Northumbria Research Link

www.northumbria.ac.uk/nrl

northumbria
UNIVERSITY NEWCASTLE

INTERNATIONALISATION FROM HOME
A GLOBAL COLLABORATIVE PROJECT BASE LEARNING

Erik Bohemia
tel: + 44 191 243 7724
e-mail: erik@theglobalstudio.eu

Aysar Ghassan
School of Design
Northumbria University
Newcastle upon Tyne, United Kingdom
NE1 8ST
tel: +44 191 243 7829
e-mail: aysar.ghassan@northumbria.ac.uk

Abstract

This paper explores how cross-institutional project-based-learning facilitated by Web 2.0 ICTs supported cross-cultural and cross-institutional student peer learning experiences.

The focus of this paper relates to the most recent project named 'The Gift' conducted through 'The Global Studio'. At each institution the students formed small local project teams which were paired with teams of students from one of the other collaborating universities.

Initial findings suggest the majority of students perceived this innovative initiative as having facilitated their learning, especially in the intended areas of development of virtual teamwork and communication skills. This paper focuses on initial findings with regards peer learning in relation to ICTs and cross-cultural communication.

Introduction

This paper discusses a recent project titled 'The Gift' conducted in collaboration between 7 international higher education institutes based in the following countries: Japan, Australia, Korea, China, Taiwan, England and Canada. The project was supported by a multinational industry partner based in Korea. The project was run through the remit of the 'Global Studio'. Communication with international collaborators was made possible through the use of Web 2.0 ICT. This paper focuses on initial findings with regards peer learning in relation to ICT and cross-cultural communication.

Peer Learning

The teaching and learning between the collaborating institutions was delivered using a blended learning approach utilising a combination of online learning and face-to-face teaching delivery. The online learning was delivered via Web 2.0 technologies and the face-to-face delivery was conducted through what can be referred to as studio-based learning environment.

Davies and Reid (2000) suggest that studio-based learning, which is thought to be student-centred and collaborative, is felt by some tutors be an activity which is instructional and led by the tutor rather than the student. It has been suggested (Davies & Reid, 2000) that this approach positions tutors at the centre of

learning activities and that this can detract from students' opportunities of achieving higher levels of learning. Thus, positioning tutors at the centre of student learning activities can undermine teaching and learning processes (Schön, 1987).

One of the aims of this international collaborative project was to place participating students at the centre of learning. The organisation of this project (outlined later on in this paper) necessitated a co-dependency between collaborating students; we suggest that such an approach created conditions which helped to place students at the centre of the learning experience. We propose that one method of facilitating a student centred approach is to incorporate peer tutoring. Topping (1996) defines peer tutoring as tutoring facilitated by individuals who are not professional teachers. The concept of peer tutoring has its origins in face-to-face environments (De Wever et al., 2010). According to De Wever et al. (2010:355) in an online setting, peer tutoring has been shown to improve 'knowledge construction'. Vygotsky (1978) claims that a learner's development is limited if solving problems independently and that a learner's problem-solving abilities can be enhanced through instruction from a more capable peer. Vygotsky (1978) propose that students 'interacting with a more knowledgeable peer can learn to become as knowledgeable as the peer.' Cross-institutional learning through ICT has also been suggested to show increased levels of peer learning amongst students (OECD-CERI, 2005).

Concept of Learning

For participating English-speaking 'natives' and their peers from the Far East, communication with participants who did not share a 'mother tongue' was an important aspect of negotiating their way through the project outlined in this paper. It is interesting to note that is has been suggested that students from different cultures have different concepts of what constitutes 'learning'. For example, Dahlin and Watkins (2000) have suggested that as opposed to Chinese students, Western students perceive understanding to be more of a function of ability than of effort on the part of the individual learner. Cultural differences between East and West have been argued to have influenced the behaviour of Chinese students and native students in other parts of East Asia. Cultural differences have been suggested to be a contributing factor in explaining the tendency for some Asian students to be viewed by some Western teachers as being more passive in classroom environments than Western individuals (Cortazzi & Jin, 1996; Turner & Hiraga, 1996). Cheng (2000:445) suggests that the *'influence of cultural attributes have been exaggerated as the hidden causes of perceived reticence and passivity'*. Instead, Cheng (2000) suggests that one reason to explain why East Asian students are perceived to be less active in classroom discussion with Western students is because of their tendency to be less familiar in the language of the Western's native language.

