

Iceberg© Online: Applying Physical Creativity Integration Tool into Online Studios

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Abstract: Distance learning was not a common phenomenon in design education. However, the Covid-19 pandemic has forced to shift from physical learning to online distance learning. This has resulted in a challenge to train students to develop design direction for their projects. This article discusses the initial investigation for the effectiveness of Iceberg adaptation to online studio in developing design direction. Google Jamboard was used as the workshop's platform to support the adapted method. Online questionnaires were employed to elicit students' feedback and the quantitative data were supported with the coordinator's observation. This study identified that most students found that the method was beneficial for design direction in the group setting. However, physical interaction is preferable as it is challenging to understand the procedure online. These responses were crucial for the researcher as the Iceberg method will be developed to suit multiple situations.

Keywords: design direction, design thinking, online studio, collective creativity, Google Jamboard

1 Introduction

This paper discusses the process of design direction using a novel collaborative creative tool Iceberg©. The use of this tool was initiated using an online studio in Universiti Putra Malaysia (UPM). This approach was adapted from its original physical activity in response to the online circumstances. Based on the restriction of having physical class due to the Covid-19 pandemic, this was an intervention undertaken to assist students in developing design direction for their projects.

Industrial design in UPM has been practised in studio base learning (SBL), rooted in design project planning and execution. The projects started with a directive approach at the junior level and became more open towards the final year. The students were exposed to and applied multiple design methodologies, especially on the fuzzy front-end design process including design driven, user centric and technological approaches. Moreover, creative activities were

carried out through analogue and digital techniques that are practised by other prominent design schools globally.

In UPM's SBL, design projects are developed to address issues and problems. Various projects are directed to the design outcome e.g. furniture, consumer product or transportation. However, in this studio, the coordinator decided to apply transportation design project as this was important to boost the student's design experience. The studio's learning outcome undertaken in this investigation emphasises creative exploration of existing and available conceptual technologies. The coordinator supplied the project's theme to control the project size suitable for the student level and the assessment system. As the theme was related to transportation design, the coordinator directed the design process to ensure the students learn rigorous designing steps in transportation design. This includes developing the design direction for their projects. Below were the design strategies applied to the respective studio (Table 1).

Table 1: Design strategy for the studio

Activities	Strategy	Procedure
Design Direction	Design statement development	Collaborate
Idea Generation	10 idea [sketches]	Individual
Idea Development	Select 5 idea, discussed with team members and choose 1 best idea [sketches] Develop 5 variations of design from the 1 best idea [sketches]	Collaborate and individual
Final design	Pick the best variation and detailed [sketches]	Individual

These four activities were conducted using the design process in the studio. The four activities encompassed from design direction to final design. Design direction refers to the stage where the design statement and criteria were developed. Then, it continues to visualise the proposal according to the design direction set before.

1.1 The change of circumstances and issue

In early 2020, all teaching and learning activities were changed online due to the Covid-19 pandemic. The current study plan was applied with the use of a suitable online application. Other than the challenge of attending online studio classes, the coordinators realised that students were experiencing difficulties in developing a design direction independently. Collaborative work maybe the answer for this. As the coordinators were familiar with the use of Iceberg©, a collaborative design thinking approach was adapted for the design direction process. The following points were considered in the implementation of the process:

1. How to adapt Iceberg's collaborative physical activities online?
2. How can the procedure be explained and understand online?
3. How is the procedure conducted online on different groups of students?
4. How will the coordinator monitor the process?

Previous studies were explored to investigate the issues of conducting online studio classes. Literature related to the methods used in preparation was also reviewed and adapted to suit the current online classroom setting.

