CULTURALLY-SENSITIVE TOOLS FOR DESIGN GROUP IDEATION IN A JAPANESE CONTEXT

Yuki TAOKA[1], **Kaho KAGOHASHI**[1], **Shigeki SAITO**[1], **Céline MOUGENOT**[1,2]
[1]Tokyo Institute of Technology, Japan
[2] Imperial College London

ABSTRACT
In engineering education at Japanese universities, design has recently been seen as a way of developing students' mindset toward real life problem solving. In design project-based learning, students from various academic backgrounds team up in a "co-design" process. Co-design is common in Europe, especially in the Nordic countries where it originated, while it is rather unusual in Japan. Since designing consists in social activities like group discussion, cultural differences between Japan and the Nordic countries are expected to impact the way to map co-design into a Japanese context. Our objective is to create design education approaches that suit Japanese cultural context. Taking cultural differences into account, our main hypothesis is that anonymity might increase Japanese designers' engagement, which would lead to higher creativity and more feedback in ideation activities. We developed new tools that provide anonymity during design activities and assessed them experimentally with sixteen Japanese students, in terms of perceived engagement of the designers and of the design outcomes. Findings show that anonymity leads to higher fluency and higher engagement in idea generation. Introduction of anonymity also increases critical discussion, while it remarkably decreased engagement of participants in idea selection. In this paper, we discuss how cultural characteristics should be taken into account when creating design tools and methods and, more generally, how design education should be tailored to specific cultural contexts.

Keywords: Design methods, group ideation, culture, collaboration

1 INTRODUCTION
In project-based courses, common in design education [1], students from various disciplines collaborate together in a "co-design" process [2]. Co-design has been mainly researched in "Western" countries, for which major differences can be seen with Japan in all six dimensions that describe "culture", as defined by Hofstede [3]. As designing is a culture-dependent activity [4], cultural differences should be taken into account when creating tools that support design activities [5]. In this context, our objective is to create tools that can facilitate design activities in project-based design courses, in an East Asian cultural context (Japan).

2 RELATED STUDIES AND RESEARCH QUESTION

2.1 Effect of culture on design activity
Several studies have investigated the impact of culture on design activities in East Asia. Six barriers in cross cultural design activities were identified [6], including sharing ideas freely within a hierarchy [7] [8] and harmony of group [8] [9].

Figure 1. Example of a tool showing emotion indirectly. "Mini-me" dolls: (a) before (b) after

Researchers attempted to overcome the barriers, as shown in Table 1, by, for example, controlling verbal interactions by turn management tools [9] [10] through design games [8] and by increasing indirectness of expressing disagreement [9] (cf. Figure.1).

Table 1. Related studies proposing culturally-aware tools for design activities

Study reference	Design task	Countries of the participants	Main findings
Rijn, 2006 [10]	Context-mapping	The Netherlands & South Korea	The tools were proposed and tested. The tools aiming at giving story for talk, supporting turn management, giving indirectness of expressing disagreement/agreement
Boeijen, 2011 [6]	Student Design Projects	(various)	Guideline to tune context mapping techniques based on three tools: sensitising booklets, preference booklets to stimulate storytelling and cards for creating safe space of communication
Hao, 2017 [11]	Context-mapping	China	Seven dedicated tools were proposed and tested: giving stories and authorities, better trust building between facilitators and participants supporting turn management and group forming, ensuring holistic view, increasing indirectness, competition,
Lee, 2009 [12]	Co-experience	The Netherlands & South Korea	Ambient tool showing duration of speech could balance discussion dynamics in a team of people from different hierarchical background
Lee, 2009 [9]	Focus Group Discussion	The Netherlands & South Korea	Tools were proposed and tested. The tools aiming at supporting turn management, giving indirectness of showing emotion or giving stories for speaking out
Yasuoka, 2013 [8]	Design Game	Denmark & Japan	Design Game was tested. Game elements created a space for non-designer to speak out. Japanese more strictly follow the design game rules than Danes.

