



Delft University of Technology

Document Version

Final published version

Licence

CC BY

Citation (APA)

Chen, Y., & Turrin, M. (2025). Group work in design education amid pandemic: Observation and reflection. In R. Rooij, R. Cavallo, & F. D. van der Hoeven (Eds.), *Teaching Architecture: Insights from TU Delft - Research on Education Innovation in Architecture & the Built Environment* (pp. 47-55). BookRxiv.

Important note

To cite this publication, please use the final published version (if applicable). Please check the document version above.

Copyright

In case the licence states "Dutch Copyright Act (Article 25fa)", this publication was made available Green Open Access via the TU Delft Institutional Repository pursuant to Dutch Copyright Act (Article 25fa, the Taverne amendment). This provision does not affect copyright ownership.

Unless copyright is transferred by contract or statute, it remains with the copyright holder.

Sharing and reuse

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights. We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.

Group work in design education amid the pandemic

Observation and reflection

Yawei Chen [1] and Michela Turrin [2]

- [1] *TU Delft, Faculty of Architecture and the Built Environment, Department of Management in the Built Environment*
- [2] *TU Delft, Faculty of Architecture and the Built Environment, Department of Architectural Engineering and Technology*

Abstract

Group work has been used in design-related education programs to train students in handling the complexity of the design process in the built environment through co-operation. Education activities moved on-line when the COVID-19 pandemic started. Students have worked in groups remotely through digital platforms instead of face-to-face on campus. How did design education programs incorporating group work adapt to these changes during the pandemic, and how did the virtual environment influence the design process and outcomes of group work? This paper addresses these questions by examining two master education courses provided at the Faculty of Architecture and the Built Environment, Delft University of Technology. It explores how the group work can be managed online with higher exploitation of digital tools helping interaction and data sharing among group members. The conclusions highlight the distinction between content development via on-line education (and how it can meet certain standards) and the communication dynamics during group work (for example how vocal remarks, separated from body language and shared context, can impact the quality and effectiveness of online group interactions). These findings underscore the importance of considering both aspects when developing group work for online education.

Keywords

Design education, COVID-19 pandemic, group work, on-line education, communication

COVER FIGURE Illustration of the proposal on the redevelopment of Fellenoord at bird's eye level - an end product of the Urban Redevelopment course, by Olga Surogina, 2024.

1 Introduction

Planners, architects, engineers, property developers and city managers are all partially responsible for delivering well-performing good quality buildings and urban districts. They deal with multiple requirements to design and develop sustainable, resilient, circular, eco, low-carbon and inclusive buildings and places. Professional knowledge from specialists is needed together with knowledge and skills to integrate different disciplinary perspectives. At the same time, designers, planners, and city managers should have a better understanding of the interrelations among technology, society, environment, economy and design, and be able to combine and synthesize a variety of academic and professional knowledge. Creativity is needed in such an integration process to make connections and integrate knowledge across fields of expertise and uncertainty (Campbell, 2014). Interdisciplinary education has become an important approach in design education (Chen et al., 2019). To develop interdisciplinary mindset and skills, group work, often chosen as a suitable education approach, fosters the ability to explore complex problems from different perspectives. It also prepares (future) professionals from different disciplinary background to communicate and collaborate in the design process. The differences in culture and education backgrounds, as well as the various disciplinary priorities during design, can create tensions in the collaboration process, a challenge frequently encountered by practitioners.

The unprecedented COVID-19 pandemic has necessitated sudden measures to avoid group gatherings and ensure social distance. As a result, group work in design education had to be executed remotely in virtual environments. The on-line setting has posed challenges to traditional group work, where personal face-to-face interaction is typically crucial. This article examines two design courses at the Faculty of Architecture and the Built Environment, Delft University of Technology - the Urban Redevelopment Game: Integrating planning, property development and design (URG), and MEGA: Integral design and engineering of a tall/large building. Both are design courses that incorporate group work and were forced to transition to on-line mode in April 2020. Based on background studies and empirical observations, this paper reflects on:

- 1 How was the group work in the design education programs in the on-campus setting transitioned to an on-line education during the pandemic?
- 2 What feedback have students and teachers provided regarding the learning process, group dynamics and group collaboration in an on-line setting?