2 Literature Review

2.1 Design direction

Design direction is a term that is briefly used in studio-based learning at least in UPM. This term is defined as the crucial textual information of a design project e.g. design statement, criteria, objective etc. The literature presents that ‘design direction’ explains how the design and innovation project should be undertaken to address the issue(s) in their research e.g. [1–4]. A closer domain can be referred to [5], in their discussion on the future design direction in a smart wearable product, used this term frequently in their report. They gathered product and fashion designers to work together by referring to the inter junction between the vision of the manufacturer and designers with the user’s requirements. The term used was to illustrate the future approach in designing smart wearable products.

It was then followed by [6], who developed smart footwear for the elderly for their design project. The distinction between these two projects demonstrated the outcome of their methods. Ariyantum’s project produced a textual vision between the two groups of designers while Callari’s project developed design artefacts by using a co-creation strategy between international gerontic participants. Nevertheless, the similarities in these two design projects were to identify and address the current design issues and problems by producing statements and artefacts. Therefore, it has a similar meaning to the definition of design direction that the research adopted. Furthermore, Iceberg aims to produce design statement collaboratively. Thus, this study determines that term is appropriate for the project.

2.2 Online studio

Various studies were identified and reviewed using two keywords which were online studio and Covid-19 pandemic. Four articles published between 2020 and 2021 were referred to as the context of these studies was during the pandemic. This study also reviewed another article that was published in 2019.

[7] and [8] discussed the implementation of design pedagogy for online studios where the typical physical design training was adapted to distance learning. Marshalsey focused on collaboration and peer learning in a virtual community and used a distinctive research framework to examine this. Fleischmann attained students’ viewpoints and triangulated them with other sources to investigate the effectiveness of the adaptation of design pedagogy. Although pedagogy was not fully explored in this study, the discussion provided a deeper understanding of the implication of the issue on student learning. Distance learning changed the studio culture and this was what [9] inquired in her study. The relation between the learning digital and social digital was examined. Nevertheless, she discussed this conceptually without involving ongoing online studio. Studies by [10,11] evaluated online studios through their teaching and learning process. The difference between these two evaluations was that Wragg examined the important attributes of online teaching by observing and reflect the records on applications used in the process, e.g. blackboard. In contrast, Somer’s research administered a survey to students to examine the effectiveness of their online studio.

This study determined that these five articles raised similar concerns regarding the potential of online studios as they were commenced due to the pandemic situation. Several issues were raised as the reason they undertook the investigation and captured from the findings were incorporated in this study. The first concern was '*social interaction between peers and instructor*'. [7] indicate that the practice-based art and design changed when cooperative and social happenstances were conducted in the distance. Even though there are numerous available social media platforms and other apps to support interaction, spontaneous unconscious learning takes precedence [9]. The successful transition of the design learning experience into online underlines the embedment of social activities that assembled a community of practice [11]. The other concern was '*distance learning is challenging*'. In a domestic environment, the knowledge was re-constructed with the absence of studio culture which involves a constant flow of subject-related conversations [9]. Alternative communication means, such as visualisation presenting, must be made available to support distance learning, including getting the involvement of students on their design problem under the influence of the coordinators [10]. For this, the past research shared various beneficial methods that can be adopted.

[7] reminded the art and design academicians should apply the same pedagogical principle into online teaching and learning. This will promote apprenticeship learning despite the challenge of being distance from the mentor. Other obviously showed that they used available conferencing tools as the active participation, e.g. Adobe Connect, to communicate and present during studio classes [8,10,11]. Wragg used RealtimeBoard, a cloud-based digital whiteboard on enabling the students to observe their peers' ideas and comments. Another example is flipped class, which uses recorded lectures and demonstrations that can be viewed before class to promote fruitful engagement during the online studio [8].

In conclusion, to undertake the design direction process upon online studio, one must be concerned with the interaction between the instructor and the students. A reachable activity needs to be provided so the instructor can conduct them effectively and the students perform. This can be achieved by using a suitable and available online platform. Samples from recent studies set a good example in undertaking online studio nonetheless holistic. The method of developing design direction was not explained exclusively in the online studio. So, it is beneficial to study how the Iceberg© approach can be used to pursue this.

