinions in small groups discussions.” (MArch tutor)

[The biggest disadvantage is] the resultant static interaction with each student. ie not being able to draw and discuss fluidly, but instead having to assess student work for each individual tutorial in advance and then wrestle with the confines of technology.” (Undergraduate tutor)

Initial results

“Students are more prepared for weekly tutorials [after the move to remote teaching] and give better presentations.” (Undergraduate tutor)

[The advantages are] too many to count. I am only a few years off retirement and am not a digital native...but I have found on-line tutorials very positive and easier than face to face (though I miss seeing students and colleagues in social terms). Students come better prepared, I can draw directly on work non-destructively, I can upload images of precedents directly into real-time files, students engage better in group tutorials – it’s all good in my experience.” (Undergraduate and MArch tutor)

3.4 Practicality and ease of delivery

Fig 3.4.1: Perceived ease of educational delivery by tutors in the architecture studio and working remotely.

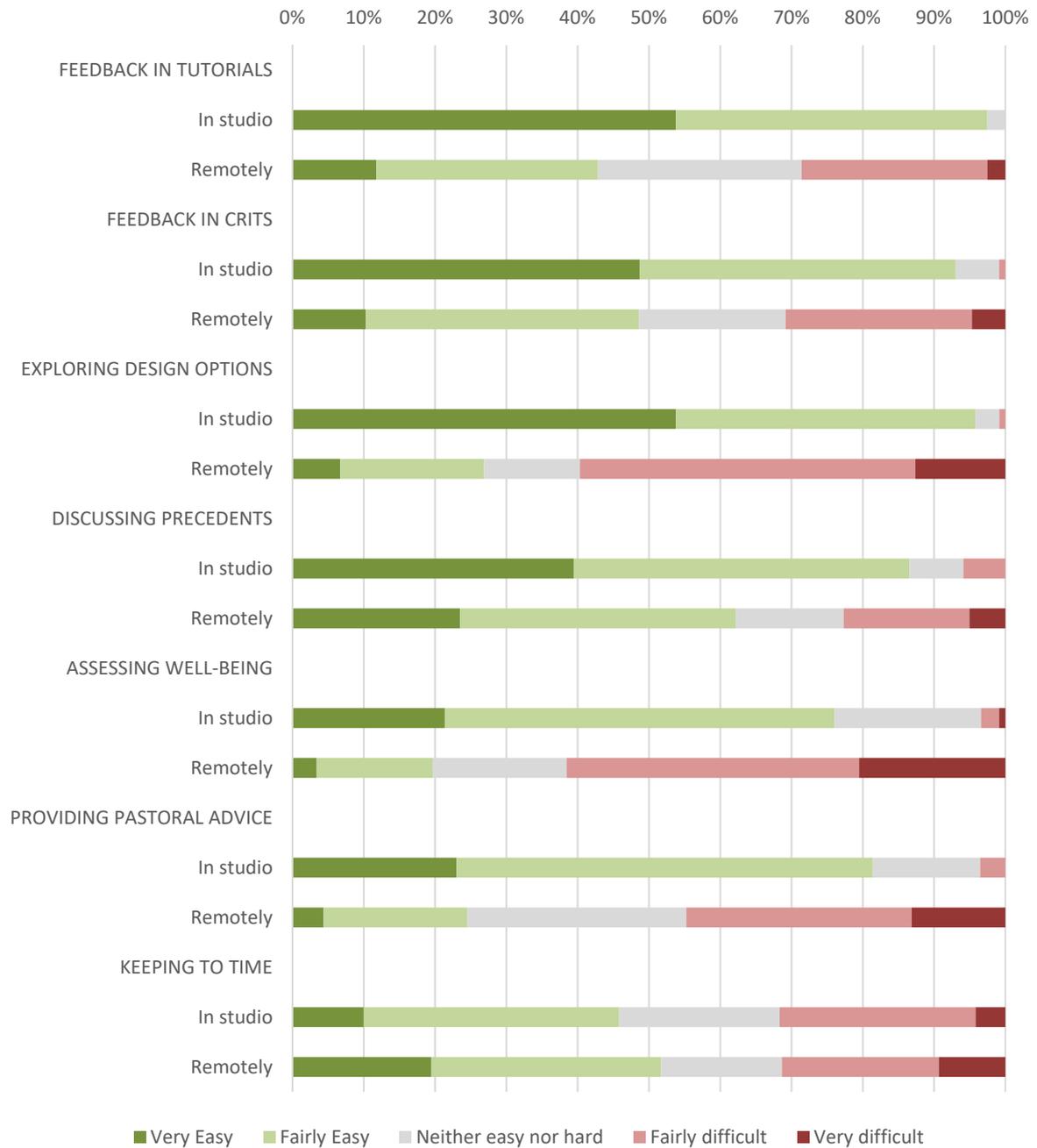
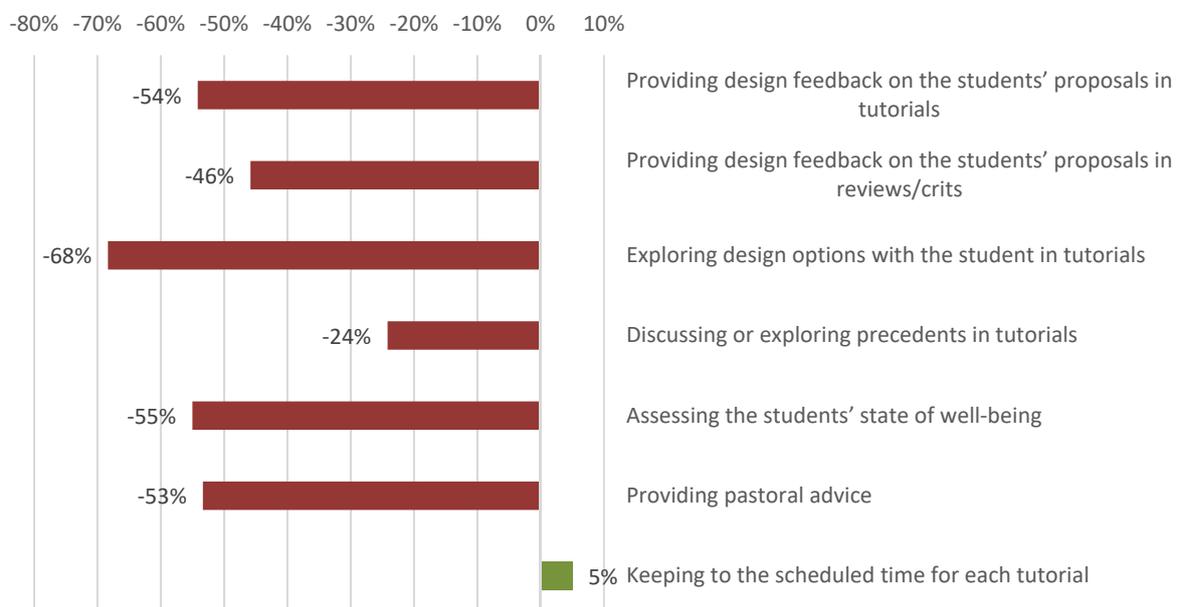


Table 3.4.1: Percentage of tutors who considered different teaching interactions in the architecture studio and working remotely to be fairly or easy or very easy to deliver.

Factor	Considered easy*	
	In studio	Remotely
Providing design feedback on the students' proposals in tutorials	97%	43%
Providing design feedback on the students' proposals in reviews/crits	89%	43%
Exploring design options with the student in tutorials	95%	27%
Discussing or exploring precedents in tutorials	86%	62%
Assessing the students' state of well-being	74%	19%
Providing pastoral advice	77%	23%
Keeping to the scheduled time for each tutorial	46%	51%

* respondents answered very easy or fairly easy

Figure 3.4.2: Change in perceived ease of educational delivery by tutors in the architecture studio and working remotely.