2.2 Effect of anonymity on design activity

Anonymity offers hiding personal identity, which let people to put more emphasise on higher level of their social groups [13]. It leads to more satisfaction and higher performance, both subjectively and objectively [14]. However, it could also lead to social loafing where people do not put efforts on tasks [15]. The influence of anonymity on creative tasks has mostly been investigated in the field of computer-mediated interaction and it has been shown that anonymity increases creativity of design outcome [16].

2.3 Research question

In this paper, we report the development and the assessment of new tools that offer anonymity for group design ideation in a Japanese context. Based on aforementioned studies about differences in designing between the East and the West, we hypothesise that anonymity might lead to higher user engagement in design activities, in an East Asian context (Japan).

3 CREATION OF TOOLS FOR ANONYMITY

3.1 "Idea Train" tool for idea generation

We designed a tool where each participant has his/her own isolated space and a device sharing ideas anonymously so that participant can share the ideas but not see owner of ideas. (cf. Figure. 2) In an individual space, each participant is given sticky notes and pieces of thick paper for idea sharing. Participants write an idea on a sticky note, then hang an idea to the tool at the centre of the table. The ideas on sticky notes are moved and shared with the people around through the motion of toy-like train.

Figure. 2 (a, b) tool overview (c) experiment setup (d) participant hooking idea

3.2 "Hidden Judge" tool for idea evaluation

We developed a setup where each idea has its own isolated workspace in which only one participant is allowed to enter to offer anonymity (cf. Figure. 3) Each participant is given a worksheet to indicate in which order they have to visit the four ideas' spaces (cf. Figure 3.a right-up corner). The participants are asked to move around the spaces at the same time when facilitators ask them to do so. The worksheet and the facilitation allow participants to move around spaces individually and anonymously because the participants cannot know who is in which space. In each idea space, an idea and a grid categorising pros (advocate) and cons (opponent) are displayed on a large sheet of paper. The participants are asked to write as many pros and cons (pros/cons) as possible on sticky notes then paste them on the sheet. The setting enables participants to write pros/cons anonymously, whereas they can take advantage of group by seeing the ideas of other participants.

Figure 3. (a) worksheet (b) experiment setup (c) a shared pros/cons paper for each idea

4 EXPERIMENTAL ASSESSMENT OF THE TOOLS

4.1 Objective and procedure

In order to evaluate the impact of the tools on participation and creativity, sixteen university students, divided into four groups of four, conducted an ideation session in two different conditions: first without tool (control condition) and then with tool (tool condition). A group consists of two undergraduate students and two graduate students, in order to introduce some perceived hierarchical differences between the participants. Two design topics were given in counter-balanced order to avoid order effect: Topic 1 "Imagine crazy solutions for thermal comfort during summer, in office, bedroom or outside" and Topic 2 "Imagine crazy solution for travelling on snow, sand or water". The design session was designed to follow the second half of double diamond model [17], where designers first diversify ideas then converge to one idea. Each design task consisted in five steps: (1) Idea generation (2) Classification (3) Vote (4) Pros/cons (5) Discussion, sketch and presentation (cf. Table 2).

Table 2. Details of the experimental design session

Design Step (min)	Description of design step	Design Task 1 (control condition)	Design Task 2 (tool condition)
Idea generation: (7)	Generate as many ideas as possible as group with brainstorming rules [18].	NOT ANONYMOUS: at face-to-face	ANONYMOUS: "Idea Train"
Classification (2)	Remove the same ideas	NOT ANONYMOUS: at face-to-face	
Vote up to 5 min	Evaluate and select four best original ideas	NOT ANONYMOUS: put stickers on ideas in front of others	ANONYMOUS: individually write down on a paper
Pros/cons (8)	write down both pro and contra of each idea	NOT ANONYMOUS: at face-to-face	ANONYMOUS: "Hidden Judge"
Discussion (5)	Discuss to select the best idea	NOT ANONYMOUS: at face-to-face	
Sketch 1 min	Sketch the idea on a paper	NOT ANONYMOUS: at face-to-face	
Talk: 1 min	Talk the idea to facilitators	NOT ANONYMOUS: at face-to-face	