2.3 The adapted method: Iceberg©

Iceberg is a concept triangulation method that uses keywords to pursue design statements and criteria [12]. It comes with a toolkit comprising a poster and a cube. It was designed by Dr Chen Yen Fu and Dr Shahrizal Dolah remotely between Taiwan and Malaysia. This method was frequently applied to a design thinking workshop by various agencies and groups.

The method was developed based on the double diamond concept popularized by UK Design Council, originally evolved from the divergence-convergence model proposed in 1996 by Hungarian-American linguist Béla H. Bánáthy [13]. The diamond is divided into 4 sections of actions and named with discover, define, develop and deliver. Every section illustrates the nature of the process, e.g. discover a wider scope situated at the beginning of the design process, as illustrated in Figure 1. Iceberg was developed and mapped to the double diamond model and positioned on the first two processes, discover and define.

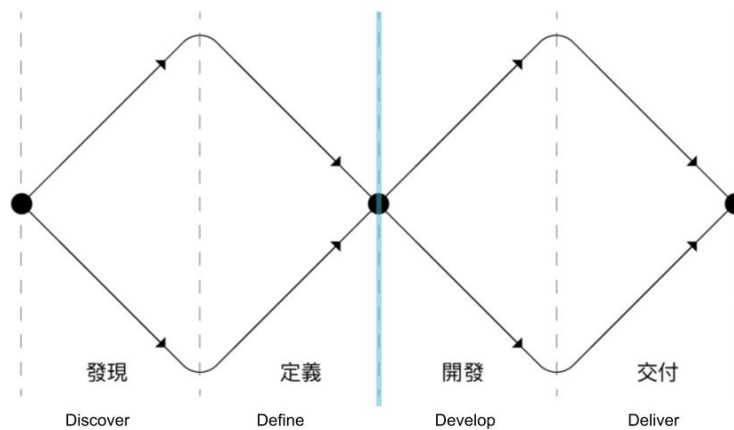


Fig. 1. Double diamond map adopted for Iceberg© approach. Source: Yang et. al. [2020]

Iceberg’s toolkit includes an Iceberg map and a Concept Remixture Cube. The object and the use of the map and the cube will be described in the following sections. This ‘Iceberg Map’ is used to discover design elements and define the innovative desire of the design (Fig.2). Amalgamating three different perspectives which are knowledge, senses, and benefits stimulates the exploration and enables opinions to be mapped, mixed and evaluated. The toolkit is designed to help facilitate cross-disciplinary discussions about a given design subject from three perspectives, represented by the three sides of the triangular iceberg. The two sides of the iceberg that sit above water (i.e. A and B) are symbolic of concepts that can be found through experience or observation, whereas the side of the iceberg underwater (i.e. C) represents concepts that need to be discovered, ones that are anticipated or desired.

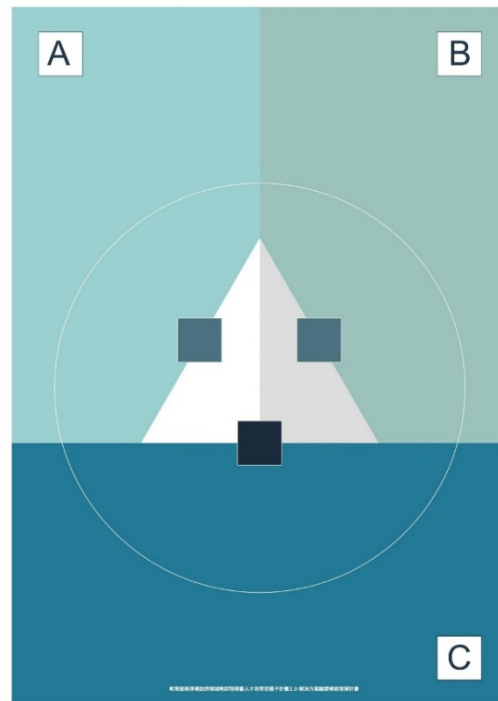


Fig.2. Iceberg Map poster. Source: Yang et. al. [2020]