This paper introduces background studies on group work in the context of design education and implications in on-line setting. It then examines how the two TU Delft design courses embraced the on-line setting and whether it affected group interaction and results. Discussion follows on pro and cons of group work on-line and how some changes should be incorporated in future design education.

2 Background studies: Group work in interdisciplinary design education: on-campus vs on-line

2.1 Group work in design education

Group work is an essential instrumental method in design education. It emphasizes interdisciplinary and pluralistic perspectives. In real life, the members of design teams or the stakeholders in urban projects embrace different perspectives. Using an interdisciplinary approach, students learn the value of each discipline and recognize their own competence to each expert in the team. Group work benefits students to handle the dynamics of group interaction when collaborating for the interdisciplinary design assignment. During the process, students gain experience in interdisciplinary communication, develop social skills, work more productively and know self-better through peer review and feedback on performance in group assignments (Michaelsen, 1992). They experience different types of meetings and workshops to formulate shared visions, exchange knowledge, develop creative solutions or team-building (Qu et al., 2019).

Group dynamics plays a vital role in forming an effective, high-performance team. The group work may experience different stages like forming, storming, norming and performing (Tuckman & Jensen, 1977), as is in table 1. Participation, communication, collaboration, influence, trust, cohesion, empowerment, and satisfaction are key components of group dynamics in shaping collective learning and action during the different stages (Greenlee & Karanxha, 2010). Students discover how to share, respect and contribute to (new) ideas and learn from critical feedback. Group work requires students to adopt collaborative attitudes to gain trust from each other, such as “open-mindedness, cultural awareness and awareness of own biases when dealing with data” (De Greef et al., 2017). It can facilitate feelings of belonging, empower team members and develop satisfaction if individuals sense their influence and contribution on group goals and decisions. Effective leadership may stimulate team members to influence decision-making processes and be satisfied with personal growth (Greenlee & Karanxha, 2010).

Stage 1	Forming	Learning about each other	Group of people	Orientation
Stage 2	Storming	Challenging each other	Potential team	Dissatisfaction
Stage 3	Norming	Working with each other	Team	Integration
Stage 4	Performing	Working as one	High performance team	Productivity

TABLE 1 the FSNP model, by L. Qu et al., 2019; Tuckman & Janssen, 1977.

2.2 Group dynamics & interaction: on-campus vs on-line setting

On-line environments imply differences as compared to on-campus environments for group work. Rooij et al. (2020) suggest a complete virtual learning environment may impose numerous challenges. In the on-campus setting, group members can use subtle hints and body language to decide whether extra chats are necessary for communication; the creation of empathy in the on-line setting depends on more formal ways. The quality of interpersonal interaction in on-line courses (e.g. frequent and effective interaction encourages commitment and higher academic performance) relates positively and significantly to student success (Jaggars & Xu, 2016).

Interactions also relate to on-line digital tools. Information and communication technology (ICT) are acknowledged to play a substantial role in enabling remote design collaboration and have a growing impact on professions in the building sector since years already (Tuncer et al., 2000; Maciver & Malins, 2015; Sariyildiz et al., 2000). Architectural and engineering offices use on-line communications with remote partners based on whiteboard software and teleconferencing, being increasingly empowered on a global role (Tuncer et al., 2000). New technologies and their appropriate use are essential for the collaborative and inclusive paradigm of contemporary design practices, where designers are demanded to have experience with the use of ICTs (Maciver & Malins, 2015). Collaboration tasks face the risks of time and data losses during information exchange and negotiation on conflicting subtask as well as of misunderstandings consequence of incomplete information, occurring in a constant dynamic renegotiation of project characteristics (Lottaz et al., 2000). The ICT infrastructure can facilitate handling this collaborative process but requires necessary ICT skills and awareness. These regards ways of sharing items such as data, images, 3D models, communication messages, and other shared documents to interact and to exchange information up-to-date, secured and consistent with the latest project characteristics (Lottaz et al., 2000). The conditions of the COVID-19 Pandemic brought this paradigm to an increased application in education.

