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A REFLECTION MODEL FOR SENSING AND DEVELOPMENT OF EXPERIENCE

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ABSTRACT
Many students are unaware of the importance of addressing the somatic sensation in the design process. This is a problem, as the aesthetic effects of products are optimally detected by both mind comprehension and somatic comprehension. However, there has been growing interest in the somatic approach, because as Jon Hewitt states, it is the designers' aim to engage as many senses as possible in order to be aware of a product's character and aesthetics. With the aim of drawing the students' attention to the role of somatic comprehension in the form-generating processes, we have tried out our "reflection model for sensing and development of experience". After each project the model can also be used to encourage the students to be aware of which internal and external realizations the project raised as part of their learning process. Testing of the model yielded a surprising lateral result as it revealed which project groups had worked well and the reasons why other groups had been oppress by lack of common expectations for their project work and common intentions for the project.

Keywords: Reflection model, somatic comprehension, atmosphere, form-generating, aesthetics

1 INTRODUCTION

One precondition for commercial success in the high-tech markets is that the products created by designers affect the consumer's senses in a meaningful way or that they form the basis for an emotional relationship, as studies by Tim Reynolds have shown [1]. Such aesthetic effects are recorded both by mind comprehension and somatic comprehension which interact in the product experience. It is, therefore, surprising that design processes more and more frequently take place in the production's media spaces, which can only be grasped mentally and have no impact on the somatic sensation. Jon Hewitt from Motorola Limited also highlighted this in 2008, when he wrote*: "The designer aims to engage as many senses as possible, touch, sight, sound, smell all help to become aware of a product character and its depth or level of design content"* [2]. Even if he only mentions a limited number of senses, the somatic comprehension plays a central role in the sensory perception of aesthetic effects and development of aesthetic experience. We have observed that our students have a basic understanding of the fact that it requires an interaction between the digital and the physical model just to balance a product's form in relation to a function and a given style. The concept 'require' covers some underlying workshop- and temporal conditions for the design process anno 2013. It is our thesis that increased awareness of the impact of somatic comprehension on the aesthetic development of experience can make students practice their sensibilities actively. In the long term, our reflection model for sensing and development of experience is expected to contribute to an increase in the students' awareness of somatic comprehension. The purpose of developing this sensibility is to use the body as an instrument in the design process, and to create products with clear aesthetic statements. The realization of this goal entails, firstly, to create an overview of which senses the students use consciously. Secondly, to gain insight into the types of aesthetic statements we can expect engineering students to treat. Which senses and which types of aesthetic statements we expect the students to use are determined based on aesthetic treatment of the Proceedings of E&PDE 2007 to 2012.

2 TYPES OF AESTHETIC STATEMENTS PROCESSED IN E&PDE PAPERS

Our study is based on Alexander G. Baumgarten's [3] sensory aesthetic realisations, which is why this particular approach has been in focus in our review of the Proceedings of E&PDE papers. The paper

"Dynamics and Diversity in use: Implication for Aesthetics and Usability" [4] put forward two - for designers - key approaches to clarify how the users make aesthetic realizations and thereby experience the value of the product. The first is that the sensing takes place in the user's context or environment and the second is that the sensing is dependent on for what and how the product is used. One approach many design-engineers may benefit from in particular, and which is highlighted by T. Reynolds [5], is 'techno-phobia' and 'surprise emotion', because they - in the right combination - can trigger a sense of pride. Other of Baumgarten's aesthetic features discussed in the Proceedings of E&DPE are 'Style' [6] and those that resemble Zen aesthetics developed by Shin'ichi Hisamatsu [7]. Richard Shusterman's expansion of Baumgarten's aesthetics with somaesthetics would be very relevant to include in relation to service design and ergonomics, where user behaviour is in focus, but not in this study which focuses more on the physical product [8].

3 REFLECTION MODEL FOR SENSING AND DEVELOPMENT OF EXPERIENCE

In the centre of the model in Figure 1, we have placed "People in the form-creating processes", because it is these processes that are the starting point.
The model was developed with three goals in mind:

- To show that people in the form-creating processes can develop both a sensitivity to the forms and materials they work with, as well as to the atmosphere they work in
- To draw attention to the fact that the future users of a product experience the product in the context they use it, while the product contributes to the atmosphere of this context at the same time
- To provide a starting point for reflecting on the form-creating processes and hereby invite to allocate the time required for the acknowledgment process.