The designer role is essential to triangulate within the user and interpret the creative process in design practice [14]. In practice, the map is used in conjunction with sticky notes for group discussions. Group members are asked to write opinions, topics, or keywords on sticky notes during discussions or brain writing sessions. On the map, the three blank squares on each edge of the iceberg (A1, B1, C1) are placeholders for the three sticky notes that represent the most common topics coming out of the group discussion for each category, respectively. The remaining sticky notes should be placed in their respective category areas. Their exact position is determined by their relative association with the common topics of its two adjacent categories and their similarity to the most common topic in its category (i.e. A1, B1, or C1). For example, a sticky note with a topic in the Knowledge (A) category will sit inside of area A; its distance to A1 symbolises its relevance to that topic; its relative distance between the B and C areas represents its relative connection or similarity to common topics of those categories (i.e. B1 and C1).

After all sticky notes from the group discussion are placed on the map, participants will be asked to vote on the different topics written down on each sticky note. Participants are given glue dots of two different colours, blue for creativity and red for marketability. One dot can be placed on one sticky note, and votes shall be distributed among the three categories. After the vote, dots are tallied, and the highest scoring topic of each category will be marked as A2, B2, and C2, respectively.

Together A1, B1, and C1 make up the “triangle of the masses,” and A2, B2, and C2 make up the “triangle of creativity.” These six topics represent concepts that are most significant in the group discussion and will be reused in the next phase of the design process using the Concept Remixture Cube, as depicted in Figure 3.

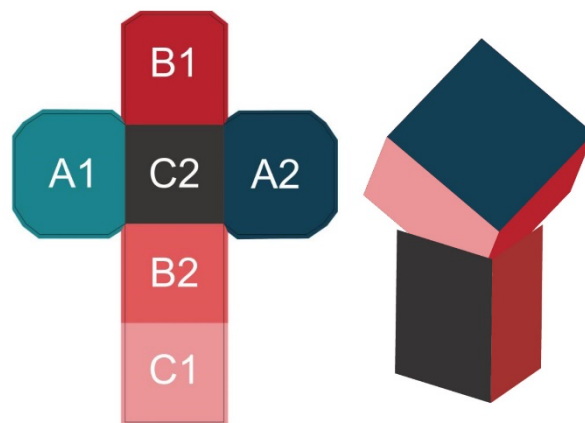


Fig. 3. Concept Remixture Cube. Source: Yang et. al. [2020]

This “Concept Remixture Cube” is used in conjunction with the Iceberg Map to prompt more possible concept remixtures in consideration of the design feasibility before forming a design proposition. Its six sides correspond to the six resulting topics represented by the “triangle of the masses” (A1, B1, C1) and the “triangle of creativity” (A2, B2, C2) taken from the preceding Iceberg Map exercise. Thus, this tool helps deconstruct a complex design problem into several simpler components.

When placed on its designated stand with one vertex pointing down, three sides of the cube will be visible from any given angle. Because of the intentional arrangement of the six sides of the cube, any three visible sides should encompass a concept from each of the three categories (A, B, C). Reflecting the previously defined A, B, and C areas, A1 and A2 represent concepts from the area of *Knowledge*, B1 and B2 from the area of *Senses*, and C1 and C2 from the area of *Benefits*. The more 1s (A1, B1, C1) involved in the combinations indicates a higher feasibility of the concept. This tool can help visualise eight combinations of the six concepts and help guide students in forming a proposition statement that incorporates any three visible concepts (any combination of an A, B, and C concept).

2.4 Brainstorming and sticky notes online

Iceberg© approach follows a thematic analysis brainstorming procedure similar to other thematic approaches such as the KJ method. The basis for this is to use sticky notes to put

keywords and vote them during brainstorming sessions. From there, the statement that leads to the design direction will be made based on the keywords that have been agreed upon.