3 Case study: comparison of two design courses at Delft University of Technology

Following the discussion of group work-on-campus vs on-line, we introduce two design courses that incorporated intensive group works. URG is offered by the Department of Management in the Built Environment (MBE) and attracts faculty wide students as well as from other Dutch Universities, and MEGA is offered by the Architectural Engineering and Technology Department and attracts students from the MSc tracks of Architecture, Building Technology, occasionally MBE and Building Engineering at the TU Delft faculty of Civil Engineering and Geosciences (CiTG). Both courses run in the fourth quarter of the first year master program, April to July. The following section first explains how group work is incorporated in the design of the two courses, then discusses differences observed in group works on-line compared to on-campus, including group dynamics and data sharing.

3.1 Group work in URG and MEGA

Background information

URG is an interdisciplinary course in which students apply various analytical, technical, and social-political skills to address an ongoing urban development project. Students develop in-depth knowledge of the site and the project using role simulation and are asked to create an urban development plan. They work in teams of 10-14 students each. Each group includes different realistic roles: several municipality parties (Land department, economic affairs, urban planning), market parties (2-3 real estate developers, housing association), independent parties (process manager, environmental law consultant, urban designer).

MEGA is an interdisciplinary design course aiming to align the integrated design and engineering of a complex multifunctional high-rise building. Students work in teams of 6-7 students each. Within the team, each student follows one discipline (architectural design; structural design; climate design and installations; façade design; design and construction management; and computational design). Each team delivers an integrated design based on multidisciplinary principles.

3.2 Group work in URG and MEGA in the on-campus setting

Group work is used in the two interdisciplinary courses. Both courses include a forming stage (first two-three weeks) to guide students in deepening their specialized disciplines. Lectures and workshops are organized. Besides, (pin-up) presentation(s) allow students to introduce their roles, discuss perspectives of different disciplines and exchange knowledge. The students are guided by tutors specialized in specific disciplines. In URG, students in groups are also guided by group supervisors helping them integrating disciplines on urban development.

Students in URG experience the storming stage in weeks 4 to 7 as they need to achieve their own interests and goals through concession after rounds of confrontation. An intensive collaborative workshop helps students to translate abstract concepts into visual products. Sessions with groups or between different roles are organized by students themselves and sometimes assisted by the process manager. This negotiation aims to agree on the overall plan design, functional program, financial feasibility, land price, phasing and contract forming. In MEGA, students negotiate design alternatives with conflicting requirements, especially in weeks 3 to 6. Numeric assessments and qualitative considerations are used to evaluate various scenarios toward a consensus for a design solution meeting an intended design strategy.

At the norming and performing stage (the last 2-3 weeks of the course), students following the URG course translate the final negotiated results into development vision, development phasing, contract for land transfer and sustainability actions. During the final group presentation the result is presented by the team to a jury and the public. A similar presentation is held at the end of MEGA, during which projects are assessed and graded based on integrated multidisciplinary teamwork. In both courses, students are expected to deliver an individual report, with in-depth work into their discipline, and to reflect on their own learning process, interaction experience and learning outcomes.

3.3 Group work in URG and MEGA in the on-line setting

During the COVID-19 pandemic, the on-campus courses were translated into on-line courses. The weekly meetings between tutor and students moved on-line, using skype for business and Zoom. All presentations by students occurred on-line, with the same structure as if they were on-campus. The fieldwork was replaced by on-line lectures and Q&A session with involved practitioners in Microsoft Teams or Zoom and supported by various digital maps and other digital information. The meetings between roles at the storming stage occurred in zoom meetings, often coordinated by the process manager. Students made use of various digital interaction tools to communicate, interaction (e.g. Zoom) and collaborate in design (e.g. Miro). Workshops were carried out in a shorter version.