We have given the model the working title "reflection model for sensing and experience of development", because it focuses on sensing what one experiences during the form-creating processes and / or on reflecting on the experiences which the design process contributes to. The basis for the model was created by unika designer Nina Ganneskov as an experience collection on her own educational progress and together with her we developed the model further through studies of the importance of somatic comprehension for the aesthetic experience.

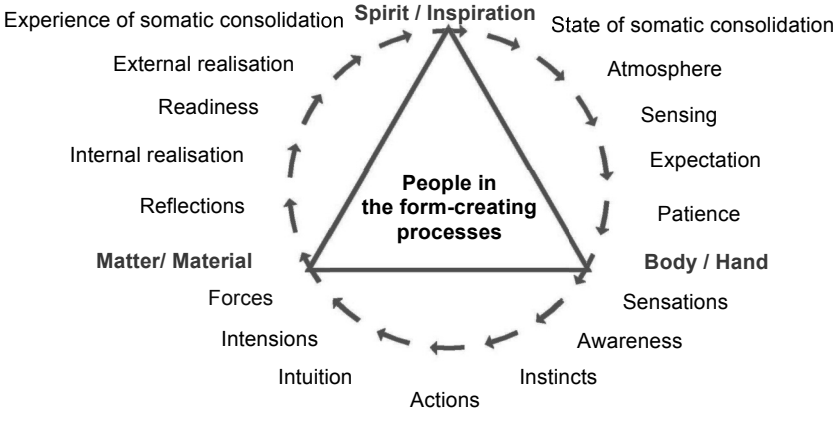

Figure 1. Reflection model for sensing and experience of development

The interaction between inspiration - hand – and matter represents the cornerstones of the model. It means that the hand works under influence of the inspiration and in interaction with the material. In addition to showing that the activities in the process have both a clear impression and expression side, the model also shows that the condition of people or the atmosphere they experience is relevant for the process. The intermediate concepts are proposed as attention-fields for studying the elements of the creative process. The concepts are not exhaustive; therefore, the participants in the study were asked whether or not they consider these concepts the most important attention-fields for this sort of study.

Poetically speaking, we can say that the generation of ideas begins when the spirit comes upon us as a "life-principle". In practice, the hand materializes the form under influence of both instinct and intuition. Although the reflections and insights come later in the process, the arrows in figure 1 do not so much refer to a specific flow as to the fact that the process requires that people are in continuous development. The students who participated in the development work ascribe different meaning to the three sides of the triangle, namely, idea generation, form development and evaluation. The reflection model is also used as a means of getting students to challenge themselves through 'reflection in practice'. Donald Schön's concept of 'reflection in practice' is here used as references for evidence of the usefulness of activities when sharpening ones alertness to the response from the senses [9].

4 METHODICAL APPROCHES TO THE STUDY

The goal of the first studies of the reflection model is to study whether students understand the concepts introduced in the model. In the long term, the plan is to supplement the concepts with a wordless representation primarily in the form of symbols, inspired by Henriette Christrup's use of visual metaphors to generate a meaning [10]. For the use of the study, the model's concepts and nouns were transformed to a series of questions that in some cases were exemplified or explained. An example of this is the concept 'inner realisation' which refers to the insights gained through thinking and examination of the responses from your body or based on your own experiences from the time before the beginning of the project, or the concept 'external realisation' which is the knowledge gained as a result of external influences, from e.g. working with material, form, methods, theories or other people. We have, on the one hand, limited sensing, which is the core activity of aesthetics to signals from sense of time, movement, balance, touch, hearing, smell and vision as well as spatial localization. On the other hand, the listed concepts also clarify which senses the model focuses on, as the participants were asked to explain how the individual senses came into play in the design process. To ensure the impartiality of the participants, a group of industrial design students in third semester, BSc03, at Aalborg University (AAU) were invited to complete a questionnaire. The interviewers did not participate in the teaching of the students. The survey was conducted right after the examination of the semester projects, in which 7 groups of students worked on re-designing a robotic vacuum cleaner within a given product family such as NIKE sports shoes, BMW cars, XBOX 360 games console etc. Out of the 41 engineering students in the semester, 37 chose to respond. Architect Lars Villumsen from Den Skandinaviske Designhøjskole (SDH) also invited the 20 students in the line for Architecture and Product Design to complete the questionnaire. These students work on many different projects, which make it possible for them to build the portfolios they need to apply for a design education. The fifteen students, who opted to respond to the questionnaire, reflected on the developing of an architecture or design concept.