Representative quotes

“[The biggest disadvantage was] simply talking to the students and gauging their progress or asking how they are. Being able to motivate my students verbally, as sometimes emails can be taken in different ways. I found video calling uncomfortable.” (Undergraduate tutor)

“Exhaustion. 8+hr days of focussed 1 to 1 teaching are physically tiring in a way in studio teaching isn't - this is draining and affects working and life on non-teaching days.” (Undergraduate and MArch tutor)

“Stilted/more protracted communication methods with students in tutorials; everything takes longer. Not being able to get 'the big picture' by being able to 'see' a whole project on the wall in one go. The shift in presentation mode part way through the year from 'on the wall exhibition' to a digital submission has been hard for staff and students to transition to.” (Undergraduate tutor)

Initial results

“It actually became easier to carry out tutorials as groups were given a slot to adhere to, rather than an ad hoc approach in the studio in which often many students wanted a long time to chat rather than keep it concise and to the point.” (Undergraduate tutor)

3.5 Feedback and Assessment

Figure 3.5.1: Tutor satisfaction with feedback and delivery mechanisms in the architecture studio and working remotely.

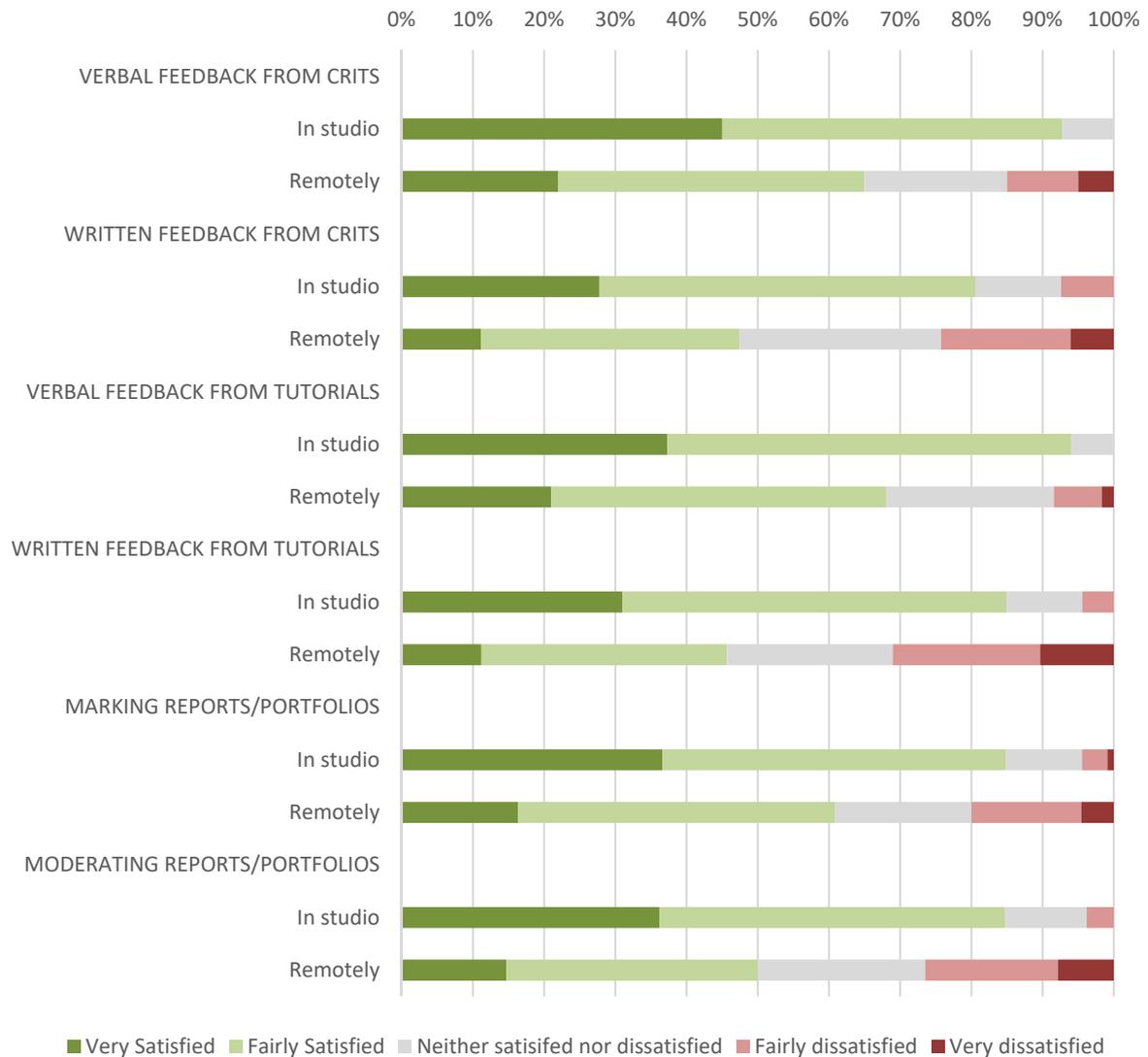
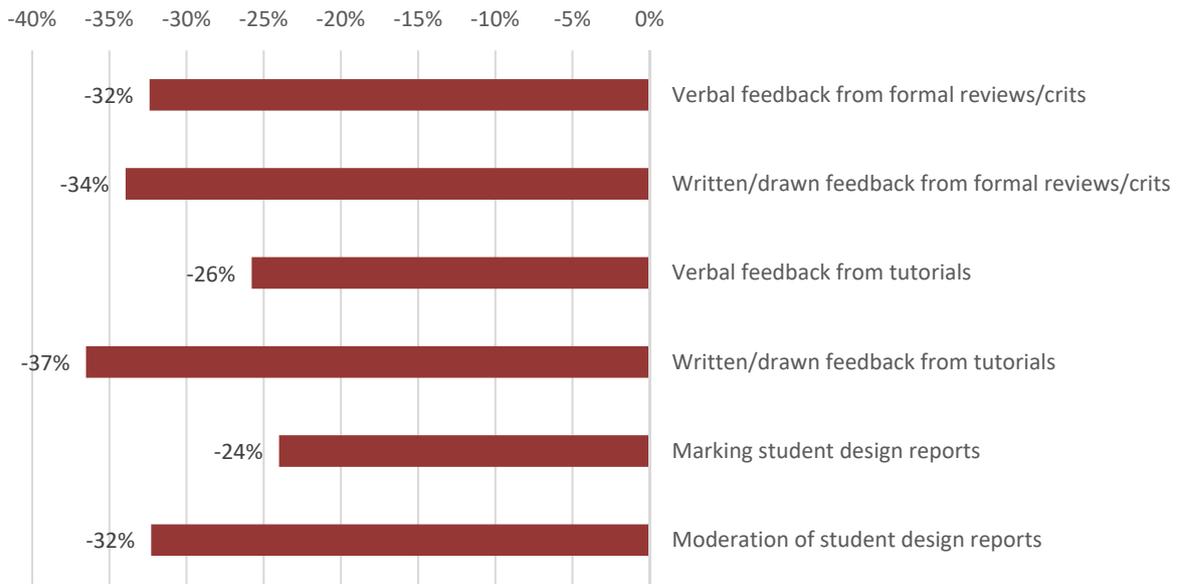


Table 3.5.1: Percentage of tutors satisfied with feedback and assessment mechanisms in the architecture studio and working remotely.

Factor	Satisfaction*	
	In studio	Remotely
Verbal feedback from formal reviews/crits	87%	54%
Written/drawn feedback from formal reviews/crits	73%	39%
Verbal feedback from tutorials	93%	68%
Written/drawn feedback from tutorials	81%	44%
Marking student design reports	80%	56%
Moderation of student design reports	75%	43%

* respondents answered very satisfied or fairly satisfied

Figure 3.5.2: Change in tutor satisfaction with feedback and delivery mechanisms in the architecture studio and working remotely.



