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FACILITATING TRANSITION TO TEAM BASED DESIGN EDUCATION

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ABSTRACT
When students enrol in Problem Based Learning (PBL) and Project-oriented universities at Industrial Design programs, what are their expectations and prerequisites for starting to learn about design and work in teams with design? The short answer is: not as much as they think, studies shows that even if they had previous experience with project work in teams, they still encounter problems during their first semesters. So as a way to ease the transition from highly framed and facilitated high school learning context to university self-driven learning context a small experiment was carried out in 2011 and 2012 in form of a "Survival Kit". This paper investigates the long-term effect of the "Survival Kit" regarding the students' development in understanding the expectations towards them and the pitfalls in studying and working projects in teams through questionnaires given to two set of students; one set that received the survival kit in 2011 and 2012 and one set that did not. The questionnaire inquires the students' attitude towards 4 aspects:

1. General level of preparedness for team and problem based project work
2. Level of information of expectations from supervisors and programme
3. Reflection of the role in a team, problem based project work
4. The level of information of special expectations from the Industrial Design program towards team and problem based project work.

Results indicates that Class receiving the "Survival Kit" improved in the calibration of expectations and enhance students attitude towards dealing with development projects as an external professional activity, rather than an internal personal activity, thus increasing team-orientation.
The paper discusses the results and indications from the results in relation to creating a productive study environment and eases the transition into the learning context of a university.

Keywords: Problem Based Learning (PBL), Design education, Facilitation, Survival Kit

1 INTRODUCTION

A Problem Based Learning (PBL) and Project oriented Industrial Design Engineering program at a university can present a significant change in learning style and learning environment compared to High School and similar primary educations. Students have perhaps experienced group and teamwork before, the may also have experience working with minor, short projects. But for most parts the high school system is based on lectures, analytical reasoning and solving given tasks. So even if the students have these prior experiences, a full-scale PBL and project-oriented learning environment [1] represent a significant change and force the students to adapt their learning style and increase their self-reflection.
Besides the change in learning environment the subject of Industrial Design Engineering with the objective of creating 'new' solutions increases the transition even further, by adding the complexity of creating synthesis to the analytical skillset.
Within the creative professions there are many variations in relation to the role of the "designer" depending on the perception of the process ranging from black box to glass box [2]. In the black box the actual process of creation is a mystery and the talent of the individual is of the essence, this is what Stolterman [3] calls the artistic and aesthetic approach. In the glass box the process is transparent and knowing the methods, controlling the process and applying the tools is the essence – the individual it self becomes secondary and is described as the guideline approach [3]. Within Industrial Design Engineering programs in universities, the latter tend to be dominating as opposed to curricula in Schools of Architecture or Design Schools in a Scandinavian context.

The PBL based and project oriented Industrial Design Engineering program used in this investigation is very process focused with the objective of opening the process for engagement for all members in the design team. This is partly due to the structure and organization of the Programmes at the University, where almost all project activities throughout a curriculum are carried out in groups.
This challenge any student with a pre-perception of design as an individual, artistic profession, but at the same time it becomes very difficult to identify where and how the design is created since form-giving now becomes a group effort.
So the relation between the individual student expectation to them selves as performers and designers and the group effort, process management and decision-making becomes a pivot point for a design student's self-perception. This can create confusion and insecurity if students take criticism and feedback on project proposals personal, believing the content is more important than process of making it, i.e. an aesthetic approach rather than a guideline approach.
Furthermore the Industrial Design Engineering approach uses a different way of reasoning than the traditional models the students are accustomed to, the deductive and inductive reasoning. The third way of reasoning is abduction or productive reasoning [4], where the designer works from assumptions, based on quick analysis of wicked problems [5] and suggests a potential 'correct' solution encompassing both quantitative and qualitative aspects. This suggestive approach is linking closely to the reflection in and on action [6], where the systematic and continuous learning cycle [7] is the key to progressing in the process.
The Industrial Design Engineering curriculum summarises these aspects in the following definition of the design process: "*The Design Engineering process is fundamentally a technical and scientific product development process, in which analysis and synthesis of social and human science aspects in relation to needs, sales and use of products and solutions are systematically and methodically integrated through externalization and abductive reasoning, capable of handling wicked problems and open-ended processes.*"
So when students take on the transition from the high school systems to the university and the Industrial Design Program, how well prepared are they and how can we facilitate this transition?
This was the question in 2012, where a small group of faculty from the Industrial Design Engineering program decided to try addressing this issue by creating a "Survival Kit to studying an Industrial Design Engineering Program".

2 METHOD

2.1 "Survival Kit": A lecture on dogmas

The first "Survival Kit" can best be described as a lecture on 13 dogmas for studying Industrial Design Engineering based on experiences from 3 staff members, whereof 2 where former students providing an 'inside' perspective on things with personal anecdotes and experiences. Most of these dogmas, rules and recommendations, are related to the way design engineering is perceived and practiced in the Programme, but a few are related to other more general aspects of being a student.
In Table 1 a run-through of the dogmas illustrates the relation to the previous mentioned aspects of Industrial Design Engineering.