Foreign Talk

For participating students, an important aspect of undertaking the project outlined in this paper was communicating with peers who did not share the same mother tongue.

The notion 'Foreign Talk' has been suggested by Ferguson (1975) to be employed when practised speakers of a particular language attempt communication with individuals for whom this language is not their mother

tongue. Foreign Talk can necessitate the incorporation of strategies which, in the eyes of what we term the 'native speaker', facilitate communication with a non-native speaker. The Workgroup on Foreign Workers' Language (1978) suggest that such strategies include the incorporation of 'lexical analysis' and 'grammatical simplifications'. The level to which a native speaker feels he needs to adjust his speech in order to address a non-native speaker varies but it has been suggested that in extreme examples, the use of Foreigner Talk results in the native speaker producing 'ungrammatical sentences' (Snow et al., 1981:81). Longer conversations with non-native speakers have been suggested to necessitate more use of 'Foreign Talk' by native speakers (Snow et al., 1981). As well as this, it has been suggested that foreigners who tend to make more mistakes with regard their non-native language receive more Foreign Talk in conversation with native speakers (Snow et al., 1981). The use of 'foreigner talk represents an attempt to improve communicative efficiency by mimicking the speech of the foreigner' (Snow et al., 1981:90).

The Global Studio

The Global Studio provides a response within Higher Education to shifting trends taking place in design practice with regards the emergence of globally networked organisations and the inherent shift in ways of working (Asokan & Payne, 2008; Hoppe, 2005; Horváth, Duhovnik, & Xirouchakis, 2003). The Global Studio is a cross-institutional collaboration conducted between a university based in England, industry partners and international universities. Its focus is to equip students with an appreciation of cross-cultural and distance communication.

The Global Studio follows in the tradition of the Design Studio, with its emphasis on project-based learning and learning in and through 'doing' (Schön, 1985). The emphasis on project-based learning in the Global Studio is underpinned by the assumption that this pedagogical technique contributes to embedding established design practices into the student's own repertoire (Bohemia & Harman, 2010). An area of innovation developed in the Global Studio involves linking student teams across the globe in order to undertake a product/service development project. The idea is to enable students to gain experience in working with peers in distributed international group settings. This presents 'home students with [an opportunity to develop] a portfolio of globally relevant skills and knowledge without them leaving their home country.'(Harrison & Peacock, 2010:878)

The Global Studio is delivered using a blended learning approach utilising a combination of online learning and face-to-face teaching. An important aspect is the incorporation of Web 2.0 technologies (Bohemia, Harman, & Lauche, 2009). These technologies are used 'to transcend national boundaries and the constraints of distance educational opportunities' (Harrison & Peacock, 2010, p. 878) According to Harrison and Peacock (2010) use of ICT is one of the ways the concept of 'internationalisation at home' can be executed.

In the Global Studio, all students are allocated an online project site which provides a common interface and space for staff, students and industry partners to collaborate on the given assignment. The use of such technology has led to the production of learner-authored content, thus facilitating a student-centred Learning & Teaching approach (Bohemia, Harman, & McDowell, 2009). The shared online project sites also provide students with an opportunity to learn

from and with peers from their own and participating universities and manage their own time frames in order to simulate a 'real world design studio' scenario. Examples include students discussing work, and what they consider to be 'good' aspects of design amongst their peers at the local level as well as with students located at other universities (Bohemia & Harman, 2008). It has been suggested that peer learning also enables students to take a leading role in learning and to develop autonomy and independence (Falchikov & Goldfinch, 2000).
A central premise of the Global Studio is that throughout the project collaborating students are co-dependent on one another's inputs. This introduces a sense of 'risk' to the Global Studio project. Earwaker (1992) suggests that for growth to occur amongst students, risk should be inherent to the experience of higher education. The international collaboration that is the focus of this paper was run through the Global Studio.

Introduction to 'The Gift' project

The idea for the theme employed in this 'Global Studio' project was inspired by the Anthropologist Marcel Mauss' classic book 'The Gift' (1950, 1990). This text puts forward a theory which argues that 'giving', 'receiving' and 'reciprocation' are social activities which are fundamental to human interaction. These interactions, which are part of cultural practices 'carry meaning[s] and value[s] for us, which need to be meaningfully interpreted by others, or which depend on meaning for their effective operation.' (Hall, 1997, p. 3)

Project Scenario

The following project scenario was developed to provide a context for the project: 'As a student, you will be visiting an international university as part of a student exchange programme for three months. You will be staying with a host family. What gift would be appropriate for you to bring that represents your University/School?'