The use of sticky notes is becoming normal in the design field. Recent research showed that this is used as a creative strategy tool in a user-centric approach such as co-design and participatory design e.g. [15–17]. A book by [18] exclusively discussed using Post-it sticky notes in different fields such as psychology, computer science and design. They also discussed the transition of manual sticky notes to digital, where several digital applications that resemble the use of sticky notes and tests in the design environment were developed. According to them, this digitised sticky notes can also be applied online.

The research needs to explore the thematic brainstorming approach online as they will apply the Iceberg approach online. The application of these tools in the market can be conveniently reviewed through the Internet. The research scoped the review according to the Iceberg’s characteristics such as;

- Brainstorming
- Using novel poster
- Using sticky notes
- Grouping
- Voting
- Using lines to connect favourable keywords (on sticky notes)
- Box of keywords
- Form design statement with keywords

The above characteristics are a mixture of activities and the tools used in Iceberg. However, the box of keywords cannot be replaced with online applications. This characteristic was conducted physically to nurture student engagement and the originality of Iceberg’s approach. Several important features were also listed on the map to ensure the research are getting the suitable apps to be used by the students. The research then mapped these with available relevant online apps (Table 2). There are many available apps to be chosen. however, we compared the most reviewed between 2019 and 2020.

Table 2. Mapping the needed features from Iceberg to the available online application

Features	Available Apps				
Iceberg	Idea Flip	Group Map	Jamboard	Lino	Mural
Brainstorming Collective contribution	Yes	Yes	Yes	Yes	Yes
Using novel poster Image can be imported to the apps	No	Yes	Yes	Yes	Yes
Sticky notes Drop, annotate,	Yes	No	Yes	Yes	Yes
Grouping Obvious and Non-Obvious feature	Yes [O]	Yes [O]	Yes [N-O]	Yes [N-O]	Yes [O]

Voting Obvious and Non-Obvious feature	Yes [N-O]	Yes [O]	Yes [N-O]	No	Yes [O]
Using lines to connect favorable keywords [on sticky notes] Obvious and Non-Obvious feature	Yes [O]	No	Yes [N-O]	No	Yes [O]
Form design statement with keywords Text box	Yes	Yes	Yes	Yes	Yes
Accessible Free, low data usage	Yes [14days]	Yes [14 days]	Yes	Yes	Yes [30 days]
Easy to use Simple, short learning curve	Yes	No	Yes	Yes	Yes

The research identified five online applications that suit the project. They were designed to support collaborative brainstorming with remote participants. However, the research recognised that only two apps serve all the qualities needed which are Jamboard and Mural. Mural is a collaborative whiteboard tool that has been used by many designers and is well-known among design companies. It can be integrated into MS Teams and other major online apps compatible with the MS Teams platform. It is shown that it is the most suitable for the circumstances as it serves the design environment. Nevertheless, Google Jamboard was used as it was more accessible and ready to be used by members of the class as they own a Google account. It was simple and adequate to apply the Iceberg© online.

3 Methodology

3.1 Online workshop

The project was conducted remotely as the students were situated in a separate residence. They were required to complete the project in 14 weeks. They were briefed on the project direction in the first week of the course. These include the project brief, milestone and trial of the Google Jamboard. The project required the students to collaborate in a group in the earlier stages of the project. This stage where design direction was developed was undertaken collaboratively within a group of five to four members.

The design direction session was divided into three stages. First, the session started in one mass video conferencing (vc) as they were given a brief introduction to the design thinking process. Second, they discussed their design direction using Jamboard as a collaboration platform. This was undertaken separately between groups using other preferred video conferencing apps while still attending the mass vc. Lastly, they were assembled back to the earlier vc channel to be debriefed by the coordinator. This session ended after a question and answer session between the coordinators and groups. The session took 4 hours online. The groups shared their outcome on the following week of the course.