Table 1. Dogmas of Survival Kit 1

Dogma	Statements	Relation to Design Engineering
1: Prototype it	"Make it – test it", "You can't think your way to a solution" and "You can't discuss your way to a solution"	Strongly related to the suggestive, abductive approach with the encouragement to generate actual proposals to help the testing (externalization process) and drive the process forward.
2: Take ownership in ideas from others	"Share ideas", "Give your ideas away" and "Take ownership in ideas from others".	This relates to the perception that designing is not a black box where the ownership is important, it is the process that is important and ideas are just stepping stones.
3:	"We don't want to hear: Is this	This dogma relates both to the fact that there is

Responsible for your own learning	good enough and what shall we do now?", "We want you to learn to do it your selves"	no one single correct answer to wicked problems. And secondly the general idea of studying a subject is a self-driven process, rather than being tutored and taught as in high school systems.
4: Get up and study	"Make your own profile and possibilities", "Make sure you learn what you find interesting", "Are you not content: act and seek out what you miss", "We cannot teach you everything".	As with the previous dogma, this places the responsibility of learning and studying with the student, but underlines the point that students need to create a personal professional profile during the studies.
5: Connecting the dots	"You haven't got the overview yet and may not see the underlying reasons for every subject", "It does not mean it is useless, just that you haven't got the overview yet", "The learning is brought to you by experts"	A curriculum is progressively built, so some subjects may be the foundation for later subjects and not other concurrent ones. Also there is a difference between high school systems where a certain subject is *taught* by a teacher and universities where a subject is *studied* supported by a researcher).
6: We are not artists, we are craftsmen	"It is OK not to feel creative", "Creativity is a tool you learn how to use", "Our profession is a craft that requires skills"	This glass-box oriented dogma is countering the perception of a certain creative talent is required to engage with the field of Industrial Design Engineering.
7: We communicate visually	"There must not be a barrier between you and what you want to express", "Draw", "Form is not described with words: show it!"	With these statements this dogma is an equivalent to dogma 1, aiming at supporting the abductive reasoning by generating material for communication with external parties and stakeholders.
8: There is no one right answer.	"You can not analyse your way forward", "Try you way forward", "Fail often, it will bring you closer to an answer"	This dogma is a very direct support to wicked-problems, open ended processes and the abductive reasoning.
9: We are not criticizing you, but your proposals.	"Do not take it personally", "Learning from mistakes are better than learning from success", "Learn a lot, do not play it safe"	This dogma tries to combine the inherent learning process in design with a more professional attitude towards receiving feedback (criticism) on a proposal, leaning towards the guideline approach rather than the aesthetic.
10: Girls wake up.	"Use 3D software", "Use the workshop", "Dismantle something", "Look out or the boys will leave you behind"	This dogma speaks to the experience that using 3D software and focusing on the constructional aspects usually is predominant within male students while female students tend to ignore this.
11: Boys, don't fall into the hole.	"It is important to know more than just one thing"	This dogma reverses dogma 10 and encourages the male students to cope with the entire design process, not just construction and 3D modelling.
12: Working in groups is difficult.	"Be patient", "Do not get upset if offended", "Help each other to learn" and "Say what you feel, not just what you mean"	This dogma acknowledges the fact that working together professionally is a challenge, and takes some time getting accustomed to.
13: Get a life	"Have a hobby", "Do physical exercises", "Find somewhere else to recharge your batteries" and "Get a part-time job"	This dogma is merely aiming at promoting a healthy study environment and a more pragmatic approach to the studying, not seeing it as 24 hours work and lifestyle, but rather promoting a professional attitude from the beginning.

2.2 The survey

The "Survival Kit" was only a 2-hour lecture out of a 900 hours pr. semester workload for the students and may not have left much of an impact in itself. But the increased focus on being explicit and facilitating the transition may have left an impact. Therefore a questionnaire was given to 2 classes, one starting the Bachelor Program in Industrial Design Engineering in 2010 who did not receive any specific or explicit attention to the transition (Class A) and one class starting the Bachelor Program in 2011 who received Survival Kit I on their 2nd semester and Survival Kit II on their 3rd semester (Class B).

The survey covers 4 main lines of questioning concerning the students own perception of their level of preparedness and the potential change is this during the first 3 semesters in the program. The Survival Kit is not mentioned in the questionnaire in order to avoid bias and leading questions; only the level of preparedness in 4 different aspects in used.

2.2.1 Question 1: Team based project work in PBL

First question is "Aalborg University utilizes a study format of project work in teams. How well prepared were you to work in team based project work within Problem Based Learning on your first 3 semesters?" This question seeks to investigate issues from dogmas 3, 4 and 12 related to responsibility for ones own learning and attitude towards seeking information and knowledge in a pro-active manner, as well as understanding the difficulty and effort a team based project requires.