Representative quotes

“Working remotely has forced increasingly didactic frameworks for briefing, assessment and review to be deployed” (Undergraduate and March tutor)

“[The biggest challenge is] the extra time needed to discuss, demonstrate and provide drawn feedback to students.” (Undergraduate tutor)

3.6 Learning from others

Figure 3.6.1: Tutors' perceived quality of peer learning mechanisms in the architecture studio and working remotely.

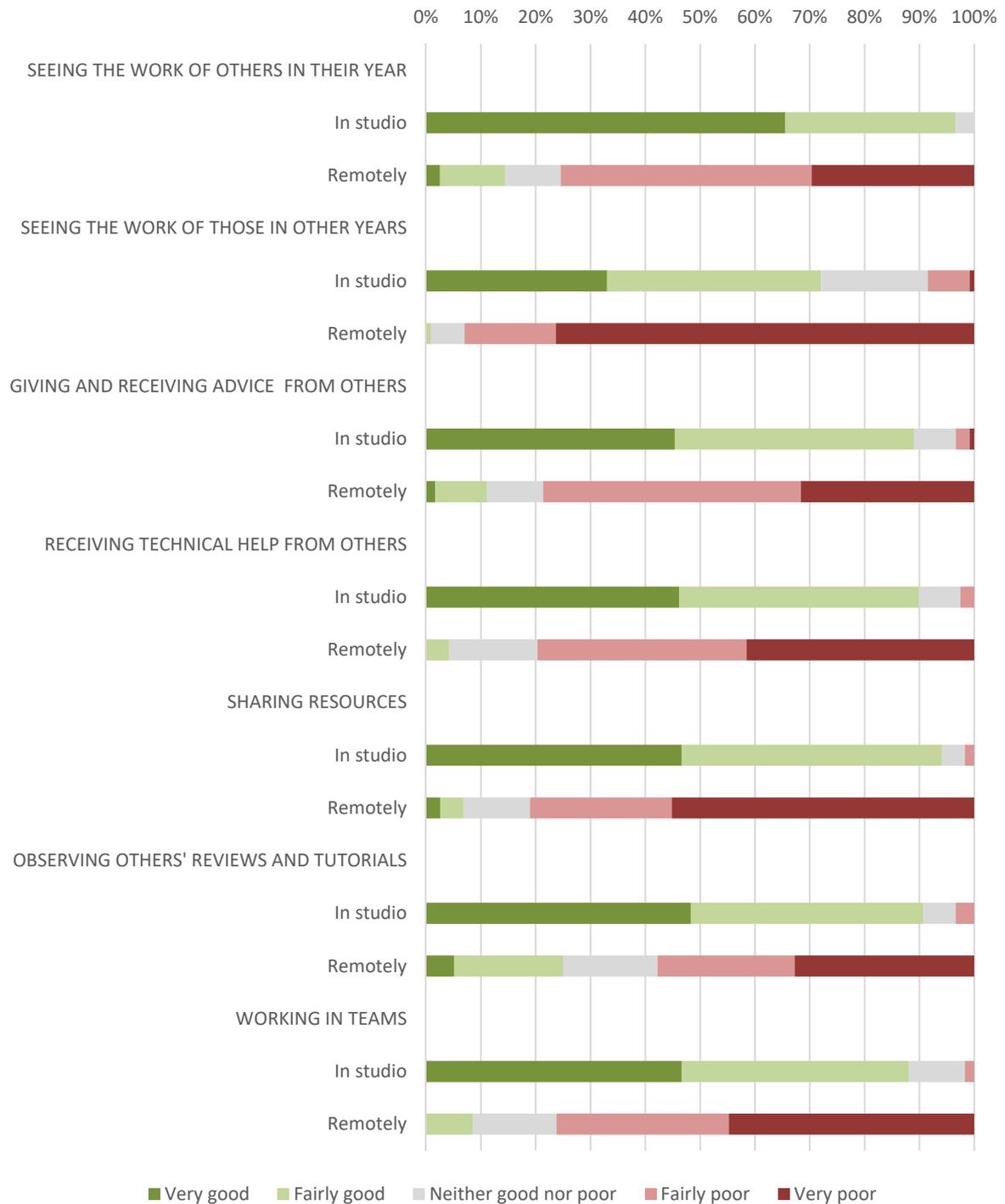
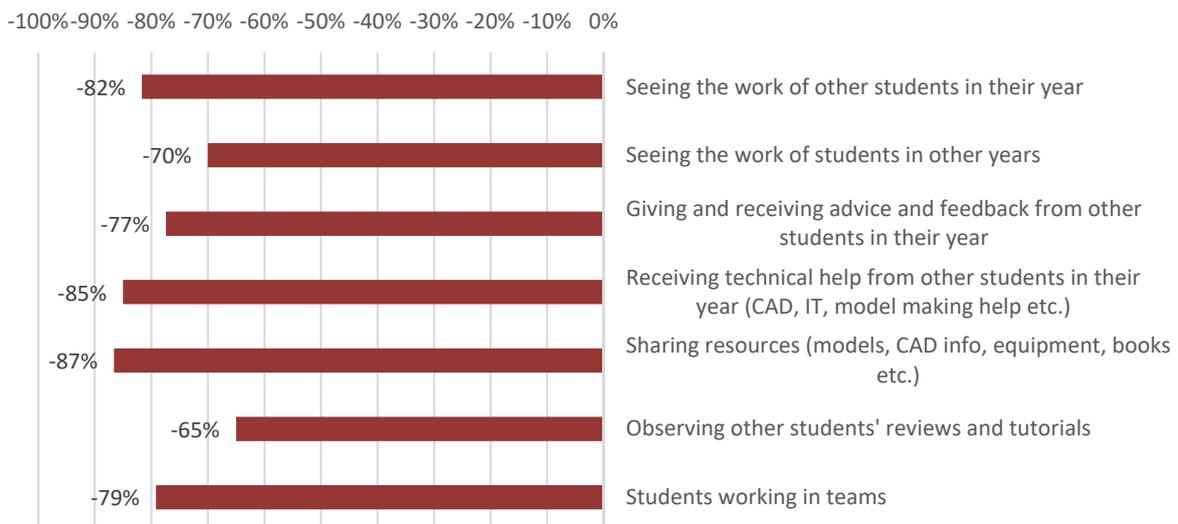


Table 3.6.1: Percentage of tutors who considered peer learning mechanisms in the architecture studio and working remotely to be of good quality (answered very good or fairly good).

Factor	Considered of good quality*	
	In studio	Remotely
Seeing the work of other students in their year	96%	14%
Seeing the work of students in other years	71%	1%
Giving and receiving advice and feedback from other students in their year	88%	11%
Receiving technical help from other students in their year (CAD, IT, model making help etc.)	89%	4%
Sharing resources (models, CAD info, equipment, books etc.)	93%	7%
Observing other students' reviews and tutorials	89%	24%
Students working in teams	87%	8%

* respondents answered very satisfied or fairly satisfied

Figure 3.6.2: Change in perceived tutor quality of peer learning mechanisms in the architecture studio and working remotely.



Representative quotes

“[The biggest disadvantage was] the lack of studio culture- social engagement, learning from each other, taking pride and ownership of space and work.” (MArch tutor)

“[The biggest challenge was] students not supporting each other as simply as they could in a studio. I found a way for students to upload their work so others could see it, I think this was important to inform the other students where they should be in terms of progress. For me first year is an extremely important year for social networking and adopting a studio environment and a productive one. I doubt that can be recreated.” (Undergraduate tutor)

“Studio experience is an identifiable loss. With everything that goes along with it: interpersonal relationships, friendships, camaraderie, as well as peer to peer learning, spatial engagement, etc.” (Undergraduate and MArch tutor)

3.7 Studio life

Figure 3.7.1: Tutors' perceived importance of aspects of studio life.