Project Organisation

The project required the small teams of students from each institution to collaborate with their designated small team from another participating university in order to complete given tasks. Of specific relevance to this paper, the theme of 'gift-giving' described above was used as a vehicle to conduct this project. Altogether, this international collaborative project involved more than 230 students (allocated into 80 teams) and 15 academic staff from 7 international universities. This project proved challenging both in terms of organisational and operational issues.
IT Services based at the English university provided each collaborating set of students with a specific project site powered by WordPress. These project sites were designed to enable shared space for the distance peer learning collaboration. There were no restrictions on the access to any of these project sites for students throughout the duration of the project. In addition to the paired teams' project sites, a Master Project Site constructed through WordPress was used to disseminate information applicable to everyone involved in the project. For example, the Master Project Site included information relevant to the overall schedule, project scenario, updates on what is required during the specific project phases and so on. Although, this Master Project Site was intended only for lecturers to disseminate information, students used it to post information on in a

hope that other students would read it. For example, students who were looking for 'errant' collaborators located at another institution.

Methodology

Data from students was collected at the 'mid-point' and at the end of the project. The surveys consisted of questions most of which included Likert scaled items on perceptions about the activities students had to undertake at various stages of the project. These questionnaires covered tasks such as those relating to writing the design brief, virtual communication, designer-client interactions and cultural awareness. Students were prompted to qualify each of their answers by adding text. The questionnaire also included two open-ended questions (the mid-point and end-of-project survey forms can be downloaded at: http://theglobalstudio.eu/pdf/ProgressGS2010v3TheGift.pdf and http://theglobalstudio.eu/pdf/ExitSurveyGS2010v3TheGift.pdf)

Data indicates that students from different geographic locations have articulated different concerns associated with the cross-institutional peer learning facilitated by the ICTs. Data indicates that one of the key prominent factors is whether or not English was the 'native language' of participating students.

Result and Discussion

Most students (71%) indicated that working with students from another university was a useful experience. Students commented that they were inspired by other students or by seeing how differently they approach their work:
Learning the ways they worked in comparison to ourselves was very interesting …Proved that communication is vital and without it the project would just come to a stop. (e4m)

And even though the project proved to be challenging, students recognised the learning gained from it was beneficial:
Although I have found it very difficult and the project hasn't gone as well as initially hoped, but we learned a lot from it for the next time we collaborate with foreign students. (e5m) *Even though it has not gone that well, talking to students from other countries was the best part of this project.* (e3m)

For all students, this was the first time such distance communication technology had been used in their higher education studies. Many indicated this approach was of benefit: *It's the first time I've done a project with foreign people and it has shown me how to communicate with them better* (m32). *I have never done a project like this before, so I have learnt a lot about communicating with long distance students, using a blog for ideas and concepts.* (e8m)

Students acknowledged the challenges associated with this type of work environment: *First time doing a multi-national project so it has given me some understanding how difficult it may be in getting people to work.* (e6m).

The lack of interaction between the distributed groups and not working 'hard enough' were the key two reasons for students who felt that working with peers from other university was not a useful experience. Only one student indicated that the poor level of outcomes provided by their counterparts contributed to their negative feelings: *I think talking with people from other country it's a nice experience, but I don't think that I learn much from this project because of the less interaction in our group.* (t6m)

Across the board, student feedback from the mid-point of the project indicates that overall 55% of students felt that working with peers based at another

geographic location has improved their skills to communicate across distance. However, at the end of the project this figure had risen to 77%. Interestingly, English-speaking 'natives' indicated that between the midpoint and end-point questionnaires, this project had had a greater effect on levels of useful with regards improving their skills to communicate across distance with peers. For example, mid-progress data indicates that only 36% of Canadian students felt that working with students based at other geographic location had improved their skills to communicate across distance when compared to 78% at the end of the project. The difference in findings between the midpoint and end-point results could be attributed to differences in levels of anxiety experienced by these students. Harrison and Peacock (2010) report that initial contact between English and international students cause both to experience anxiety, but that this anxiety is reduced over time. We propose that it is important to provide sufficient time for students to practice cross-cultural communication across distance in order to overcome anxiety.