Since engaging participants is key in co-design process [19], the "level of engagement" of participants with co-design tools was assessed through a questionnaire based on the User Engagement Scale [13] [14]. The questionnaire assesses six attributes of user engagement which are perceived usability, attractiveness, focused attention (similar to flow), felt involvement, novelty, and endurability. Figure 4 shows relationship among the six attributes. We carefully selected seventeen questions, where two adjective or phrases are written at each side of SD method, to cover the six characteristics.
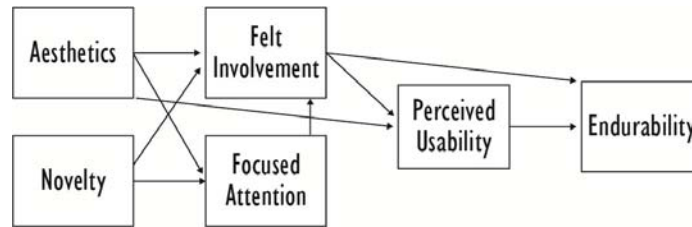
Figure 4. Map of six characteristics of user engagement

4.2 Results

In a previous paper, both tools, "Idea Train" and "Hidden Judge", were proven to offer anonymity and to increase the number of ideas generated in idea generation and the number of comments proposed in idea selection [20]. In this paper, we report the results of user engagement with each tool in the two design phases, ideation and idea selection (Table 3).

Table 3. Results of "user engagement" evaluation

Category	Alpha	Questionnaire items	Results - Idea Generation			Results - Idea Selection		
			Control aver (SD)	Tool aver (SD)	Sig.	Control aver (SD)	Tool aver (SD)	Sig.
Attractiveness		not attractive-attractive	4.25 (1.44)	4.63 (1.75)	.396	4.69 (1.20)	4.38 (1.20)	.022*
	.795	dislikeable-likeable	4.69 (1.30)	5.25 (1.44)	.207	5.00 (1.10)	4.38 (1.26)	.026*
		rejecting - inviting	4.06 (1.18)	4.13 (1.86)	.855	4.38 (1.20)	3.38 (1.26)	.040*
		unpleasant - pleasant	4.93 (1.39)	5.31 (0.95)	.472	5.53 (1.06)	4.25 (1.13)	.002*
Involvement	.703	boring - fun	4.25 (1.61)	5.38 (1.15)	.039*	4.81 (1.60)	4.06 (1.06)	.002*
		didn't feel - felt involved	4.19 (0.91)	4.63 (0.96)	.100	4.94 (1.06)	4.75 (1.18)	.058
Novelty	N/A	discouraging - inciting curiosity	4.56 (1.31)	4.56 (1.5)	.918	4.75 (1.06)	4.38 (1.26)	.017*
Focused Attention	N/A	Time passes slowly – time flies	5.38 (1.96)	4.13 (1.71)	.107	5.25 (1.88)	5.25 (1.77)	.131
Usability		discouraging - motivating	4.20 (1.57)	5.19 (1.28)	.053	4.93 (1.03)	4.38 (1.26)	.015*
		confusing - clear	3.19 (1.17)	3.81 (1.68)	.278	4.44 (1.82)	4.81 (1.33)	.029*
	.850	complicated - simple	4.63 (1.86)	4.75 (1.18)	.723	4.75 (1.61)	5.13 (1.15)	.441
		unsure – confident about the task	2.94 (1.29)	3.69 (1.20)	.103	3.56 (1.41)	4.38 (1.45)	1.000
		could not – could achieve the task	3.31 (1.82)	4.38 (1.15)	.100	3.94 (1.69)	4.88 (1.15)	.952
		mentally - not demanding	4.38 (1.82)	5.63 (0.96)	.005*	5.06 (1.73)	5.5 (1.03)	.458
Endurability	.148	would not - recommend it	4.53 (1.19)	5.06 (0.85)	.099	4.80 (0.86)	4.31 (1.08)	024*
		worthwhile-worthless	4.8 (1.15)	4.88 (0.89)	.927	5.47 (0.92)	4.94 (1.18)	.067
Original	N/A	unsatisfied - satisfied	3.69 (1.54)	4.94 (1.39)	.021*	4.44 (1.21)	4.63 (1.15)	.057