5 THE OUTCOME OF THE STUDY

The questionnaires were processed by first sorting the responses of the AAU students according to the project groups they worked in and then extracting the essence of the responses to each question. The results were then compared to the data collected from the students from SDH, see Table 1.

The group reading reveals that the reflection model is excellent at providing insight into how well the group works together. For instance, the item "inspiration" reveals that despite the fact that BSc03 was assigned a family of products which the vacuum cleaner should reflect, some group members found inspiration elsewhere. The same groups had no common "intension" for the products they worked on. Under the item "inner realisation" many of the students in these groups moved their focus from the form-generating process to reflecting on the group work situation itself and on how to best get their views across or what they want to learn henceforth. The item "expectations" and "patience" also reveals that some groups have neglected to balance the expectations internally in the group as it is recommended in connection with group formation in the first semester at the university.

Table 1. The essence of the survey

	Den Skandinaviske Designhøjskole	Aalborg University
1. Inspiration	In the project's function, its context, history, in art and books on architecture and design. Making different models and finding ideas in the forms that arise.	Through analysis of the product family, its predecessors and competing products, in experiments, sketching and modelling.

2. State of somatic consolidation	Students are predominantly open to impressions from both the world around them as well as the condition of their own bodies.	The students are predominantly neutral to open to impressions from the surrounding world, but most are closed to neutral in relation to the condition of their own bodies.
3. Atmosphere of room	Very focused on interaction with people, inspiration from models, light and music when decoding the atmosphere.	Focus on good lighting, noise, mess, open and office style room with inspiration sketches on sloping walls and a cosy workshop.
4. Senses in use: time:	Time is a stress factor that motivates for planning and moving forward.	Ranging from losing sense of time when the work is exciting to stressful deadlines.
movement:	Calm and accurate movements produce nice sketches. In the test of a product e.g. a watch: location of the product on the body.	Movement of the body promotes idea generation and through the handling of the product perceived form.
balance:	The balance is tested by the suspension of houses on a bridge.	Testing the model's weight distribution. (This sense is often mistaken for visual balance.)
location:	People revolve around the product and observe it from different angles.	By switching work space location in the room you achieved a new perspective on the product and the space.
feel:	Material is selected based on the sense of touch. You should be able to feel your model to understand the form and its proportions.	Phenomenological study of the product family and models as well as working with models in Car Clay, foam and wood gives a better understand of form.
hear:	Hearing music has affected the process by helping to create a good mood and by distracting from sounds of others.	Noise affects the design process negatively. A product's sound can be both positive and negative for example by giving feedback on user interaction and by growling when the product is activated.
smell:	During the model preparation, smell of glue and coffee can steal the attention.	The smell of a new car is special and smell can evoke memories. Important factor in the development of dirt chamber for vacuum cleaner.
vision:	Constantly used to observe light, proportions, details, etc. and to decode the aesthetics expression.	Along with touch probably the most important in the assessment of the reference product, sketches and the form expression.
5. Expectation	Exciting tasks where I can test my ideas to move from abstract to concrete. That I by examining several ideas will reach a good result and learn something that is not entirely typical.	That everyone in the group contributes and helps to develop a product, which reflects design DNA. Training in the structured process. Learn new techniques and gain increased understanding of form.
6. Patience	Patience is high enough to test many options and create models of a decent quality, but not so high that it affects the design process in a negative direction.	Necessary to achieve thorough idea development and to experiment a lot to a good result. It reflects on the quality when the process is speeded up. Patience creates a good working atmosphere.
7. Sensations from material	The work with wood, cardboard, foam, clay, etc. gave a good idea of its structure and flexibility.	Sense of the resistance, fragility, formability, strength, softness / hardness and lightness of the material.
from the form	Senses if the form intuitively feels right.	Perceived the form complimenting function, its guiding lines, soft edges and smooth surfaces.
from atmosphere	The industrial environment and the room's functionality.	Level of activity, light and peace of mind.
8. Awareness	The technique in producing a prototype. Understanding of materials and testing of new ones. Using several materials and models in a realistic 1:1 scale.	On the requirements for the product and materials. On 3D models – an eye opener for the form. The group's intension for the project.
9. Instincts	Used my instincts to predict the materials' reactions and effects on themselves and each other as well as the	Previously acquired talent and instinctive interactions with the product. Follow my instincts where after I discuss with the group

