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Integrating Conceptual Design and Technology Learning in Visual Communication Education

Keywords: Design Learning, Conceptual Skills, Technical Skills, Integrated Learning, Visual Communication Education

Introduction

This paper reports on a scoping study that provides evidence that a more balanced approach for visual communication students' learning is necessary so they can become design professionals who are ready for practice because they are a) strong design thinkers, but also b) confident and efficient users of technology to bring their creative ideas to life. The research reported here suggests that those two roles are not, but should be, well integrated in practice-oriented education of graphic designers. The paper proposes that an integration of conceptual and technology skills in visual communication programs is an important step in improving education of future designers, and provides some preliminary findings how it can be achieved.

AGDA's (Australian Graphic Design Association, 2012) building blocks of the graphic design profession include *"substantial creativity, innovation and technical expertise".* At universities, the importance of the former is not questioned. When it comes to technical expertise, however, some academics seem to believe that focusing too much on learning and teaching of technology tools will turn university courses into trade education, instead of higher level education in design thinking. Some university teachers in my study believed that *"we don't teach programs, it's not our job",* or *"technology is not important at uni, anyone can learn that".* Stefan Sagmeister, an internationally renowned and influential New York graphic designer, noticed this as well (Smashing Magazine, 2012, online): *"Interestingly, in most graduate schools, being technically good at something is almost a bad word if you're talking about contemporary craft. Somebody who is very good in Photoshop, is almost universally despised at a grad school."*

Sagmeister goes on to say: *"It's silly. I'm not saying that I'm a friend of people who can do just that and can't think, but I think a combination of skills matters* (Smashing Magazine, 2012)*".* Similarly, I argue that while creativity and conceptual skills matter

tremendously and are essential to good designs, designers will not be able to produce their artifacts and realise their even most creative ideas without proficient daily use of hardware and software. This is why AGDA, as mentioned above, lists 'technology expertise' as one of the profession's building blocks, alongside creativity and innovation.

There is a clear need to look closely at future graphic designers' preparation to find out whether they currently learn to simultaneously draw on, and apply in their projects, all, not just one, of those building blocks; this is the focus of my study reported in this paper. It is based on findings from surveys, interviews, and focus groups involving university students, teachers, recent graduates, and experienced graphic design practitioners. Even though this study focuses on the graphic design practice specifically, the results may be useful to other design educators as well, especially those interested in the issues surrounding the learning of conceptual and technical skills.

The study will be first positioned within the relevant literature; the methodology is explained next. The findings are structured as follows. It was first important to discuss both the importance of technical proficiency, and the importance of conceptual thinking skills in the graphic design profession. The paper then presents findings that demonstrate that it is the balance between both kinds of skills that is essential. Considering this, it was then worthwhile to explore whether current university graduates do feel confident about both kinds of skills that the previous sections deemed as essential in the profession; it will be shown that university graduates feel more confident about their conceptual thinking skills than their technical skills. This called for a need to look closely at the current ways of conceptual and technical learning at Australian universities. The study points to the importance of a new model of such learning, and it provides one specific tactic that could be used in such a model to help students learn and integrate their conceptual and technical skills.

Literature Review

While much has been written about design education in general (e.g. Waks, 2001; Davies & Reid, 2000; Trigwell, 2003; Frascara, 2007; Strickfaden & Heylighen, 2010), or studio-based learning (Lackey, 1999; Kvan, 2001), a literature review has revealed that the issue of conceptual and technology learning in design has not been researched yet, to the best of our knowledge, with two exceptions.

One group of researchers from University of Canberra has also called for an integration of design and technology learning. In their case study, Porritt and Miller (2004) focused on the inclusion of both design principles and technology skills in one course. The focus was more on making sure that students develop their concepts first in one project, and then execute them on a computer; it was stressed that the computer can only be used at the very last stages of the project. The skills were, therefore, still taught separately, which, as our evidence presented later in this paper reveals, is not an ideal solution. It was still interesting though to see other researchers raising similar issues and confirming the need for further research in this area. Apart from the case study (also presented in an ACUAD conference), I could not find any more work on the issue from those authors after 2004.