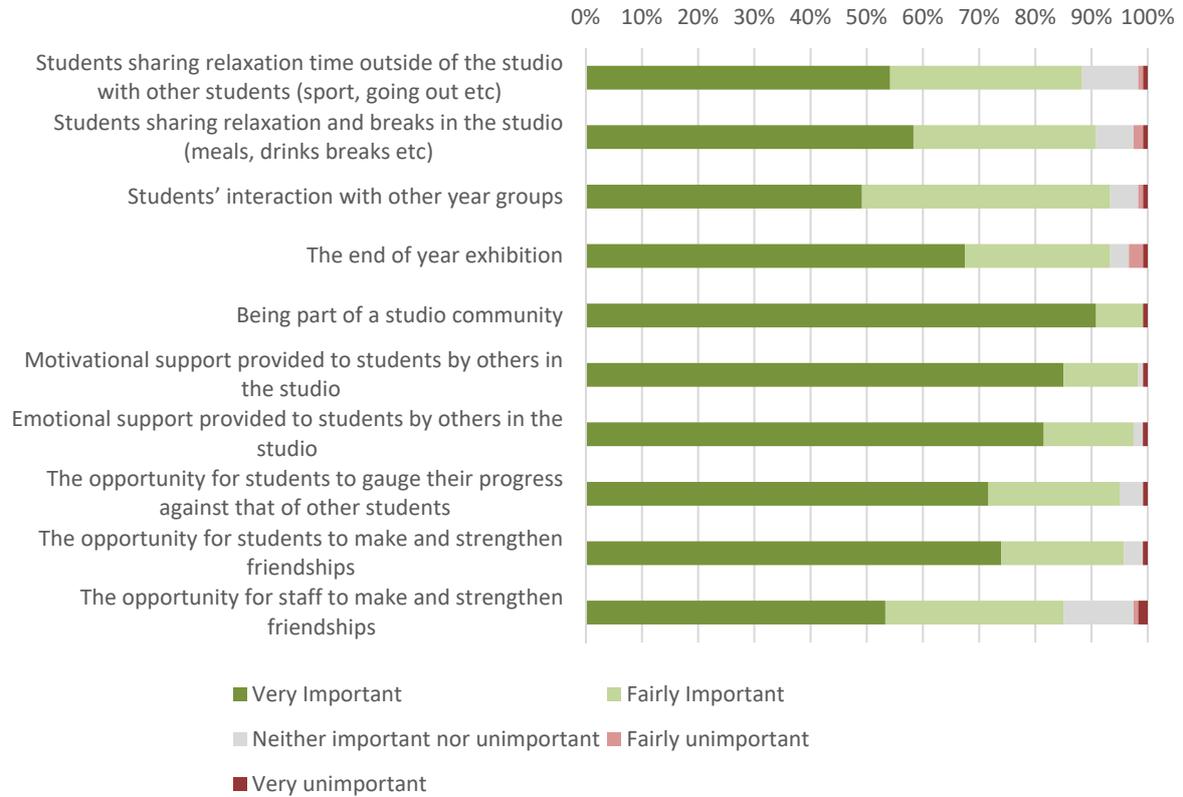
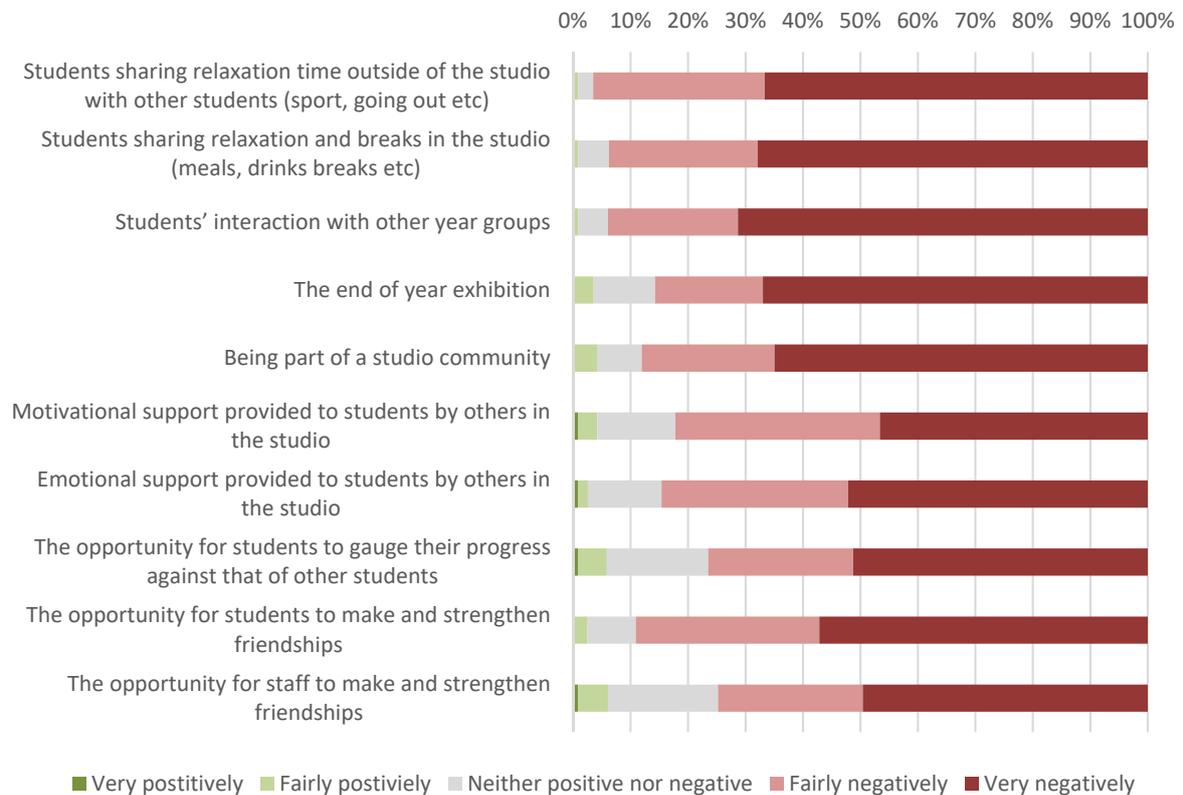


Figure 3.7.1: Tutors' perceived impact of remote working on aspects of studio life.



3.8 Overall satisfaction

Figure 3.8.1: Tutors' preferred mode of delivery of architectural education.