	selection and evaluation of materials and form.	to achieve an argument for them.
10. Actions	Action is mainly based on experiments and only to a limited degree based on methods and theories.	Action is largely directed toward model experimenting and only secondly on method testing.
11. Intuition	Individual students are aware that a lot of their choices are intuitive and have a clear sense that they cannot justify them in detail.	Intuition particularly influences the design such as placement of the guiding lines and choice of height, length and weight when testing and research did not result in anything useful.
12. Intensions	Individual, corresponding to the school's methods such as practical, simple, easy and the product is made from material from the environment in an easy way.	Reflects product family DNA, the robot's functions, for instance an elegant, aggressive expression, but not flashy.
13. Forces	A phenomenon the students did not articulated.	The tension between the dynamic and static as well as light and shadow effects.
14. Reflections	In relation to the concept - if it was clear and right, and whether it lived up to the intension, for example, to keep it simple and yet to create interesting forms and surfaces.	The relationship between forms and the associations they trigger. That the form would have been stronger, had there been more details such as notches and grooves to emphasize the aggressive.
15. Internal realisations	In relation to own learning and the product e.g. 'I have learned to think a little differently' and 'the clock is a piece of jewellery and hence a kind of fashion phenomenon that will change'.	"Kill your darling" is hard, everyone works differently. Own approach and its internal logic. Better to analyse too much than too little.
16. Readiness	All neutral to welcoming to new insights as a result of the judgements of others.	Most are neutral to welcoming to new insights as a result of the judgements of others.
17. External realisations	Looking at images and at what the others have produced has affected the design process. Through others, I have been able to achieve a greater understanding of the work process.	The tested form-creating methods may produce unexpected shapes and the shadow effect's importance to form perception. The form is better adapted when materialized in a 1:1 model.
18. Experience of somatic consolidation	One should not take major decisions, when working long hours. I have become better with my hands at cutting cardboard, gluing and taking into account the weight.	Forms with smooth transitions are more alive than geometric forms. Greater understanding of the concept of interaction by industrial design and craftsmanship in the final model.

The use of the senses in this study reflects the two different types of projects the students worked on, respectively the bridge house and a robot vacuum cleaner. The SDH students were clearly more familiar with spatial localization. Several AAU groups worked with the robot's movement pattern, therefore it must be assumed that they did not actually study how people experienced the robot in different positions, since their responses did not reflect this. In the robot project, the sequence of events was not registered by the sense of time either, just as the response from the sense of movement is only sparingly used. This was the case even with the group who chose to control the robot by using hand gestures the same way they interact with a game console. It was not possible to determine, on the basis of the answers from SDH students, if they used their sense of balance to balance their bridge house, as too many confused this senses with visual balance. Overall, the study revealed that the five senses of time, balance, movement, smell and hearing along with spatial localization are given little or no awareness in the design process. The AAU students had no opportunity to produce a prototype; therefore they did not have the opportunity to test whether they could reduce discomfort or improve the sound from the user interface. Along with sensing, bodily sensations help to create the aesthetic experience, which is why we must hope that the sparse registrations of these phenomena are due to the fact that the students have not yet received actual training in aesthetics. The Academy of Art's Design Schools filter out applicants who do not live up to Baumgarten's demands of having natural ability for aesthetics. Aalborg University does not employ these measures either which becomes evident in many student projects. To the students' defence, the aesthetic statements were also absent in several of the