Feedback from many students (79%) indicated that using the WordPress collaboration site was useful for working across distance:

I've learnt WordPress and it's interesting because personally I would like to make a personal blog by WordPress. (e2m)

By having the collab site you were able to see everyone else's work which was a great help. It gave you a boost if you were ahead of other people and a kick if you could see that you were behind. (eL)

Complete all the process through the network is quite fresh and interesting. (k12m)

Some students reported that this website had been a hindrance to their learning experience. Many such students indicated this was due to the interface of the site:

It would have been better if the messaging was instant. (e32m)

...accessing to this site was confusing. For example we had hard time to find the way to upload our picture and some video references. We need more specific instruction about it. (k3m)

The interface of this website was too complicated and confusing. Now I kind of get how it works – at the end of the project. (k13m)

Many students independently introduced other methods of communication through Web 2.0 into their learning experience. Many of these indicated this benefited their learning experience:

Skype is great because it free and relatively clear. File sharing is very useful too. (ca10m)

Prior to this project I did not have skype, I found it to be a very useful tool to get to know about our partners. Skype allowed us to share more personal details... (ca1m)

A minority of students indicated their learning experience was hindered by the use of distance ICT:

I believe I would have done better without the online component.

We couldn't even tell who was meant to be in each group as they were all just crowded around the same webcam. It didn't feel as intimate as it could/should have. (eL)

6

Some students reported that their learning experience was hindered by a lack of communication with their collaborators through ICT:

We have not had much contact with our collaborators so my communication skills haven't been tested.(e23m)

…prior to the final presentation date, we as a group, received little information from the [collaborating] *students, as a result we were unable to give advice and feedback on how the presentation was.* (eR)

The development of the above cross-cultural distance communication skills is becoming increasingly important in a globally networked professional community of practice (Bohemia & Harman, 2008; de Vere & Gill, 2010; Del Vitto, 2008; Horváth et al., 2003; Horwitz, 2006; Nemiro, 2004). It has been argued that contemporary design higher education is still focused on developing students' traditional design skills such as sketching and model-making (Norman, 2010). It has been argued that contemporary skills such as learning in an online environment have not been formally introduced to students as much as they should (Yang, You, & Chen, 2005). We propose that students in higher education should be further exposed to such technology as they facilitate the development of contemporary 'employability skills' (Cassidy, 2006).

For many students, this collaboration presented the opportunity to work with peers who did not share a 'mother tongue.' Interesting, many students for whom English was not their first language indicated the project had aided their progress in practicing English:

We are forced to use English to communicate, but this is really help to improved English. (t24m)

I don't have any chance to write or speak English if I don't participate this project. (j3e)

I did a lot of conversations in English for the first time. (j13e)

It is interesting however that only one group whose primary language was English reported attempting to communicate in their collaborator's home language. *We did try to translate some of what we wanted to say into Korean…*

Many students for whom English was not their first language reported feeling anxiety, frustration or being embarrassed by their perceived lack of skill in this area:

…the most difficulty is to communicate in English. Due to our different mother languages, sometimes I can not express my idea completely. (cn12m)

Japanese students, including me, should study and talk English more times.(j16e)

I always worry if I answer the Australia's partner slowly, he will feel impatient, so I often terror-stricken every time online. (t11m)

Ellis (1994) suggests that experiencing anxiety can have a negative effect on learning a second language. Many English-speaking 'natives' reported that they had learned how to communicate effectively with peers for whom English was not their first language.

In the vast majority of cases, feedback has indicated that for the English-speaking 'natives', instead of attempting to learn their collaborators' language, other strategies were employed. These included *adjusting diction accordingly, re-phrase questions* and *hav*[ing] *to talk a little slower and a little louder using*

more simple English so that we were able to get our point across (eL). Such strategies could be regarded as examples of 'Foreign Talk' (Ferguson, 1975). Many English-speaking students indicated that collaborating with internationally-based peers taught them *to be patient* and *taught* [them] *how the smallest details can alter perception*[s] (e1e). To facilitate their communication exchange, many English-speaking native students reported utilising supplementing their use of verbal or written language with other methods. For example, [we] *learnt to communicate using more pictures and less words*. (e5e) Some students found that communicating with students who did not share a high level in a common spoken or written language a hindrance to their learning experience:

We couldn't communicate so smoothly. Because we use different languages. So if we have support for this, we could collaborate with others. (j19e)
We only had contact throughout the whole project with the same person as the others said their English was not that good. It would have been nice to have opinions and even for them to show us the work that they each did. (eL)

Because the languages are different, the meaning's translation is difficult and often make people hard to understand, can't transmit clearly. (t27m)

The world of design practice is increasingly a global one. It has been suggested that contemporary industrial design students should be able to communicate in languages which are foreign to their own (Yeh, 2001). It is interesting to note that for many Far Eastern students, this collaborative project presented an opportunity to attempt to improve their English skills. On the other hand, the vast majority of English-speaking 'natives' indicated that using 'Foreign Talk' was a preferred option. For many English-speaking natives the use of visual storytelling appeared to be another strategy employed in bridging the communication barrier.

We propose that cross-institutional peer learning provided students with insights in regard to issues associated working across cultures and distance. The vast majority (88%) of all participating students reported that the learning experience was better or the same as in other modules. Overall, comments suggest that students appreciated working cooperatively with peers from other universities. For some, this element provided them with a sense of competition where they benchmarked their skills against other students, for others this provided them with insights on how their international peers can approach the given tasks differently. Although, many student groups were critical of their peers' lack of interactions they appreciated the authentic learning experience which was facilitated through incorporating cross-institutional peer learning activities.

Conclusion

This project was challenging both in terms of organisational and operational issues. However, it provided participating students with a valuable opportunity to experience cross institutional peer learning environment. This peer learning would not have taken place without the incorporation of Web2.0 technologies. We suggest this cross-institution peer learning afforded students with an authentic opportunity to develop contemporary 'employability skills' (Cassidy, 2006). Across the board, the vast majority of students indicated that despite operational and technical issues they benefited from working with peers from internationally-based higher academic institutions.

We propose that such collaboration requires students to be comfortable with Web2.0 technologies. As well as this, we propose that such collaboration requires students to be experienced with working with peers whose mother tongue is different to their own. Therefore we propose that students should be exposed to these types of activities more regularly in order to build these highly relevant skills into their repertoires. We recommend that further studies should be undertaken into the mechanisms which can facilitate cross-institutional peer learning enabled though ICTs in an age of global collaboration and communication amongst professional designers.

References
Asokan, A., & Payne, M. J. (2008). Local Cultures and Global Corporations. *Design Management Journal, 3*(2).

Bohemia, E., & Harman, K. (2008). Globalization and Product Design Education: The Global Studio. *Design Management Journal, 3*(2), 53-68.

Bohemia, E., & Harman, K. (2010). *Dissemination of innovative teaching and learning practice: Global Studio*. Bristol, UK: ADM-HEA.

Bohemia, E., Harman, K., & Lauche, K. (2009). *The Global Studio: Linking Research, Teaching and Learning*. Amsterdam, The Netherlands: IOS Press.

Bohemia, E., Harman, K., & McDowell, L. (2009). Intersections: The utility of an 'Assessment for Learning' discourse for Design educators. *Art, Design and Communication in Higher Education, 8*(3), 123-134.

Cassidy, S. (2006). Developing employability skills: peer assessment in higher education. *Education + Training, 48*(7), 508-517.

Cheng, X. (2000). Asian students' reticence revisited. *System, 28*(3), 435-446.

Cortazzi, M., & Jin, L. (1996). Cultures of learning: language classrooms in China. In H. Coleman (Ed.), *Society and the Language Classroom* (pp. 169–206). Cambridge: Cambridge University Press.

Dahlin, B., & Watkins, D. (2000). The role of repetition in the processes of memorising and understanding: A comparison of the views of German and Chinese secondary school students in Hong Kong. *British Journal of Educational Psychology, 70*(1), 65–84.

Davies, A., & Reid, A. (2000). Uncovering problematics in design education - learning and the design entity. In C. Swann & E. Young (Eds.), *International Conference on Design Education: Re-inventing Design Education in the University* (pp. 178-184). Curtin University of Technology, Perth, WA, Australia: Curtin Print & Design.

de Vere, I., & Gill, C. (2010). *Global Design: innovative curricula towards global collaboration*. Paper presented at the ConnectED 2010 International Conference on Design Education, Sydney, 28 June - 1 July.