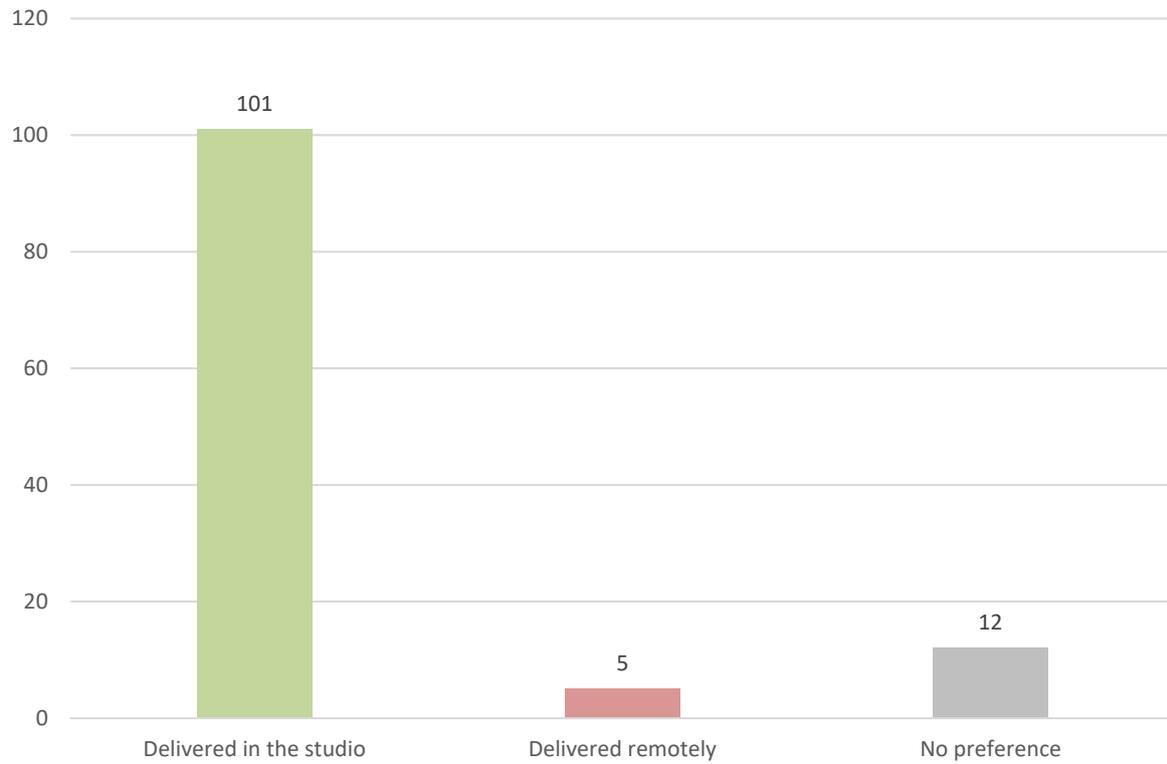


Figure 3.8.2: Tutors' satisfaction with modes of delivery of architectural education.

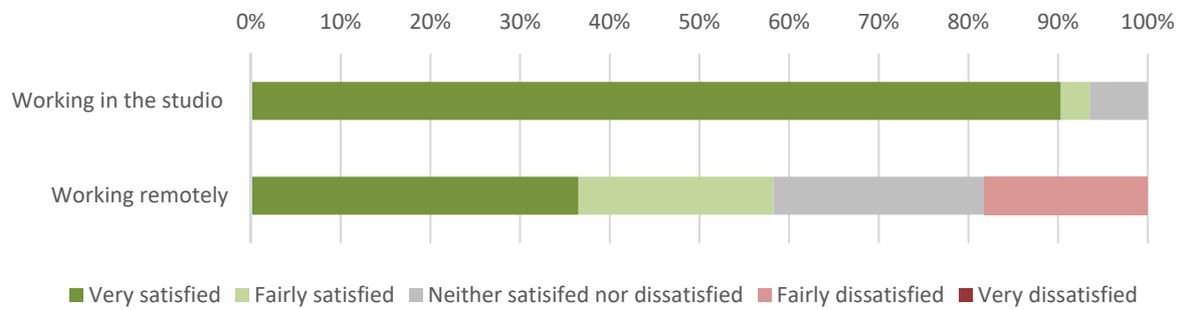


Table 3.8.2: Tutors' satisfaction with modes of delivery of architectural education.

	Satisfaction*	
	In studio	Remotely
Overall satisfaction	94%	58%

* respondents answered very satisfied or fairly satisfied

References

- Abbasi, N., Adams, N., Gide, E., O'Brien, D. and Lawrence, P. Online delivery of architecture and building design studios: a case study of Central Queensland University. 2018. pp. 469-475.
- Boone, H.N. and Boone, D.A., 2012. Analyzing likert data. *Journal of extension*, 50(2), pp. 1-5.
- Brown, J.B., 2020. From denial to acceptance: a turning point for design studio in architecture education. *Distance Design Education*.
- Corazzo, J., 2019. Materialising the Studio. A systematic review of the role of the material space of the studio in Art, Design and Architecture Education. *The Design Journal*, 22(sup1), pp. 1249-1265.
- Harpe, S.E., 2015. How to analyze Likert and other rating scale data. *Currents in Pharmacy Teaching and Learning*, 7(6), pp. 836-850.
- Johns, R., 2010. *Likert items and scales* [Online]. Available from: [https://www.ukdataservice.ac.uk/media/262829/discover_likertfactsheet.df.\(11.04.2018\)](https://www.ukdataservice.ac.uk/media/262829/discover_likertfactsheet.df.(11.04.2018)) [Accessed 01/06/2020].
- Jones, D., Lotz, N. and Holden, G., 2020. A longitudinal study of virtual design studio (VDS) use in STEM distance design education. *International Journal of Technology and Design Education*, pp. 1-27.
- Lahti, H. and Seitamaa-Hakkarainen, P., 2014. Designing Teaching--Teaching Designing: Teacher's Guidance in a Virtual Design Studio. *Journal of Learning Design*, 7(1), pp. 10-26.
- Lotz, N., Jones, D. and Holden, G., 2015. Social engagement in online design pedagogies. In: R. Vande Zande, E. Bohemia and I. Digranes, eds. *Proceedings of the 3rd International Conference for Design Education Researchers* Aalto University. pp. 1645-1668.
- Lotz, N., Jones, D. and Holden, G., 2019. OpenDesignStudio: virtual studio development over a decade *The DRS LearnXdesign Conference 2019*, 9-12 July 2019 Ankara.
- McClean, D., 2009. *Embedding learner independence in architecture education: reconsidering design studio pedagogy*. (Doctoral dissertation), Robert Gordon University.
- Mohammed, M.F.M., 2017. Blended E-learning in the architectural design studio: an experimental model. *International Journal of Parallel, Emergent and Distributed Systems*, 32(sup1), pp. S73-S81.
- RIBA, 2014. *RIBA procedures for validation and validation criteria for UK and international courses and examinations in architecture* [Online]. Available from: <https://www.architecture.com/-/media/gathercontent/validation-procedures-and-criteria/additional-documents/validationprocedures2011secondrevision2may2014pdf.pdf> [Accessed 25/06/2020].

Rodriguez, C., Hudson, R. and Niblock, C., 2018. Collaborative learning in architectural education: Benefits of combining conventional studio, virtual design studio and live projects. *British Journal of Educational Technology*, 49(3), pp. 337-353.

Salman, M., Kominek, A., Melvin, E., Sabie, S. and Sabie, D., 2017. Delivery of Design Studios for On-Line Platforms and its Impact on Teaching and Learning Outcomes. *Proceedings of the joint 8th IFEE 2017 and 3rd TSDIC2017 Sharjah, United Arab Emirates, April 18–20*.

Schön, D.A., 1985. *The Design Studio*. London: RIBA Publications Ltd.

Shulman, L.S., 2005. Signature pedagogies in the professions. *Daedalus*, 134(3), pp. 52-59.

Vowles, H., Low, J. and Doron, H.R., 2012. Investigating Architecture Studio Culture in the UK: A Progress Report. *Journal for Education in the Built Environment*, 7(2), pp. 26-49.

Webster, H., 2008. Architectural Education after Schön: Cracks, Blurs, Boundaries and Beyond. *Journal for Education in the Built Environment*, 3(2), pp. 63-74.

APPENDIX A

Student Demographic Data

Figure A1: Age of student respondents.