The influence of technology on the graphic design profession was also discussed by Nielsen and Trias (2010). The authors considered both extraordinary opportunities and fundamental problems of technological developments in design. They see technology as the best medium to accomplish design's goal of communication but also argue that the focus on, and improvement in, technical skills but not design skills bring the overall loss of quality in design. To address this issue, the authors proposed a 4-step model for graphic design work and education that can be used in both generating and evaluating design: reason (thought, logic, analysis), function (legibility, usability), emotion and senses (colour, perception), and technology as a tool. The authors did not include any empirical findings to support their model. The similarity to the work reported in this paper lies in a call for a new model of graphic design education, and the importance of simultaneous use of the 4 dimensions of the model. While my study's model focuses on 2 dimensions (conceptual thinking skills that would include Nielsen and Trias's first 3 concepts, and technical skills), in future studies it may be important to divide the former one into 3 separate dimensions as Nielsen and Trias (2010) did. Currently, it was more important to look at this higher level division between design and technical skills, as this was what was found to be most problematic.

Methodology

As I aimed to understand the current use of conceptual and technical skills both in design practice and in design education, the following respondents and data collection methods were chosen to help fulfill this aim.

152 university students (including 42 final year students)	online survey
9 final year students	focus groups
11 university teachers	interviews
6 design professionals	interviews

As I was looking for relevant groups' views and attitudes, qualitative methods were chosen; open-ended surveys, interviews, and focus groups are used to uncover participants' perspectives (Gray & Malins, 2004).

To gauge opinions of large number of students, an online survey was used first, with several open-ended questions (e.g. How ready do you feel for entering practice soon?). I then wanted to explore some issues in-depth, and, therefore, conducted 3 focus groups to hear more from students about the same issues but asking for more explanations and examples from their studies. Focus groups were used rather than interviews so that students could bounce ideas off each other, remembering more relevant experiences from their studies.

I also conducted interviews with university design teachers. Their interviews focused on the teachers' opinions on the skills taught at university and the way they are taught, but also, as many of them have had industry experience, on the use of those skills in their design work.

Finally, I interviewed design practitioners. I asked them about their design practice, with the focus on conceptual and technical skills use. They were also asked to reflect on their education and how they learnt those skills both in formal education, and in their professional development. Two of those designers are responsible for hiring graduates so we also talked about graduates' skills, how ready they seem for practice from an employers' perspective, and the like.

All the interviews were then transcribed, and the transcripts (as well as the online survey answers) fed into the NVivo software, and coded into common themes. The data analysis was based on guidelines provided in Grounded Theory methodology by Glaser and Strauss (1967) and further elaborated by Glaser (2005, 1998). These data analysis techniques were used because they are particularly well described in this methodology, with rich details on practical guidelines and their implications; I also

used these analysis methods in my previous PhD study and found them very suitable to find common themes in people's attitudes and views. The analysis was based on such concepts (Glaser & Strauss, 1967; Glaser, 2005, 1998) as theoretical saturation, substantive coding (including open and selective coding as well as the use of memos) and theoretical coding to ensure validity and rigour of this research.

Study Results

As mentioned in the Introduction, the aim of this project was to examine whether the central aspects of the design profession, conceptual thinking skills and technology proficiency, are currently well integrated in design education. The first question though that needed evidence was whether they should indeed be integrated in design education at all.

1) The Importance of Technical Proficiency

While creativity and innovation are not questioned as central aspects of design education, technology skills are often not considered as worthy of enough attention. The following evidence from an experienced professional illustrates the importance of technology skills in design. Stefan Sagmeister, the designer mentioned in the Introduction, addressed it directly in the Questions and Answers section of his website (Sagmeister & Walsh, 2015, online):

> *"[Question:] As designer's profession changes, you say its necessary to better technical skills. You have said your design would not be possible without the computer and that it has affected it in many aspects. Do you think better knowledge of software has become something essential in graphic design today?*
> *[Answer] Stefan: Yes. I think throughout design history, a deep understanding of the craft (as well as of all of its production techniques) was necessary for anybody who wanted to do good work. [...] As the current craft is a digital one, a deep knowledge will be necessary."*