De Wever, B., van Keer, H., Schellens, T., & Valcke, M. (2010). Structuring asynchronous discussion groups: Comparing scripting by assigning roles with regulation by cross-age peer tutors *Learning and Instruction, 20*(5), 349-360.

Del Vitto, C. (2008). Cross-Cultural "Soft Skills" and the Global Engineer: Corporate Best Practices and Trainer Methodologies. *The Online Journal for Global Engineering Education, 3*(1), 8.

Earwaker, J. (1992). *Helping and Supporting Students: Rethinking the Issues*. Bristol, PA: Open University Press.

Ellis 1994 cited in Cheng, X. (2000). Asian students' reticence revisited. *System, 28*(3), 435-446.

Falchikov & Goldfinch, 2000 cited in Cassidy, S. (2006). Developing employability skills: peer assessment in higher education. *Education + Training, 48*(7), 508-517.

Ferguson, C. A. (1975). Anthropological Linguistics. *Anthropological Linguistics, 17*(1), 1-14

Hall, S. (Ed.). (1997). *Representation: Cultural Representations and Sygnifing Practices*. London: Sage.

Harrison, N., & Peacock, N. (2010). Cultural distance, mindfulness and passive xenophobia: using Itegrated Threat Theory to explore home higher education student's perspectives on 'internatilasion at home'. *British Journal of Educational Technology, 36*(6), 877-902.

Hoppe, R. (2005). The Global Toothbrush: International Division of Labor. *Spiegel: Special International Edition, The New World,* 130-135.

Horváth, I., Duhovnik, J., & Xirouchakis, P. (2003). Learning the methods and the skills of global product realization in an academic virtual enterprise. *European Journal of Engineering Education, 28*(1), 83-102.

Horwitz, F. M. (2006). The promise of virtual teams: identifying key factors in effectiveness and failure. *Journal of European Industrial Training, 30*(6), 472-494.

Mauss, M. (1950, 1990). *The Gift* (W. D. Halls, Trans.). Suffolk, UK: Rautlege.

Nemiro, J. E. (2004). *Creativity in virtual teams : key components for success*. San Francisco, CA: Pfeiffer.

Norman, D. (2010). *Why Design Education Must Change*. Available: http://www.core77.com/blog/columns/why_design_education_must_change_17993.asp [2011, 20 Jan].

OECD-CERI, 2005 cited in Laurillard, D. (2007). Modelling benefits-oriented costs for technology enhanced learning *Higher Education, 54*(1), 21–39.Schön, D. (1985). *The Design Studio: An Exploration of its Traditions and Potentials*. London: RIBA Publications.

Schön, D. A. (1987). *Educating the Reflective Practitioner: Towards a New Design for Teacvhing and Learning in the Professions*. San Fracisco, CA: Jossey-Bass.

Snow, C. E., van Eeden, R., & Muysken, P. (1981). Employees and Foreign Workers. *International Journal of the Sociology of Language, 28*, 81–92.

Topping 1996, cited in De Wever, B., van Keer, H., Schellens, T., & Valcke, M. (2010). Structuring asynchronous discussion groups: Comparing scripting by assigning roles with regulation by cross-age peer tutors *Learning and Instruction, 20*(5), 349-360.

Turner, J. M., & Hiraga, M. K. (1996). Elaborating elaboration in academic tutorials: changing cultural assumptions. In H. Coleman & L. Cameron (Eds.), *Change and Language* (pp. 131-140). Bristol: British Assocaition for Applied Linguistics and Multilingual Matters Ltd.

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Workgroup on Foreign Workers' Language 1978 cited in Snow, C. E., van Eeden, R., & Muysken, P. (1981). Employees and Foreign Workers. *International Journal of the Sociology of Language, 28*, 81–92.

Yang, M.-Y., You, M., & Chen, F.-C. (2005). Competencies and qualifications for industrial design jobs: implications for design practice, education, and student career guidance. *Design Studies, 26*(2), 155-189.

Yeh 2001 cited in Yang, M.-Y., You, M., & Chen, F.-C. (2005). Competencies and qualifications for industrial design jobs: implications for design practice, education, and student career guidance. *Design Studies, 26*(2), 155-189.