Teaching Design Thinking in times of COVID-19: an online learning experience

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Abstract

Due to the COVID-19 pandemic, in March 2020, the Innovation Management & Design Thinking course at NOVA IMS suddenly transitioned to a 100% online setting after only two presential classes, requiring adaptations to the learning experience, course materials and class dynamics. There were concerns that the learning experience would suffer and if it would be possible to promote empathy in an online environment. This study evaluates the impact of this disruption on the learning experience, student performance and engagement by comparing the final grades, applying two surveys and conducting in-depth interviews. Our results show that instead of a contingency situation, it turned out to be a transformative experience. Learning performance and engagement were not meaningfully affected, as students were just as able to commit to their innovation projects and produce quality outcomes. We propose that blended learning experiences will leverage the best of both online and presential worlds in the future after COVID-19 and offer specific suggestions drawn from the collected data. The results are valuable for lecturers – from any course – who want to improve their learning experience in the new reality after the COVID-19 pandemic.

Keywords: Design thinking; online learning; learning experience; pedagogical innovation; problem based learning.

1. Design Thinking in the data-driven economy

NOVA IMS's motto, "From data to value", encompasses its mission to train leaders capable of working in a global and competitive environment, combining innovative investigation with a stimulating and creative teaching environment. While it is clear that jobs in the data-driven economy require analytical skills, uniquely human skills, such as persuasion and communication, are not usually supplied in education. However, they have gained increased importance in the industry (Börner et al., 2018). The Future of Jobs Report (World Economic Forum, 2020) identifies analytical thinking and innovation, active learning, complex problem-solving, critical thinking and creativity as the top 5 skills for 2025. Today, any data scientist, manager, marketeer or any other professional that uses data to solve business problems requires these skills to succeed. In this context, NOVA IMS created the Innovation Management and Design Thinking (IM&DT) curriculum, a 14-week course to combine qualitative and quantitative approaches to solve complex business or societal challenges.

Design Thinking is a thought process that "brings designers' principles, approaches, methods, and tools to problem-solving" (Brown, 2009). It can also be defined as "a human-centred innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping and concurrent business analysis" (Lockwood, 2009). The course was structured according to the three phases of Design Thinking defined by Brown (2009): Inspire, Ideate and Implement. Table 1 summarizes the objective of each phase and the essential tools used.

Table 1. Design Thinking stages and used tools.

Stage	Goal	Design Thinking Tools used
Inspire	Empathize with users, understand user needs, formulate design problems	Exploratory research (benchmarking, trend analysis, parallel universes, literature research), ethnographic research (interviews, user journey mapping), visualization (capture of ideas and concepts in a whiteboard, mind mapping) and synthesis (finding patterns in research, identify personas, formulate insights).
Ideate	Apply creative and divergent thinking techniques to generate and refine ideas	Brainstorming, divergent thinking techniques, visualization (capture of ideas and concepts in a whiteboard), idea prioritization (scoring and selecting ideas for implementation based on their desirability, feasibility and viability).
Implement	Prototype and test assumptions	Prototyping (storyboards, digital or physical mockups), user testing (synchronous and asynchronous).

Design Thinking's benefits as an approach to innovation and problem-solving have been described in the literature (Buchanan, 1992). The fact it can be used effectively by inexperienced teams (Seidel, 2013) and designers and non-designers alike (Brown and Katz, 2011) are two of the main reasons for its popularity as an innovative approach. Design Thinking has been shown to increase group task reflexivity, manifested through more debate in the group, which correlated with more successful outcomes (Seidel, 2013), and to reduce cognitive bias (Liedtka, 2015).

1.1. COVID-19 impact on the course

The second class of Innovation Management and Design Thinking at NOVA Information Management School (NOVA IMS), held on March 10th, 2020, was the last face-to-face class of the semester. Due to the COVID-19 pandemic lockdown, professors had one week to move their classes to a 100% online setting, which implied rethinking the experience, study materials and in-class dynamics.

Being Design Thinking a collaborative and people-centred methodology, moving to an online synchronous setting would impact all stages of its process. This way, we applied alternative tools to each stage of the Design Thinking methodology, as presented in Table 2.

Table 2. Methods used in each Design thinking stage for face to face and online classes.

Stage	Face to face class method	Online class method
Group Formation	Groups assigned by students	Groups predefined based on the students' profile
Inspire	Face to face ethnographic research (interviews and field observations)	Online ethnographic research (interviews and customer journeys)
Ideate	In-class brainstorm using whiteboards and post-it notes	Online brainstorm using virtual whiteboards like Mural or Viima
Implement	Physical prototypes and face to face user testing	Digital prototypes and virtual testing (synchronous and asynchronous)
Final Pitch	In-class presentations	Online presentations

Furthermore, we increased the available time for student coaching outside of class, recording the classes and increasing the course material available online (including short videos with a summary of the ideas discussed in each class). Throughout the semester, we openly checked in with students. We asked for feedback, as we were all going through the same disruptive experience together and would need constant feedback to adjust.

To measure the impact of the changes implemented in the Innovation Management & Design Thinking course, we monitored the learning experience on overall learning performance, student satisfaction, learning experience and student engagement.