The necessity of deep knowledge and confidence in technology use has been confirmed in my surveys and interviews, too. As put by some design professionals participating in the study: *"technology is becoming increasingly important in the design industry"*, or *"technology skills are undeniably needed/required to survive and work in the design field"*. Yet another quote from a professional sums it up well: *"I think a strong understanding of the technology is vital"*. The very nature of design

industry points to the importance of technical skills, as a final year student pointed out: *"As a technologically driven industry, learning how to use and adapt to changing technologies is extremely important in the Visual Communications learning process."*

A central theme in the design professionals' answers was that technology skills are important to learn simply because they will be, undoubtedly, used every day by designers in practice :

- *"most [design] jobs require advanced computer skills"*
- *"we use technology for most design work"*
- *"I think [tech skills] are vital - most designers at some point will need to use software programs"*
- *"[...] to really work in the here and now you have to know the software that is used currently, and you do have to use it in conjunction with your design skills"*

Many student respondents also focused on the fact that creative ideas need technology to be brought to life:

- *"[designers'] ideas cannot eventuate if they are not supported by good technical skills"*
- *"You can have a great idea but if it's not executed to its potential, it could be a failure"*
- *"Technology is very important. I often find that I have an excellent idea, but am not always sure how to translate it to the physical form"*
- *"I think technology is really more important than I once thought in design work.*
  You need good tech skills to realise ideas [...] "
- *"It [technology] is essential. You can't execute your concepts without that skills professionalism"*
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The lack of technical skills may mean not ever realising some ideas at all, such as in this example discussed by a design professional: *"Even now sometimes technically if I have a concept, sometimes I don't know how to actually show it. Like how to put it together. [....] Yeah, there's like four of us that kind of sit in a pod [in a design agency] and if none of us know how to do it then it's just too hard. We just don't do it."*

A number of respondents alluded to the increased digitization of our society, seeing it as a factor in the increased importance of technology in design:

- *"Especially with the way the world is going tech, it is becoming ever more important"*
- *"As technology continues to advance and make its way into the majority of careers and fields, it is important for designers to understand how to work with the programs and adapt"*
- *"Design moves more towards using technical applications on computers"*
- *"Technical competence is a requirement for professional practice in design/vis comm, and is also integral to the realisation of creative concepts"*

2. The Importance of Conceptual Thinking Skills

The importance of conceptual skills and design thinking seems to be appreciated by design professionals, university educators, and students alike. Respondents from all those groups agreed that strong conceptual skills are necessary to be a good designer:

- *"Designers need strong conceptual and design thinking skills"*
- *"I think conceptual skills and creative thinking is essential"*
- *"Having great ideas is the most important"*
- *"The idea is paramount"*
- *"Really good designers... it's about smart design, something that has an idea – so it became more about the idea"*
- *"A good designer needs to have good design ideas first!!!"*
- *"In a studio, you know, I think you want the person to come in who's got the breadth of thinking"*

A quote from a professional who hires graduates sums it up well: *"it's coming up with your own ideas and reasons for doing something, that's important to me."*
Furthermore, students realized that conceptual skills are hard to develop on their own: *"I think conceptual skills are the most important areas to develop at university as it is difficult to maintain a development of this type on your own."*

3. The Importance of Balance of Both Kinds of Skills

The evidence presented above points to the importance of both conceptual and technical skills. Another finding in this study was how important the right balance of

the two is. As put by one final year student respondent, *"what is needed is a balance between ideas, concepts and tech abilities - one needs the other"* – or, in other words, *"technical skills back up these conceptual areas", "the two must go hand in hand together. Without one your designing would not be as strong."*

A similar view by another (design professional) respondent supports that: *"Technology does have a big role in design work, but to me I feel you need to be well versed in design thinking skills so that you can pair them up together and design effectively."* Furthermore*, "you do have to use [your knowledge of software] in conjunction with your design skills".*