product families they were assigned, but the groups who were assigned Alessi design and Philippe Starck did not come much closer to giving aesthetic statements. Unfortunately, none of the product families steered the students towards working with technology aesthetics, which several students noted. Most concepts triggered the expected response, but besides the concepts of sensing, the students had problems distinguishing between "instincts" and "intuition" as well as "internal realisations" and "external realisations". It must be assumed that people draw on their background awareness both when they use their instincts and their intuition; instincts being a purely somatic response, and intuition happenings in the mind. The way instincts and intuition developed is, therefore, fundamentally different. The last two concepts can be seen as one as they distinguish between mind comprehension and somatic comprehension. The project exam seeks to highlight causes of the difficulties of the process; therefore it can be argued that it is too late when the students to become aware of the difficulties at the exam. The problems caused by a lack of common intensions or balanced expectations for the results ought to have been identified earlier. Therefore, the students would clearly benefit from using the reflection model just after submitting their program, both to ensure that somatic comprehension is used actively in the registration and to anticipate the aforementioned problems. Only the item "forces" triggered suggestions to add other concepts to the model. The concepts "technology", "function" or "users" were suggested and someone specifically proposed to add a triangle rotated 180^0 relative to the model. There is no doubt that expanding the reflection model to include these proposed terms of technology will make it easier for engineering students to use the model, but at the same time it would downplay the importance of the aesthetic basis, which is not desirable.

6 CONCLUSION AND PRESPECTIVES

The reflection model's concepts forced the students to think about the sensing they did in relation to a specific project and drew their attention to the fact that somatic comprehension uses more senses than they are trained to use. At the same time, the model drew attention to how the students could gather experience in preparation for a project exam. Furthermore, the reflection model has proved useful for spotting process difficulties, which makes it more effective in the program phase.

Both possibilities of illustrating the meaning of the model's concepts with metaphors and supplementing with the more concepts should be explored, partly to increase the sensitivity of the not generally known senses and to make the reflection model more easily applicable to the technical disciplines. At the same time, engineering students must learn about technology aesthetics and somaesthetics so they can create products with more technical aesthetic qualities so that they receive a higher degree of appreciation for their professional competencies.

REFERENCES

[1] Reynolds, T. Resherching first contact emotional responses to products *The 12th International Conference on E&PDE,* NTHU Trondheim Norway 2010, 242-247

[2] Eves, B. and Hewitt, J. Semiotics, Design Character Language *The 10th International Conference on E&PDE,* Universitat Politecnica de Calalunya, Barcelona, Span pp. 573-584

[3] Kjørup, Søren , 'The philosophy of the Art- a indføring in aesthetic'Roskilde 2000

[4] Van der Bijl-Brower, M and Wouter Eggink Dynamics and Diversity in use: Implication for Aesthetics and Usability *The 12th International Conference on E&PDE,* NTHU Trondheim Norway 2010, pp. 230-235

[5] Reynolds, T. Researching First Contact Emotional Responses to Products *The 12th International Conference on E&PDE,* NTHU Trondheim Norway 2010 pp. 242-247

[6] Casakin, H. and Mastandrea, S. Aesthetic Emotions and the Evaluation of Architectural Design Styles *The 11th International Conference on E&PDE,* University of Brighton UK 2009, Nr. 123

[7] Thomsen, B. D. and Madsen, K. Aesthetic, Structural and Functional Transparency in Design *The 13th International Conference on E&PDE,* City University, London, UK 2011, pp. 411-416

[8] Shusterman, R. Somaesthetics: A Disciplinary Proposal *The Journal of Aesthetics and Art Criticism*, Vol. 57, No. 3. USA 1999, pp. 299-313.

[9] Schön, D. *Den reflekterende praktiker: Hvordan professionelle tænker, når de arbejder* 1983 (translation by Steen Fiil) Klim, Aarhus 2001

[10] Christrup, H. *Self-creation & Performance Spaces*, in Kristiansen, Erik (ed.) *Engaging spaces* 2012 (in press Roskilde University).