1.2. The Design Thinking challenge and participants

The course of Innovation Management and Design Thinking is based on real-world challenges allowing students to practice the theoretical concepts covered. Every edition of the course has an industry partner proposing a challenge to students. For the 2020 edition, NOVA IMS itself challenged the students to envision a new academic building that promoted innovation, inclusivity and sustainability.

The class had 47 students from different backgrounds: 10 nationalities, 5 different backgrounds (health, management, marketing, data science and engineering) and different seniority (from recent graduates to 20+ years of work experience). The fact that the course is elective to different NOVA IMS programs increases student diversity. To leverage this diversity and produce more disruptive outcomes in the innovation project (Edmondson and Nembhard, 2009), students were assigned to groups using a specific procedure. First, we apply a questionnaire to students measuring different dimensions: academic background, personality traits, demographics and work experience; then, we clustered students based on each dimension, obtaining a final cluster solution with similar students; we then assign to each group students from each of the cluster, allowing a more diversified set. Over 14 weeks, the students worked on the project, following the stages listed in Table 1, and ending with a final pitch presentation to the NOVA IMS Dean.

2. Data Collection and Analysis

For evaluating the impact on learning performance, we compared the grades from 2018/2019 (pre-COVID-19) and 2019/2020 (during COVID-19) academic years. For student satisfaction, we compared the results of the class evaluation survey that the university uses to assess all its courses' quality. The response rates for this survey was 50% for 2018/2019, corresponding to 20 students, and 36% for 2019/2020, corresponding to 17 students. To measure the impact on the learning outcomes, we compared the grades for the project work in both years.

Finally, we handed out a survey at the end of the semester and interviewed students from both years to enrich the survey findings. In the case of student engagement, which has been defined as investment or commitment (Marks, 2000; Newmann, 1992), the survey questions focused on the three dimensions of engagement – behavioural, emotional and cognitive (Henrie, Halverson and Graham, 2015) – which students answered on a Likert scale. Concerning the impact on the learning experience, we asked students to rate different

activities as "more difficult", "the same" or "better", comparing face-to-face to online. We received 25 responses to this survey, 16 from 2018/2019 and 9 from 2019/2020.

To explore in more detail the impact of the transition, we performed 8 in-depth interviews (4 from 2018/2019 and 4 from 2019/2020), inviting students to provide examples of situations to illustrate their feelings., and interviewed.

3. Results and discussion

Overall, the results show that the transition to 100% online classes did not significantly impact the learning performance, student satisfaction and student engagement. When comparing 2019/2020 (during COVID-19) to 2018/2019 (pre-COVID-19), grades improved by 7%, student satisfaction increased by 2% and student engagement increased by 1%. These results indicate that the adaptation of the teaching techniques to a 100% online environment effectively maintained the overall quality of the learning experience.

When looking in detail at different day-to-day activities of the learning experience, we observe that some were affected positively and others negatively in others, as depicted in Figure 1. Discussion in class, asking the professors for feedback and keeping focus during class was perceived as "more difficult" in online classes. Lecturers should have these three moments in mind when planning online or blended courses. For instance, use techniques for more effective discussion online, such as breakout rooms or using the chat for student prompts, schedule moments both in class and outside of the class for students to ask for feedback and adapting active learning techniques in the online environment to enhance student focus and engagement in an environment that is typically filled with distractions (laptops and smartphones).

Doing presentations online was equally perceived as worse, better, and the same, which indicates that it does depend on the context as much as on the students' preferences. Some interviewed students explained that they felt more comfortable presenting online due to feeling less exposed, while others missed assessing the audience's reaction face-to-face. Working as a group and motivation to attend classes were perceived as slightly better in an online environment. Interviewed students said it was better not to have to commute home in the evening, and it was more comfortable to attend the class from the comfort of their home after a tiring workday since the class was held in a night-time schedule. Additionally, the interviews revealed that students were already doing group work online previously to the pandemic, only getting together for two specific reasons: socialization or when a physical deliverable was required (e.g., project board).
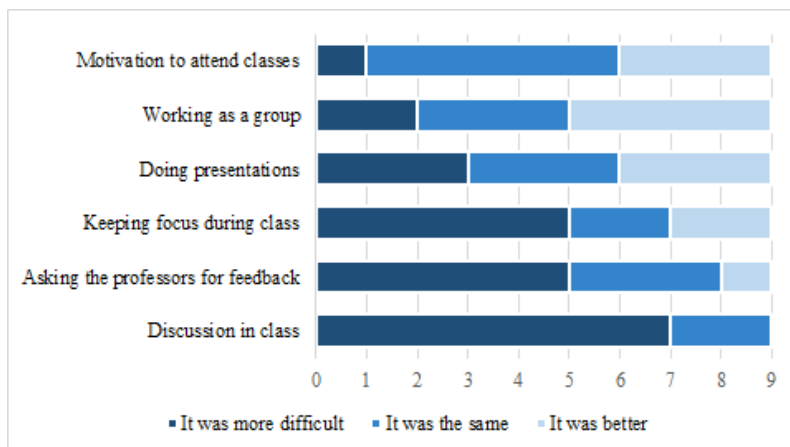
Figure 1. How students felt about online learning experience comparing to on-campus experience.