It seems that rather than focusing on which is the more important of the two, both in education and in practice, it is more useful to acknowledge the importance of conceptual and technical skills (to use the keywords from the data) as needing to be in *"balance", "backing each other up",* used *"in conjunction", "going hand in hand together",* or *"paired up together".*

As summed up by a design professional: *"There are so many different factors being a designer. It's about the tools, it's about thinking [...]".*

Both kinds of skills need to be constantly drawn upon. On one hand, focusing too much on technical skills will not lead to innovative and creative outcomes. As put by our professional respondents, *"even if [designers] are technically good with the programs, without good ideas they won't be able to create good design"* or *"Technology is great as a grad, but if that's all you can do you'll never get promoted".* Clearly, *"owning and using a computer program is not enough to be a designer"* or *"just because you have proficient technology skills does not make you a good designer".*

On the other hand though, focusing on conceptual skills solely will mean missing out on realizing those innovative ideas into tangible designs. Student respondents believed that technology skills are needed *"to execute our conceptual ideas into the finished product*", *"to realise ideas [with] good tech skills",* to *"translate [ideas] to the physical form",* or to *"express what we want to express".*

Both kinds of skills then need to work in combination, seamlessly integrated, one or the other possibly more important in some stages of the design process, but both still essential overall*, "going hand in hand together".*

Proficiency in both is what makes a good designer. On one hand, according to our design professional respondents, *"it is creativity that sets designers apart",* but on the other hand, *"skills in using technologies can make or break a designer who needs to remain on the cutting edge".*

4. The Graduates' Conceptual and Technical Skills Confidence

The previous sections revealed that in the graphic design profession, both conceptual and technical skills matter in combination and balance. Our next objective was to find out whether this is reflected in university design education in Australia.

Evidence from the study suggests that employers are often disappointed with technology skills of university visual communication graduates. A professional responsible for hiring graduates explained that graduates' work portfolios from a specific private college were *"more sleek, and crafty, with this beautiful aesthetics"* than those of university graduates. On the other hand, she found university graduates' portfolios to be much more advanced conceptually. The interviewee wished for portfolios that would combine both of those strengths. Another professional explained: *"I think in my head I've got this opinion that like if someone's graduate from [a specific college] and I guess there's other private colleges that we don't know of – I just presume that technically they'll be much better than someone graduating from uni"*. That designer found university graduates again to be very strong conceptually.

A design professional still remembered when she started work after leaving university*: "I was so scared of Photoshop when I left uni. [...] And then I suddenly went into advertising and yeah, it was basically just learning from the people around me how on earth to use it."*

Forty-five percent of final year university student participants in our study felt not ready to enter practice in terms of their technology skills, though many felt ready conceptually:

- *"I'm definitely not at a technical level needed for the workplace"*

- *"The conceptual skills are matured nicely; however we are in the deep end on the technology side of things"*
- *"In terms of concept and design thinking I believe I'm prepared but not technical skills, not confident enough to take my skills into the professional field"*
- *"I feel concerned that I am still learning fairly basic skills in the print process and Photoshop, for example, in fourth year"*
- *"Expectations for technical skills fell short and while emphasis on development is emphasized, technical education should be there to support students to further realise their ideas."*

There were no student participants that would report that they do not learn enough conceptual skills at university.

A professional who graduated from a private college confirmed what seems to be the opposite of the university situation there: *"So it was all computer based. There was no theory. And basically you would have an exercise to do. And we learnt things like Photoshop and Dreamweaver."*

5. Current Model of Conceptual and Technical Learning at Australian Universities
As reported above, both conceptual and technical skills are necessary in the design profession, but in terms of the latter, university education does not seem to equip students with enough confidence. Our next step was having a closer look at university programs to see whether technical skills were indeed not included in those courses. This review was based only on publicly available course and subject descriptions provided on university websites at the time of writing.

I found out that technology skills are part of most courses, but what seems to be missing is a lack of agreement on the best practice in this aspect of design education.