Step 1

The coordinators presented step-by-step instruction on how to use the Iceberg tool while the groups followed them using the shared Jam board among the group members. First, they were required to brainstorm keywords for each element from the Iceberg poster which are knowledge, experience and outcome (Figure 4). They were required to use simple and short keywords and each brainstorm session for the elements was limited to 5min per session. No discussion was required and they articulated their idea individually. They used the sticky notes on the app where it can be easily annotated and differentiated by colour. These sessions took 3 different whiteboards to complete.



Fig. 4. Brainstorming using digital sticky notes in Jam board on Knowledge, Experience and Outcome

Step 2

The groups used the image file of Iceberg's poster supplied by the coordinator. Then, the file was paste horizontally following the apps original whiteboard orientation on the 4th page. The poster's meaning and usage were extensively explained to ensure optimum understanding from the groups. They were required to name the poster's section using the earlier elements accordingly, such as

- A – Knowledge
- B – Experience
- C - Outcome

Step 3

The keywords were all transferred and grouped with the same meaning and labelled with another preferred keyword or by using an existing keyword to represent them. This was also undertaken at a limited timing. The most popular keyword that was grouped with the highest number of sticky notes was positioned on the edge of the Iceberg. All other sticky notes were positioned according to their relation to the most popular keynotes on the middle as well as their relationship among the elements. This took a longer period of approximately 10 minutes times.



Fig. 6. Concept Remixture Cube. Voted keywords transferred onto designated faces, positioned at it corner to get mixture of keywords for design statements

The original Iceberg approach includes creative collaboration. Recent practices for this were done by using sketches or mock-up as a proposal undertaken collaboratively between participants. This activity blended with the normal design process in the studio where the students visualised their ideas through sketches.

3.2 Participant observation

Coordinators in this research observed the workshop to investigate the effectiveness of the method without detaching themselves from the observation by adhering to the method compiled by [19]. They observed themselves while observing the students and the process. The coordinators discussed and reflected on the procedures they have taken through the workshop to elicit important points. This approach was convenient to the study as it applied to their previous research [20].

3.3 Online Questionnaire

Recent research showed that Google Forms was used as the tool for online surveys [21–23]. The app was mainly used as it was easy to be operated due to its simplicity and easy usability. Google Forms is widely used nowadays as a survey for research and management purposes. This study believed that the tool was familiar to the students. Following this, an online survey was undertaken to the students using Google Forms to investigate the effectiveness of the method. The survey consisted of eight questions covering their familiarity with the KJ method and their online response to the Iceberg© approach. Two of them were yes and no questions. Then, four Likert scale questions, one multiple choice and lastly, a short answer question. The questionnaire was distributed after the workshop.

4 Findings

4.1 Coordinators observation

The coordinators were investigating the effectiveness of facilitating the design direction workshop in the online studio context. As this was their first attempt, it is nearly impossible to review its efficiency compared to its original implementation. However, certain points can be highlighted for the benefit of future online applications.

The coordinators agreed that applying Iceberg in an online situation is applicable and beneficial. The steps are compatible with online conditions, especially with the use of suitable online software. For example, in the original application, different colour of sticky notes was required to do the brainstorming. This was easily adopted with Google Jamboard where different colours of sticky notes can be chosen and change if needed. This shows that it was helpful for the students to commit to the program remotely in a collaborative manner. With Jamboard as the platform, the students can easily manipulate the tools to accomplish the Iceberg's goals. For instance, transferring the sticky notes to the poster and grouping them allowed the students to adjust the sticky notes' size to suit the available space. As it an online-based application, the work is automatically saved and ready to be revisited by the members and coordinators at any time needed.

The observation shows that conducting an online design thinking workshop seems to be sustainable. Unlike its original enactment, undertaking the session online do not require the coordinators to prepare physical sticky notes, posters and stationaries. Thus, it was economically and environmentally sustainable. Despite the encouraging review for the program, the coordinators found some other points that need to be considered.