Next to group interaction and collaboration, how to exchange data digitally is crucial. In on-campus setting, the students in URG use Google Drive or Dropbox to store meeting memos, discussion results and drawings accessible and revisable by each team member. On-line, the storage of data becomes more critical. Besides, students started to use on-line design tools such as Miro to exchange design concepts. In MEGA, on-line data storage is critical also in the on-campus setting, and this helped the move to on-line setting. The computational designer of each team was responsible for organizing a digital collaborative workflow, including a system to exchange digital information and guarantee everyone worked on updated files. All teams engaged in full-on-line collaboration via data platforms and BIM-based systems, such as Speckle for Rhino McNeel (an open-source data platform for AEC) and Autodesk BIM 360 (a unified platform for collaborative design, management and engineering).

4 Observations and feedback from the students and teachers

When the course URG was transitioned on-line for the first time, many doubts came about on whether students could really carry out group work on-line instead of on-campus studio setting. During the URG course, one of the authors joined in a number of group sessions to check whether students really encountered any problem in group sessions. After the course was completed, these doubts were discussed in a panel session organized by the students, with students attending on voluntary base. In the course MEGA, individual feedback was collected during and right after the course. Based on the standard teaching activities, afterwards reflections have been made. Activities in MEGA did not include any moment for intentional observations on group work.

In both courses students generally displayed a notable commitment to the new mode of working. Group work interaction was often discussed or reported as manageable, although lacking the more complete and intuitive communication of face-to-face interaction and the nuances of spontaneous interpersonal exchanges. On average, students reported missing the group interaction afforded by on-campus education, even though they eventually reported satisfaction with the content development during the course. They missed informal interaction, such as the use of subtle hints and body language. Some students found it slow and time-consuming to understand each other. Group discussions on a single topic were often longer than expected in the attempt to communicate ideas. Additionally, some students noted that verbal remarks disconnected from body language and mutual context could be interpreted more personally among team

members. To some extent, the efficiency of the work structure and punctuality appeared to be higher than in on-campus education. Group work proved to be effective in terms of results, with all expected deliverables generally being met. Students from URG reported that the on-line setting reduced free-rider behaviors as each member's task was clearly defined and irreplaceable. Nonetheless, the final deliverables on average demonstrated considerably more effort dedicated to the process compared to on-campus education. The process seemed to demand more attention and extra time to achieve results, sometimes at the expense of energy invested on the final outcomes.

5 Conclusion

The paper has presented the experiences of two MSc design courses based on group work, conducted remotely throughout the COVID-19 pandemic. It has reflected on the influence of the sudden move to on-line education in the case of group work, reporting observations on processes and results. The two design courses examined in the paper were transitioned from on-campus to on-line version with the assistance of digital tools such as Zoom, Miro and Google Docs, as well as platforms for interdisciplinary 3D modelling in cloud-based environments like Speckle with Rhinoceros McNeel and BIM 360 with Revit Autodesk.

Regarding the effect of on-line group work, there are two aspects: On one hand, the efficiency of the work structure and punctuality were observed to be generally higher than for on-campus education, and the content development met expected standard. On the other hand, both students and teachers highlighted the time required to adapt to online meetings and virtual collaboration. They also noted that the lack of spontaneous interaction could lead to tension or harsher reaction among group members, thereby undermining the effectiveness of close interpersonal understanding.

The translation of the two design courses to an on-line setting revealed increased explicit verbalization to structure the process. We observe a greater utilization of digital tools for remote interdisciplinary collaboration, including on-line meeting tools, data sharing platforms and web-based BIM software, nowadays increasingly required in practice. While improvements in interpersonal interaction within group work dynamics are necessary, the formulation of explicit group process dynamics and the use of digital tools are to be considered valuable beyond the contingency of the pandemic. This paper provides firsthand insights into the performance of group work in on-line design education. Its conclusions reflect both the resilience and vulnerability of group work in virtual context. Addressing how to enhance on-line communication in group work should be a focus in future on-line education practices.

Acknowledgement

The research proposal of this study has been approved by Human Research Ethics Committee at TU Delft. The figure used at the beginning of the article is an example of urban development plan from the course Urban Redevelopment Game (URG) - The fusion of Fellenoord at eye level - drawn and provided by Olga Surogina. Please note that this figure is created in 2023, not during the corona period 2020-2021.