In the UTS Bachelor of Visual Communication course, for example, bits and pieces of technology learning are attached to different subjects in different ways, with no coherent strategy that would integrate conceptual design with technical skills. Though software and hardware tools are rarely explicitly taught in subjects, they are required to be used in many assignment tasks, though it is often assumed that students will learn how to use those tools on their own or somewhere else.

The University of Western Sydney offers a course (Bachelor of Design, Visual Communication) similar to the UTS Visual Communication, and the review of subjects offered indicates that both technology and conceptual thinking are taught; however, they are treated as two separate entities that are learnt and taught in separate subjects. For example, in the second semester of their study, students learn about Design Thinking with the focus on processes of design, and, separately, in a different subject, about Digital Design Production where computer software skills, functions and features of design software programs (Adobe InDesign, Photoshop and Illustrator) are the focus.

UNSW's Bachelor of Design offered by COFA includes 'Graphics Media' as its major. The description of this general design course includes some keywords that again would indicate the integration of *“conceptual and technical skills that underpin design”,* e.g. *"The program provides students with experiences in using established and emerging technologies in a collaborative atmosphere, where integration is perceived as the driver for responsible and innovative design"* or *"[...] connecting the various specialisations of design, communication and technology".* The review of subjects offered indicates that both areas are indeed covered, but still separately, with a number of conceptual subjects on design thinking and theories, and separate technical subjects called 'Design and Computer 1, 2, 3, and 4". Despite the name that implies an integrated approach (design *and* computer), the focus seems to be on *"investigation of computers and applications for graphics",* tool sets, software packages and software applications.

The University of Sydney offers their only visual communication design course called Bachelor of Design Computing. While the course description alludes to the fact that digital design has infused all aspects of design, not just the design of websites, special effects or animation, the course structure and subjects offered clearly indicate that its focus is on interactive media, with technology tools taking centre stage (advanced software, programming, or hardware), with very few subjects such as Design and Cognition.

6. Discussion - Towards an Integrated Conceptual and Technical Learning Model

The previous sections provided evidence that creative design thinking and technical skills are both important in design practice. It was also shown that currently at universities there is more focus on the conceptual side, with students not feeling confident about their technology skills. It was further argued that universities do offer

some technology subjects but this approach seems not to be working in terms of students' confidence.

Based on what I heard from our student respondents, I suggest that it is the separation of the conceptual and technology skills that may be affecting students' readiness.

> *"I think [conceptual and technology skills] are very much separated, as seen in our tech electives. I've always seen our subjects as theory based OR practical based rather than a balanced mixture of both in every subject."*

By learning some technology skills separately, and conceptual skills in different subjects, students may not learn to use both to their full potential, and not know how to integrate them seamlessly and proficiently in their practice. It may not be hard to learn and master the new tools, but learning how to apply and integrate new methods in the relevant design context can be challenging (Staples, 2001). Design professionals draw on both kinds of skills constantly and simultaneously - one backs up the other, as discussed in the *"Importance of Balance"* section. It seems important to apply this to design education as well - learning conceptual thinking and new tools separately is different to workplace contexts, and may make it hard for students to efficiently integrate those skills in practice. This supports both models discussed in the Literature Review: Nielsen and Trias's (2010) proposal of a model that includes reason and technology as dimensions that need to be simultaneously drawn upon in design generation and evaluation, and Porritt and Miller's (2004) argument that in graphic design design and technology must be used together.

Porritt and Miller (2004) found that design students often treat design and technology as separate entities. This study suggests that it may be because this is how teachers view those, which, consequently, influences course and subject designs.

Secondly, it seems that students are expected to learn technology skills on their own, but this approach does not seem to be well received by students themselves:

- *"We are given a lot of direction conceptually. Technology we are generally expected to learn in our own time."*

- *"I feel like a program is rushed over, and the skills are forgotten once the subject in finished."*
- *"Technology is treated as a tool and I often hear from lecturers that we should do this and that with our skills in computers but then, who is teaching us those skills?"*

Interestingly, two teachers I interviewed believed that students nowadays already know how to use most programs when they come to university. They also thought that anyone can learn programs easily on their own. However, as revealed earlier in this section, students themselves seem to have different expectations regarding this, and they do not feel confident in using those tools as the two teachers thought they were. Many beginning students' experiences were similar to the following: *"I have basic knowledge in Photoshop. I am confident in using this program to do basic things. I have never used Illustrator or InDesign."* It could be, therefore, that students' readiness for practice may be negatively affected when teachers not only purposely separate conceptual and technology learning, but also focus much more on the former than the latter due to a misguided assumption that students already know all the programs, or can learn them easily on their own as university education should focus on the conceptual side only.