1: * means significant differences (p<.0.05), 2: N/A means Not Applicable

The reliability was evaluated by calculating Cronbach's alpha [21]. Subcategories of attractiveness, involvement, usability have well enough alpha values as the acceptable value of the alpha varies 0.70 to 0.95 [22]. We could find three significantly different attributes in idea generation session and nine significantly different attributes in idea selection session. In idea generation, the participants felt significantly higher satisfaction and more fun in "Idea Train" condition, in anonymous condition. They considered the task significantly less mentally demanding in "Idea Train" condition. In idea selection, eight of them imply that the participants had more positive impression about the task in control condition rather than "Hidden Judge" condition. One of the nine attributes shows that the participants considered the task in "Hidden Judge" condition clearer than the task in control condition.

5   DISCUSSION AND CONCLUSION

5.1 Impact of anonymity on design ideation, in a Japanese context
Our previous study showed that anonymity increased the number of generated ideas [20]. In this study, we found that the subjective evaluation of user engagements shows different results depending on the design phase. In idea generation, three attributes in tool condition shows significantly higher user engagement score than ones in control condition. However, the eight attributes in idea selection shows the opposite results. It suggests that our hypothesis is not validated. The introduction of anonymity in idea selection may have caused social loafing by concealing individual contributions [9]. Another explanation is that removing verbal interaction forces participants to focus on the design task. As the participants were recruited for the laboratory-based experiment, they might have considered the task as work. The higher user engagement in idea generation can be explained by playful appearances of the tool, "Idea Train". The appearances may let participants feel like playing during idea generation as it was reported as playfulness allows the participants to create distance from their daily life, which makes participants think out of the box, in other words, be more creative [23] [24]. It seems that the introduction of anonymity could lead to higher effectiveness and user engagement when it is coupled with introduction of playfulness.

5.2 Implications for real life co-design and design education
The results suggest that tools offering anonymity can increase the effectiveness of design activities in a team with hierarchy, in a Japanese context. It also shows that culturally aware tools are more effective than global standard design tools. When employing anonymity in real life co-design project, anonymity could have both positive and negative influence. In real life co-design project, there could be more positive impact of anonymity because the participants are bound by stronger relationship than that of lab based experiment. They may feel stronger freedom of speech, which leads to more active design discussion. However, anonymity could also have negative influence of weakening interpersonal bonds among the participants in the long term [25], which could lead to break up the co-design project. For real projects, it is desirable to investigate good balance of anonymous and identified discussion.
In the specific context of Japanese design education, our tools can help enhancing the collaboration between people in various social positions (e.g. students, design educators, company people), who may otherwise be reluctant to provide feedback about others' ideas because of the perceived social hierarchy.
Overall, we found that anonymity helps the participants to express their own opinion with group members, while it compromises user engagement in design tasks. The negative effects of non-anonymity could be mitigated by the introduction of playfulness in design tool. Further research with participants from different cultures is planned, to map the results into different cultural contexts.

REFERENCE
[1]   Dym, C. L., Agogino, A. M., Eris, O., Frey, D. D., & Leifer, L. J. Engineering Design Thinking, Teaching, and Learning. *Journal of Engineering Education,* 2005, 94(1), 103-120.
[2]   Fox, Stephan, Vartan Kurtcuoglu, and Mirko Meboldt. Teaching Cross-Disciplinary Collaboration in Design Project with Engineering and Medical Students. In *International Conference on Engineering and Product Design Education, E&PDE'14,* September 2014, University of Twente, Enschede, the Netherland.
[3]   Hofstede, G. et al. *Cultures and Organizations - software of the mind. Revised and expanded 3rd Edition.* 2010 (New York: McGraw- Hill USA.).

[4] Détienne, F. et al. Cultures of collaboration in engineering design education: a contrastive case study in France and Japan. *International Journal of Design Creativity and Innovation.* 2016, 5(1-2), 104-128.

[5] Van Boeijen, A. Cultural Study in Design: in Search of a Meaningful Approach. In *International Conference on Engineering and Product Design Education (E&PDE'14)* September 2014, University of Twente, Enschede, pp 232-237.