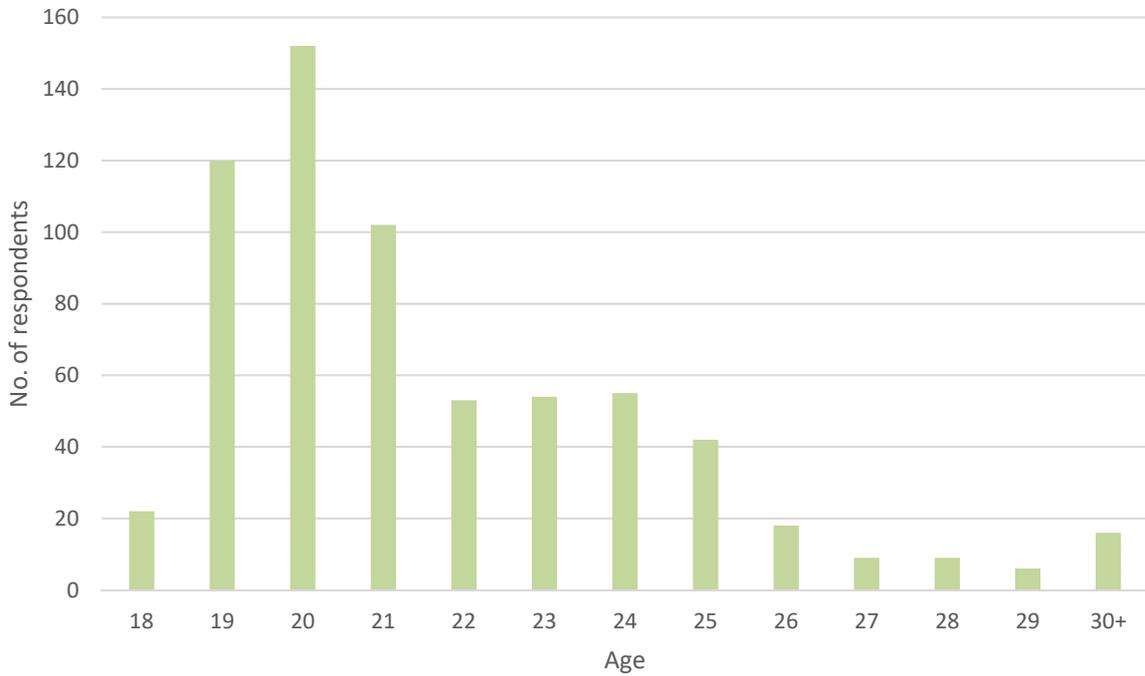


Figure A2: Genders of student respondents (no students responded "other").

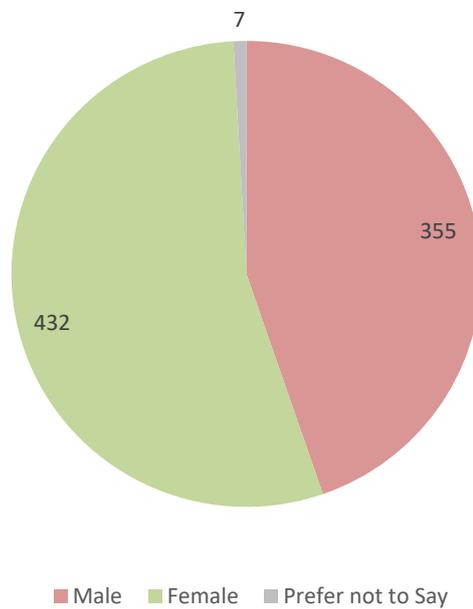


Figure A3: Ethnic groups of students by student status.

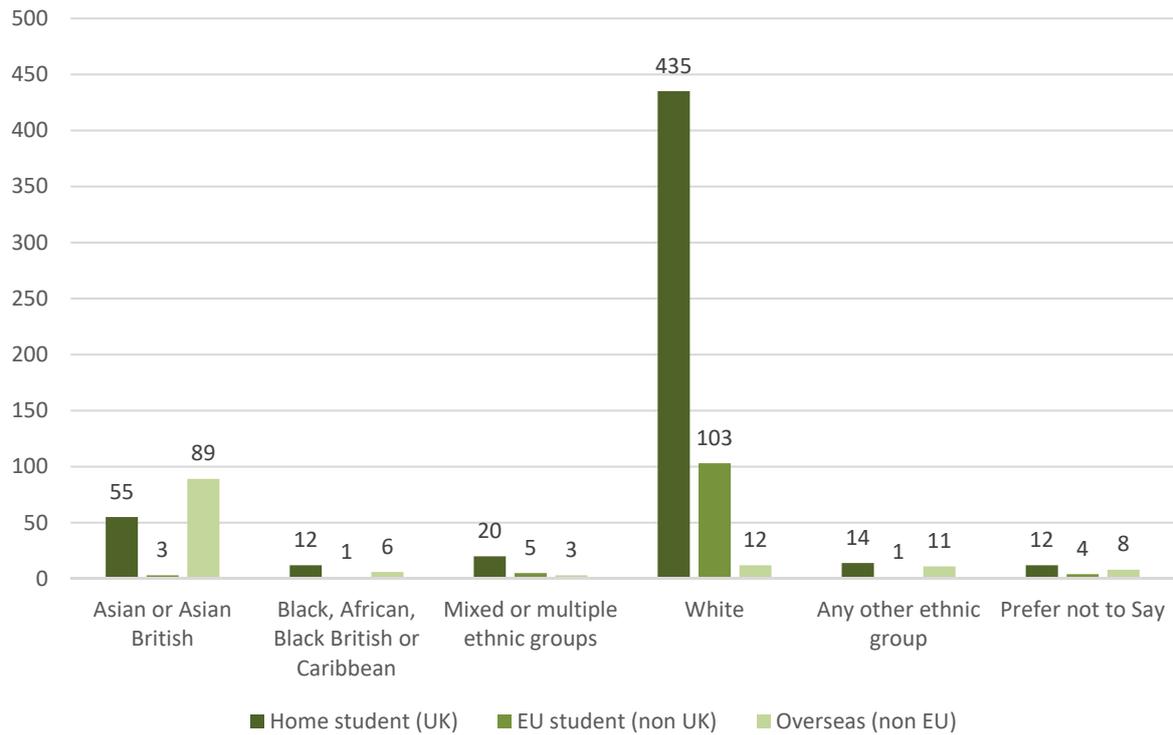


Figure A4: Year of study of respondents.

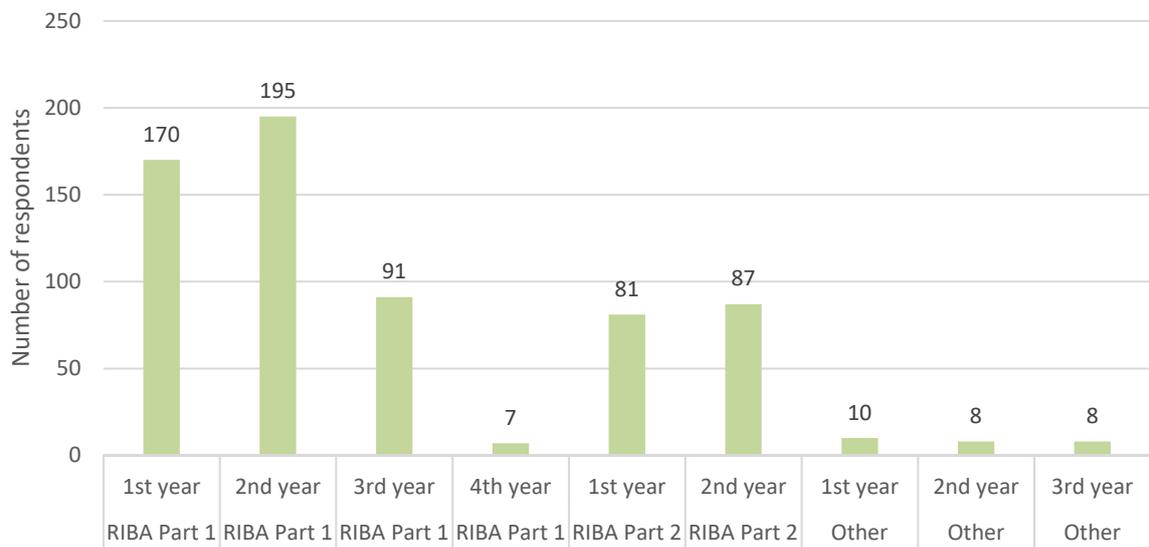


Figure A5: Remote working locations of student respondents.