Conclusion And Future Research

As evidence provided in this paper indicates, a more balanced model of graphic design education would include more guidance given to students on not just conceptual but also technical skills, and facilitating learning of those simultaneously, applied together in the same projects. The main aim of this paper was to provide evidence for this new approach; my future studies will aim to develop and trial specific strategies and tactics that may help implement such an integrated model of conceptual and technological learning and teaching. As an example, one specific tactic that we have trialed as part of a Learning and Teaching grant is presented here. It is important to keep in mind that a more comprehensive model is our future aim, and this is just one of many tactics that would be a part of it.

The detailed findings of the trial are too extensive to include in this report; however, they have been structured around various parts of Goodyear's (2005) learning design model, and included specific tactics that can be used to improve students' design and technology learning. Goodyear's (2005) model includes pedagogical strategies and tactics, and educational setting (tasks, resources, and groupings).

In this summary, a brief discussion of one tactic is included – *"providing real examples from practice achieved using a specific tool/skill".* Some other tactics trialed included free experimentation, being taught by older students, *"showing little tricks"* (quoting participants), or visual step-by-step demonstrations.

The tactic involved teachers in computer classes showing motivating examples from their own work or prior university assignments to show how the new tool was actually used in real practice to achieve successful outcomes. The teachers were specifically asked to show many interesting design outcomes and explain to students how and why they used the specific tool to achieve their creative vision.

The focus, therefore, was not on the taught tool itself and how the end result was created using this tool, but it included the conceptual ideas that the designer had developed and was trying to achieve in their outcome.

By large students found this approach very useful:

- *"It's always useful to look at applications and examples of certain technical skills as it puts it our learning into perspective"*
- *"It showed how it relates to practical applications in real life rather than just something you would do for an assignment"*
- *"It helped us realize the relevance of them and encouraged us to learn"*
- *"It provided an inspiration"*

Many students said it helped them see how the skill can be used in the future, for example:

- *"It allowed me to see what the end result should be and allowed me to understand when to use the tool, rather than just how to use them"*
- *"I found it very useful as it showed me the purpose of the tool and in what situations i would be able to use them. It also showed me the result of using the tool"*
- *"It's always nice to see how learning these skills can actually be applied in later work. Understanding the methods to employ and subsequently what to use them in is definitely beneficial for later years"*
- *"We got to see what kind of skills helped with what type of designs"*

There were no students in the whole cohort who would offer any negative comments on this tactic.

It seems in line with the goal of this project that focused on promoting integrated technology and conceptual learning, rather than learning tools by themselves, with no link to creative design thinking. Such examples can help link technology skills that students are learning to real life designs, when they can actually use them, or what vision and ideas they can help them express.

However, it seems that not many tutors used such examples, even though they were specifically asked by the unit coordinator before each class to include them. As students explained:

- *"But it wasn't like deep into what it could be, the potential of it. It was more like, you can do it for this exercise and then that's about it."*
- *"But they did not show the examples so much."*
- *"I think the tutors need to show more examples of the result of using the tool and the work produced from the tool".*

The tutors interviewed after the term said they didn't realise the importance of this tactic. It seems useful, therefore, to provide more explanations to teachers the rationale behind such a tactic, possibly presenting them with some of the above student quotes.