References

- Campbell, H. (2014). Specialists and generalists: Are there too many hedgehogs and not enough foxes? *Planning Theory & Practice*, 15(3), 287-290.
- Chen, Y., Daamen, T., Heurkens, E.W.T.M., Verheul, W.J. (2020). Interdisciplinary and experiential learning in urban development management education, *International Journal of Technology and Design Education*, 30 (5), 919-936. <https://doi.org/10.1007/s10798-019-09541-5>
- De Greef, L., Post, G., Vink, C., & Wenting, L. (2017). *Designing interdisciplinary education. A practical handbook for university teachers*. Amsterdam University Press.
- Greenlee, B. and Karanxha, Z. (2010). A study of group Dynamics in Educational leadership Cohort and non-cohort groups, *Journal of Research on Leadership Education*, 5(11), 357-382. <https://doi.org/10.1177/194277511000501101>
- Jaggars, S. S. and Xu, D. (2016). How do online course design features influence student performance?, *Computers and Education*, 95, 270-284.
- Lottaz, C., Stouffs, R., & Smith, I. F. (2000). Increasing understanding during collaboration through advanced representations. *Journal of Information Technology in Construction*, 5(ARTICLE), 1-24.
- Maciver, F., & Malins, J. (2015). Fostering design collaboration: Novel ICT tools to support contemporary design pedagogy. *International Journal of Education through Art*, 11(3), 407-419. https://doi.org/10.1386/eta.11.3.407_1
- Michaelsen, L.K. (1992). Team Learning: A Comprehensive Approach for Harnessing the Power of Small Groups in Higher Education". *To Improve the Academy: A Journal of Education Development*, 249. <https://digitalcommons.unl.edu/podimproveacad/249>
- Qu, L., Chen, Y., Rooij, R. and de Jong, P. (2019). Cultivating the next generation designers: group work in urban and regional design education. *International Journal of Technology and Design Education*, 30(5), 899-918. <https://doi.org/10.1007/s10798-019-09540-6>
- Rooij, R., Aalbers, K., Hausleitner, B., Newton, C. and Rocco, R. (2020). Education for the resilient city – teaching and learning urban design and planning in (post-) COVID-19 times, urban design and planning in (post-) COVID-19 times. *Proceedings of the Institution of Civil Engineers – Urban Design and Planning*. <https://doi.org/10.1680/jurdp.20.00052>
- Sariyildiz, İ. S., Stouffs, R., Çiftçioğlu, Ö., & Tunçer, B. (2000). Future developments of ICT in the building sector. *Digital Library of Construction Informatics and Information Technology in Civil Engineering and Construction*.
- Tuckman, B., & Jensen, M. (1977). Stages of small group development revisited. *Group and Organisational Studies*, 2(4), 419-427.
- Tunçer, B., Stouffs, R., & Sariyildiz, S. (2000). Collaborative information structures: educational and research experiences. *Proceedings of COOP 2000 Workshop: Analysing and Modelling Collective Design*, 20-28.

Colophon

Title

Teaching Architecture

Subtitle

Insights from TU Delft – Research on Education Innovation in Architecture & the Built Environment

Editors

Remon Rooij, TU Delft, NL

Roberto Cavallo, TU Delft, NL

Frank van der Hoeven, TU Delft, NL

ISBN

978-94-6518-081-6

Design

Sirene Ontwerpers, Rotterdam, NL

Lay-out

Tejon Kraan, TU Delft, NL

Frank van der Hoeven, TU Delft, NL

Cover images

Front: Graduate students adding tiles with their names in the Alumni Wall of Fame, TU Delft (Photo: Frank van der Hoeven)

Back: Students working into the evening in the modelshop at Bouwkunde, TU Delft (Photo by Frank van der Hoeven)

Published by

TU Delft Bouwkunde

Sponsored by

4TU Centre for Engineering Education

4TU. CENTRE FOR
ENGINEERING EDUCATION

Attribution 4.0 International (CC BY 4.0)

This book is published open access.

You are free to:

Share – copy and redistribute the material in any medium or format

Adapt – remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution – You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions – You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Notices:

You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.

No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.