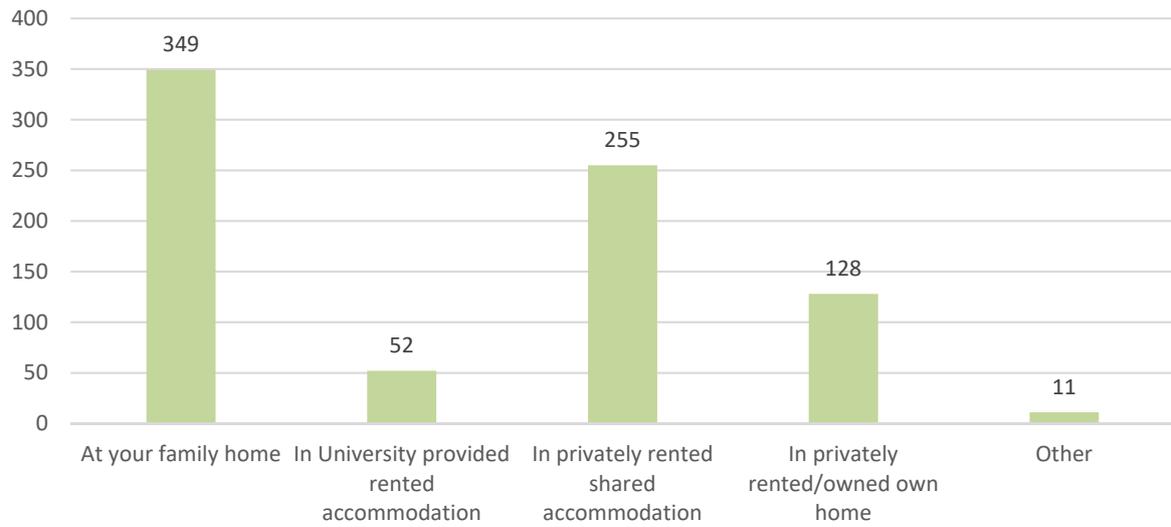


Figure A6: University of attendance of student respondents.

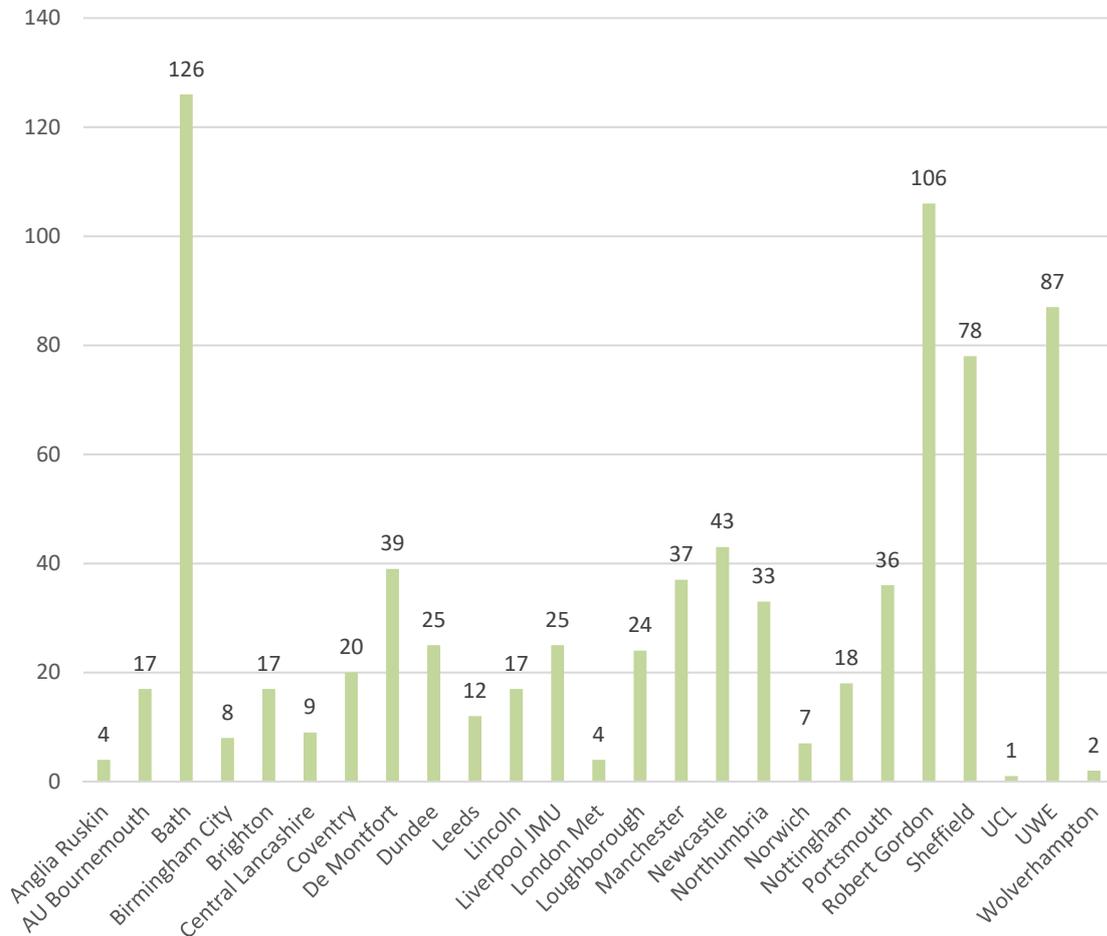


Figure A7: Studio provision available to student respondents.