This paper provided empirical evidence that both conceptual and technical skills are important in design practice, and are used simultaneously, backing each other up. I also argued that currently at universities there is more focus on development of conceptual skills, with students not feeling confident about their technology skills. A review of Australian courses revealed that universities do offer various technology subjects but this approach seems not to be working in terms of students' confidence. I found that it is because teachers not only purposely separate conceptual and technology learning, but also focus much more on the former than the latter due to a misguided assumption that students already know all the programs, or can learn them easily on their own as university education should focus on the conceptual side only. The paper concluded that a better, more balanced approach, would include more guidance given to students on not just conceptual but also technical skills, and facilitating learning of those simultaneously, applied together in the same projects, so

they can back each other up to help produce the best quality designs. One tactic that can be part of such an approach was discussed; further studies, focused on identifying and trialing best practice, will aim to develop more guidelines that will help develop such a balanced model of graphic design education.

References

AGDA - Australian Graphic Design Association 2012, ‘What is Graphic Design’, viewed 10. March 2012, <http://www.AGDA.com.au/about/what-is-graphic-design>.

DAVIES, A. & REID, A. 2000, 'Uncovering Problematics in Design Education: Learning and the Design Entity’, viewed 4. April 2011, <http://www.arts.ac.uk/cltad/resea/adpapers.html>.

FRASCARA, J. 2007, ‘Hiding Lack of Knowledge: Bad Words in Design Education’, Design Issues, Vol.23, No.4, pp. 62-68

GLASER, B. G. 2005, ‘The Grounded Theory Perspective III: Theoretical Coding’, Sociological Press, Mill Vallet / CA

GLASER B. G. 1998, ‘Doing Grounded Theory: Issues and Discussions’, Sociological Press, Mill Vallet / CA

GLASER, B. G. & STRAUSS, A. 1967, ‘The Discovery of Grounded Theory: Strategies for Qualitative Research’, Aldine Press, Chicago / IL

GOODYEAR, P. 2005, ‘Educational design and networked learning: Patterns, pattern languages and design practice’, Australasian Journal of Educational Technology, Vol.21, No.1, pp. 82-101

GRAY, C. & Malins, J., 2004, ‘Visualizing Research: a guide to the research process in art and design’, p. 118

KVAN, T. 2001, 'The Problem in Studio Teaching - Revisiting the Pedagogy of Studio Teaching', 1st ACAE Conference on Architectural Education, Milton, T. Centre for Advanced Studies in Architecture, National University of Singapore, Singapore, pp. 95-105

LACKEY, J. A. 1999, ‘A History of the Studio-based Learning Model’, viewed 4. April 2011,<http://schoolstudio.engr.wisc.edu/studiobasedlearning.html>

NIELSEN, J. & TRIAS, J. M. 2010, ‘From the times of the first scribes: Innovation and technology within graphic design’, in Digital Creativity, Vol.11, No.2, pp. 89-98

PORRITT, D. & MILLER, B. 2004, ‘Integrated Learning: Design Theory versus Technology in Graphic Design’, Australian Council of University Art & Design Schools (ACUADS) Conference, 23-25. Sept 2004, Canberra

SAGMEISTER & WALSH, 2015, ‘Answers’; viewed 1. May 2015, <http://www.sagmeisterwalsh.com/answers/>

SMASHING MAGAZINE, 2012, ‘Stefan Sagmeister : Trying to Look Good Limits My Life’, viewed 1. May 2015,<http://www.smashingmagazine.com/2012/10/stefan-sagmeister-trying-to-look-good-limits-my-life-interview>.

STAPLES, L. 2001, ‘The New Design Basics’, in HELLER, S. (Ed.) 2001, The Education of an E-Designer, Allworth Press, New York, pp. 6-9

STRICKFADEN, M. & HEYLIGHEN, A. 2010, ‘Cultural Capital: A Thesaurus for Teaching Design’, Art, Design and Communication in Higher Education, Vol.29, No.2, pp. 121–133

TRIGWELL, K. 2003, ‘Approaches to Teaching Design Subjects: A Quantitative Analysis’,
Art, Design and Communication in Higher Education, Vol.1, No.2, pp. 69–80

WAKS, L. J. 2001, ‘Donald Schön's philosophy of design and design education’, International Journal Of Technology And Design Education, Vol.11, No.1, pp. 37-51