From the analysis of the students' interviews on each of the Design Thinking process phases, we concluded that the Group Formation and Inspire phases were positively impacted by online teaching. The Ideate phase was negatively impacted whereas the Implement phase and the Final Pitch were not significantly impacted by the change, as summarized in Table 3.

Table 3. Online methods impact per stage of design thinking

Stage	Online class method	Change Impact
Group Formation	Groups assigned by an algorithm, following a questionnaire	Positive
Inspire	Online ethnographic research (interviews and customer journeys)	Positive
Ideate	Online brainstorm using virtual whiteboards like Mural or Viima	Negative
Implement	Digital prototypes and virtual testing (synchronous and asynchronous)	Neutral
Final Pitch	Online presentations	Neutral

Concerning Group Formation through the sorting algorithm, students reported that they felt they had "complementing profiles in the group" and that "the assignment of the groups was fair and easier since we did now know the other classmates". During the Inspire phase, going online facilitated the interview process: "interviewing people online was really practical". We observed an increase in the number of interviews done by students compared to previous

years when face-to-face interviews were the standard. Students reported that the quality of the interviews was not affected: "The quality of the conversation is more important – it had to feel like a casual conversation and not an interview. The fact that it was online did not matter." When asked about the Ideate phase, interviewed students from 2018/2019 reported that "we created a fun environment in class for the brainstorming sessions, with snacks and beverages, which stimulated the flow of ideas. The excitement was contagious, and we even participated in the brainstorms of other groups." The experience of students was poorer – each group brainstormed online on their own – and students did not report the same level of excitement: "brainstorming was difficult, we felt lost about what to do." During the Implement phase, students did not report any difficulties in building their prototypes in an online context. The main difference from previous years was that students opted more for digital prototypes over physical ones.

4. Conclusions

When we were forced to teach IM&DT online due to the COVID-19 pandemic suddenly, we assumed that the learning experience would change: would it be possible to promote empathy and human connection in an environment where everyone would be remote and isolated? It turned out to be not a negative experience but a transformative one. We learned meaningful insights that will impact the learning experience and teaching methodology in post-COVID times.

The results from this study show us that, essentially, it is not a question of online versus face-to-face classes but a matter of how we can leverage the best of both worlds. The students' feedback we collected showed us that being online provides advantages in terms of comfort and time management for classes that function in night-time schedules – especially for working students. The evidence points to students demanding more blended learning formats in the future. As an implication, professors will need to adapt their curriculum and methods to this new reality, bearing in mind that teaching online cannot be done in the same way as on-campus. Three adaptations recommended from this experience that addressed the observed limitations of online teaching are 1) to provide additional time outside of class for student coaching and feedback, 2) to make available "offline" the lessons learned in class (e.g., by recording classes or releasing short videos with a summary) to compensate the greater difficulty of keeping focus in an online class and 3) to find ways to promote discussion in the online medium similar to face to face discussions.

While students prefer the online environment for group work and theoretical classes, the on-campus experience enhanced brainstorming activities and enabled socialization. The traditional classroom built for passive learning is obsolete (Benade, 2017). How we envision

learning spaces in the future should reflect and support these needs and new active learning methodologies.

References

Benade, L. (2017). Is the classroom obsolete in the twenty-first century? *Educational Philosophy and Theory*, 49(8), 796-807.

Börner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewning, K. & Evans, J. A. (2018). Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. *Proceedings of the National Academy of Sciences*, 115(50), 12630-12637.

Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation.* New York: Harper-Collins.

Brown, T., & Katz, B. (2011). Change by Design. *Journal of product innovation management*, 28(3), 381-383.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, 8: 5-21Edmondson, A. C., & Nembhard, I. M. (2009). Product development and learning in project teams: The challenges are the benefits. *Journal of product innovation management*, 26(2), 123-138.

Edmondson, Amy C., Ingrid M. Nembhard (2009). Product development and learning in project teams: The challenges are the benefits. *Journal of product innovation management* 26.2: 123-138.

Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education*, 90, 36-53.

Liedtka, J. (2015). Perspective: Linking design thinking with innovation outcomes through cognitive bias reduction. *Journal of product innovation management*, 32(6), 925-938.

Lockwood, T., ed. 2009. *Design thinking: Integrating innovation, customer experience, and brand value* (3rd ed.). New York: Allworth Press.

Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American educational research journal*, 37(1), 153-184.

Newmann, F. M. (1992). *Student engagement and achievement in American secondary schools*. Teachers College Press, 1234 Amsterdam Avenue, New York, NY 10027 (paperback: ISBN-0-8077-3182-X, $17.95; hardcover: ISBN-0-8077-3183-8, $38).

Seidel, V. P., & Fixson, S. K. (2013). Adopting design thinking in novice multidisciplinary teams: The application and limits of design methods and reflexive practices. *Journal of Product Innovation Management*, 30, 19-33.

World Economic Forum. (2020). *The Future of Jobs Report 2020*. World Economic Forum, Geneva, Switzerland.