They discovered that there was a lack of engagement from both parties. The current practice allows them to move around while explaining and demonstrating. The attention of the participants is being alerted by movement and gestures, sometimes jokes. The coordinators cannot perform this as the online procedure depended on the slide and software sharing. Furthermore, body gestures and facial expression of the students was difficult to be observed during the session. This led to the exertion of holistic measures of the students' understanding and attention. The absence of the student's real-time images due to turn off camera also contributed to this issue.

The time taken to do concurrent explanation and demo was also longer than physical settings. Attending student's query on the process required extensive clarification to ensure adequate understanding from them. In addition, disturbance of the internet connection required them to demo and explain repeatedly. Spending longer time online which require long hour sitting is exhausting. Therefore, frequent breaks were taken to allow students and coordinators to refresh themselves.

A Stable internet connection is essential for online teaching and learning. However, it is impossible to control this and ensure all students possessed an equal stable connection. Due to this, some of the students had difficulties contributing smoothly to the program.

4.2 Survey on the students

The first three questions were to investigate student's familiarity with the KJ method. This is important for the program as this will help students in undertaking Iceberg smoothly as it has a similar thematic analysis sequence. A total of 78% of the students was familiar with the KJ method and most of them used it 2 to 3 times before. Furthermore, most of them agreed that KJ method was helpful in the brainstorming process as it showed that 51 students rated between 4 to 5 on a scale of 5.

The rest of the questions elicit students' feedback on the use of Iceberg in their program. It was surprising that 44% of the students heard or used Iceberg even though this was the first time we introduced the approach to them. We suspect that they must be confused with the context between 'familiarity' and the question asked. Nevertheless, the students' explanation was not pursued to justify this. 44 numbers of students agreed that the Iceberg approach was helpful in the brainstorming process as they rated 4-5. They were asked about the accessibility of using the Iceberg online and 18 students seemed to experience difficulties accessing the program. However, 41 students rated between 4 and 5 for this scale of not easy – very easy.

Understanding the instruction given in the online program of the Iceberg is important as it is one of the key points in assuring optimum benefit for the students. A question for this was asked and 31 students rated that it was easy to understand. Nevertheless, 27 students rated 2 to 3 and this showed that nearly half of the class had difficulties in understanding the instruction during the program.

The last part of the survey inquired on students' further opinions on the Iceberg approach. For this, the survey received 13 responses. 4 replies were suggestions and perhaps complaints. 7 replies were praising the program. Another 2 replies are void responses. One respondent believed that the Iceberg approach is simple, but it is difficult to understand it online. This then followed with a comment by another respondent that this approach may better to be 'one to one'. Perhaps this response meant 'physical' or 'face to face'. One commented that maybe the program needs an easier way to explain the knowledge, experience and output. This may relate to the rating survey of understanding level for the instruction given. This is followed by another comment that highlighted the importance of a sample e.g. using one of the groups as a sample to make the Iceberg process understandable. Two from the praises emphasised how the approach helped in the idea generation process. Others stated that it is beneficial as a good communication tool between teammates and general commendations.

5 Conclusion

Integrating Iceberg into online studio execution was challenging yet beneficial. It showed a balance between advantages and disadvantages. Thus, improvements need to be realised to overcome these challenges. For instance, every group need to have their own facilitator to ensure

enquiry can be entertained instantly. Another improvement that can be made is to take one of the groups to be an example during the process. Iceberg was used to expose participants to the design thinking process. However, applying it to solve real problems, e.g. developing design direction for studio project seems to have more impact on the participants. This must be driven by real needs and responsibilities. Using Jamboard as a platform seems to be adequate. However, it may not reflect the full potential of the Iceberg method. The coordinator may need to explore the possibility to use better online platforms. For this, good groundwork must be done e.g. preparing access to the application for the students. Further investigation must be undertaken to test the theory. Another series of online Iceberg needs to be commenced.

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