[6] Van Boeijen, A. and Stappers, P. Preparing Western designers for the use of context mapping techniques in non-Western situations. In *International Conference on Engineering and Product Design Education (E&PDE'11)* September 2011, London, UK, pp 547-552

[7] Taoka, Yuki, Kaho Kagohashi, and Celine Mougenot. Living Labs and Co-design for Social Innovation: Mapping the European Model to Asian Societies? In *Cumulus Hong Kong 2016, Open Design for Everything. International Association of Universities and Colleges of Art, Design and Media*, June, 2016.

[8] Yasuoka, M., Nakatani, M., & Ohno, T. Towards a culturally independent participatory design method: Fusing game elements into the design process. *In Culture and Computing,* 2013, IEEE, pp. 92-97.

[9] Jung-Joo, L., & Kun-Pyo, L. Facilitating dynamics of focus group interviews in East Asia: Evidence and tools by cross-cultural study. *International Journal of Design,* 2009, 3(1), 17–28.

[10] van Rijn, H. et al. Three factors for context mapping in East Asia: Trust, control and nunchi. *CoDesign.* 2006, 2(3), 157–177.

[11] Hao, C., van Boeijen, A. G. C., Sonneveld, M. H., & Stappers, P. J. Generative Research Techniques Crossing Cultures: A Field Study in China. *International Journal of Cultural and Creative Industries*, 2017, 4(3).

[12] Lee, J. J., Koskinen, I., & Mikkonen, J. Co-experience in a Cross-Cultural Notion: Unpacking the Effect of Culture on Users' Social Interaction. *In The International Association of Societies of Design Research, IASDR'09,* October 2009, Seoul, South Korea. 2009, pp. 19–22.

[13] Reicher, S. D., Spears, R., & Postmes, T. A Social Identity Model of Deindividuation Phenomena. *European Review of Social Psychology.* 1995, 6(1), 161–198.

[14] Tanis, M. and Postmes, T. Cues to identity in online dyads: Effects of interpersonal versus intragroup perceptions on performance. *Group Dynamics: Theory, Research, and Practice.* 2008, 12(2), 96–111.

[15] Karau, S.J. and Williams, K.D. Social Loafing: A Meta-Analytic Review and Theoretical Integration. *Journal of personality and social psychology,* 1993, 65(4), 681–706.

[16] Pissarra, J. and Jesuino, J.C. Idea generation through computer-mediated communication: The effects of anonymity. *Journal of Managerial Psychology,2005,* 20(3), 275–291.

[17] UK Design Council. *A study of the design process.* Available: https://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20(2).pdf [Accessed on 2018, 25 April]

[18] Osborn, A.F. *Applied Imagination.* 1957 (Oxford, England: Scribner's.).

[19] Simonsen, J. and Robertson, T. *Routledge international Handbook of Participatory Design.*, 2012. (Routledge, England)

[20] Taoka, Y., Kagohashi, K., & Mougenot, C. A Proposal of Participatory Design Tools for East Asia Focus on Anonymity and Playfulness. In Kansei Engineering and Emotion Research, KEER2018, March 2018, Kuching Malaysia, pp. 111-121 (Linköping University Electronic Press, Sweden)

[21] Cronbach, L.J. Coefficient alpha and the internal structure of tests. *Psychometrika*, 1951, 16(3) 297–334.

[22] Tavakol, M. and Dennick, R. Making sense of Cronbach's alpha. *International Journal of Medical Education,* 2011, 2, 53–55.

[23] Vaajakallio, K. and Mattelmäki, T. Design games in co design: as a tool, a mindset and a structure. *CoDesign.* 2012, 10(1), 63–77.

[24] Brandt, E. and Eva Designing exploratory design games. Participatory design Expanding boundaries in design, PDC '06, 2006, 57-66 (ACM, New York, USA, 2006).

[25] Postmes, T., Spears, R., Sakhel, K., & De Groot, D. Social influence in computer-mediated communication: The effects of anonymity on group behaviour. *Personality and Social Psychology Bulletin*, 2001, 27(10), 1243-1254.