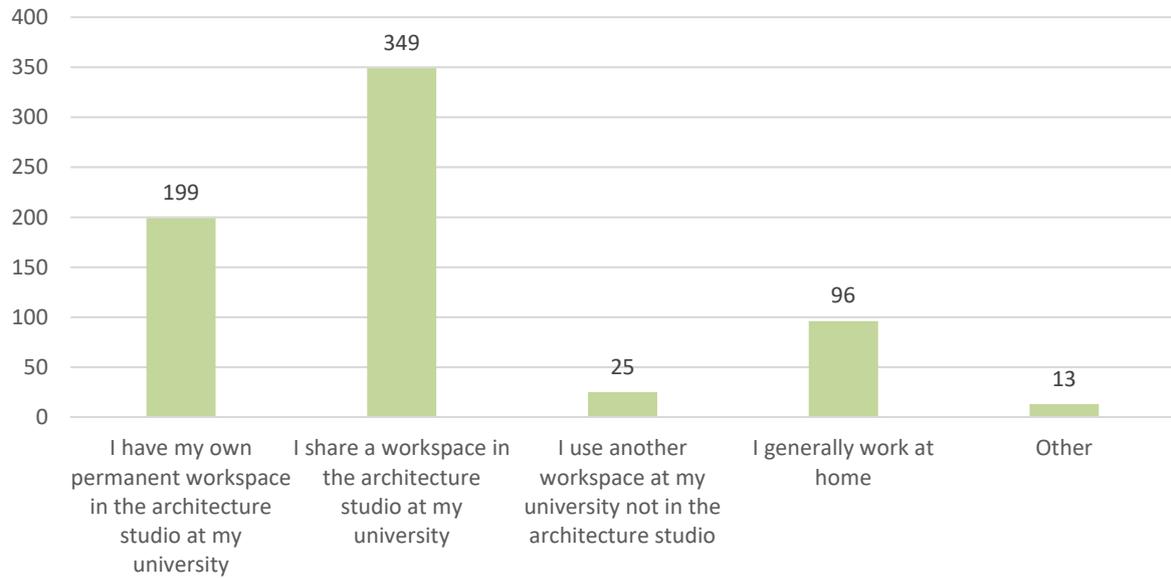


Figure A8: Resource use of student respondents in hours per week

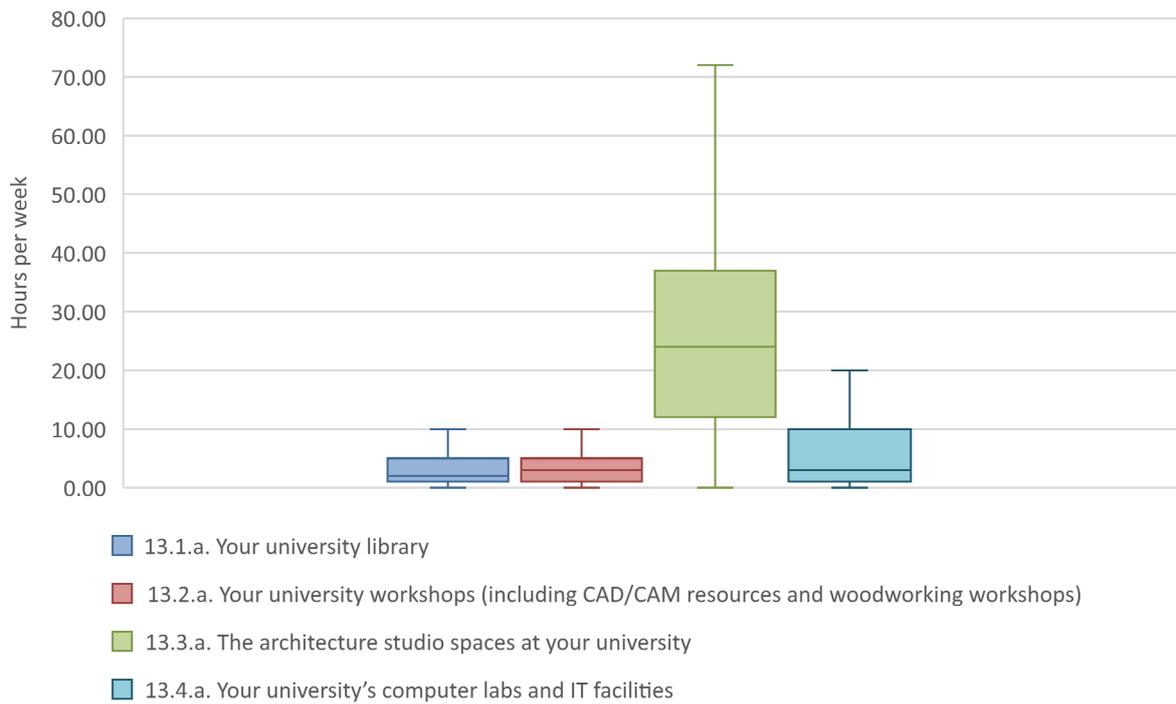


Table A1: Average resource use of student respondents in hours per week.

	University library	University workshops	Architecture studio space	Computer and IT facilities
Average hours per week	4.92	5.08	26.73	7.29

Appendix B

Tutor Demographics

Figure B1: Genders of tutor respondents (not tutors responded (“other”).

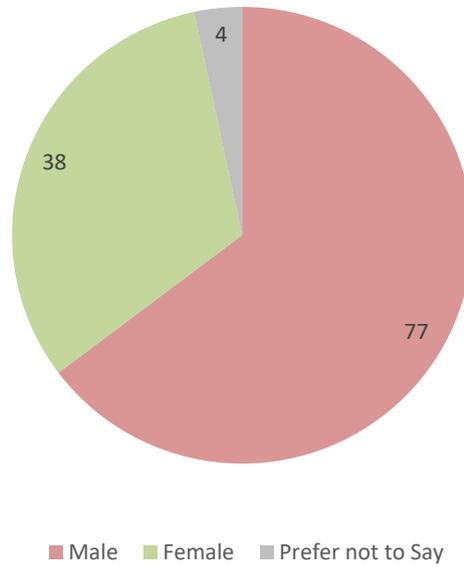


Figure B2: Ethnic groups of tutor respondents.

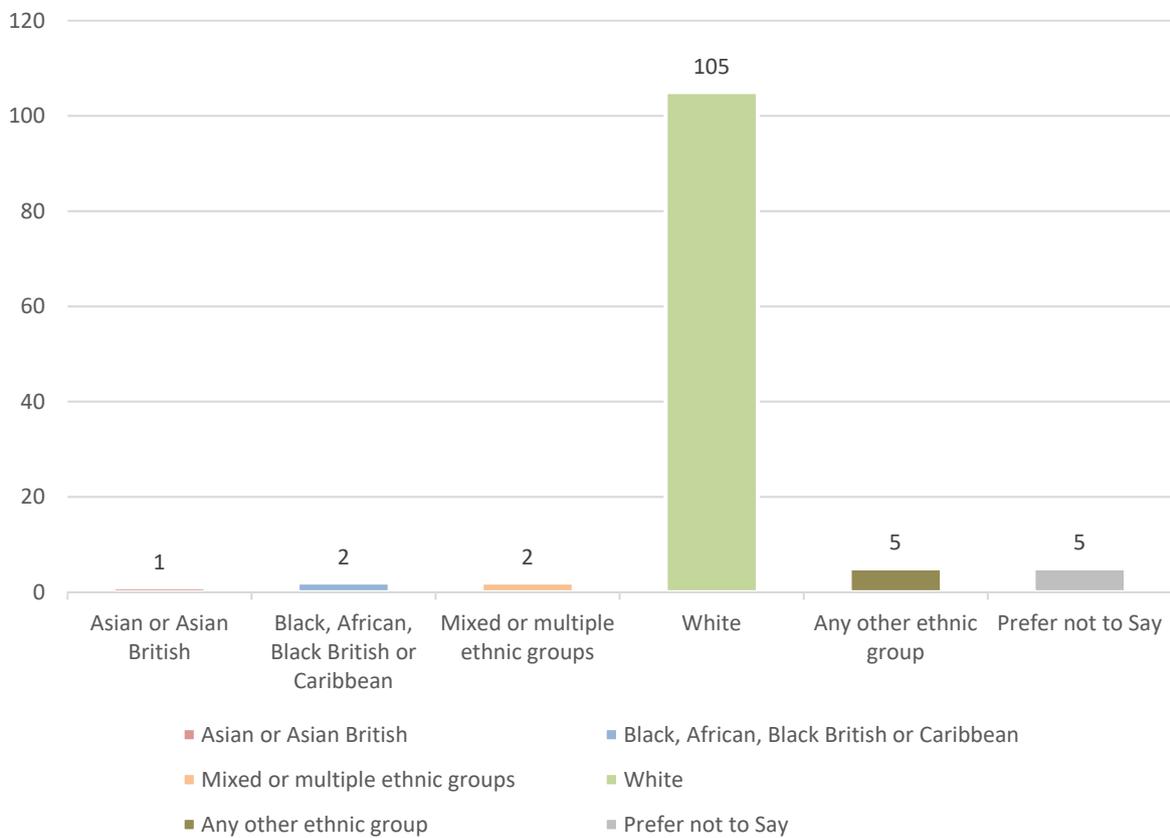


Figure B3: University of work of tutor respondents (includes tutors working at multiple universities).