2.2.2 Question 2: Studying a creative profession

Second question is "There is a difference between studying a creative profession at the University and your former educational activities. How clearly was the expectation towards you as a student communicated by the Program, Project coordinators, supervisors, lecturers, etc.?"

This question investigates issues related to dogma 5, 6 and 8 concerning the overall perception of a university curriculum as something that is not set in stone and the subject matter is influenced by qualitative aspects (human and social science), that does not lead to one right answer.

2.2.3 Question 3: Role in team work

Third question is "There are many ways to engage in team work, to what degree did you feel comfortable with and understood your own role?"

This question investigate the self-reflection on the students own potential strengths and weaknesses, some of them exemplified in dogma 10 and 11 concerning gender specific pitfalls and dogma 2 concerning engaging co-creational activities.

2.2.4 Question 4: Industrial Design specific approach

Fourth question: "The Industrial Design Engineering Program has expectations of the professional subjects and the way you approach a project. How clearly were these expectations towards you as a student during the first 3 semesters?"

This question investigates the students attitude to the issues of producing material, visual or models (dogma 1 and 7) as an integrated part of the design process, as well as necessary feedback loop on content (dogma 9) and the professional attitude of the profession being a job rather than a lifestyle (dogma 13).

3 RESULTS

The survey results are divided in the 4 main categories with varying percentage of response, which renders the results on question one very uncertain and will be omitted.

3.1 Studying a creative profession

The most interesting difference between the classes in relation to question 2 shows that the increase in clarity was significantly larger in the "Survival Kit" class (Class B) than the Class not receiving the Survival Kit (Class A) as shown in Figure 1.

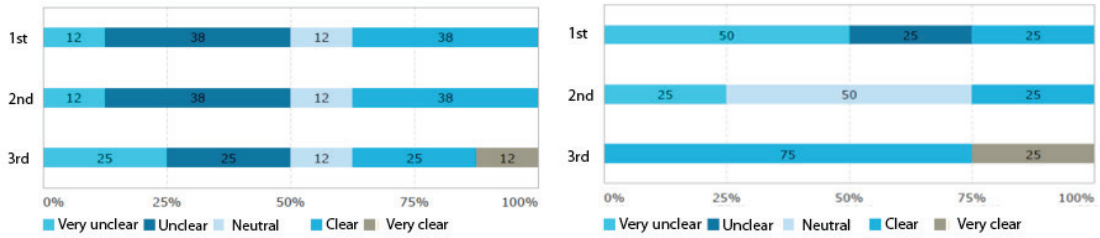

Figure 1. Class A on the left, Class B on the right

Class A shows no difference in the perception between the first 2 semesters, and a slight increase from 2nd to 3rd semester in the top of clarity (Very clear), but it is balanced by a similar increase in the absolute bottom (Very unclear). Class A differs significantly and show a steady progress throughout the 3 semesters, ending with only "Clear" and "Very clear" answers. The most significant leap is from 2nd to 3rd.

The comments received indicated that most significant for the clarity in how to study a creative profession was *"Study guide and occasionally lecturers and supervisors"*.

3.2 Engaging in team work

In Figure 2 Class A shows that approximately 50% are "Comfortable" and feel at ease with their own role in a project team, and the development over the 3 first semesters show only a slight improvement from 1st to 2nd semester. Class B shows a very significant progression with all respondents being from average and below in the 1st semester to all respondents being above average "Comfortably" or "Very comfortably".

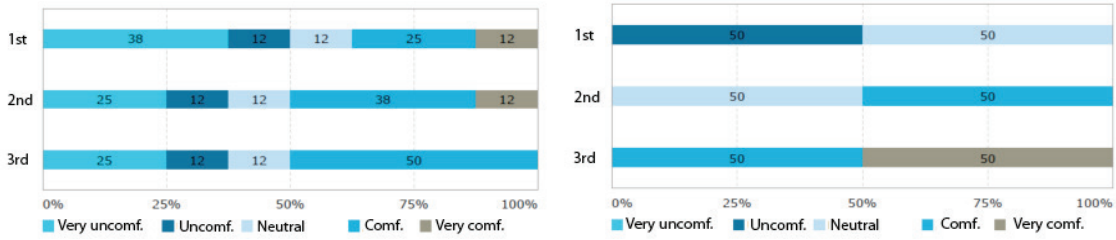

Figure 2. Class A on the left, Class B on the right

3.3 Industrial Design specific approach to project work

In Figure 3 Class A shows almost no change over the 3 first semesters of the Bachelor programme, except for a very little change from 1st to 2nd semester. This is interesting considering the fact that Industrial Design was introduced on 2nd semester in a short project and the entire 3rd semester was exclusively Industrial Design Engineering. Class B shows another interesting change: a 100% "Above average" understanding on 1st and 2nd semester changing to 50% "Average clarity" and 50% "Very Clear".

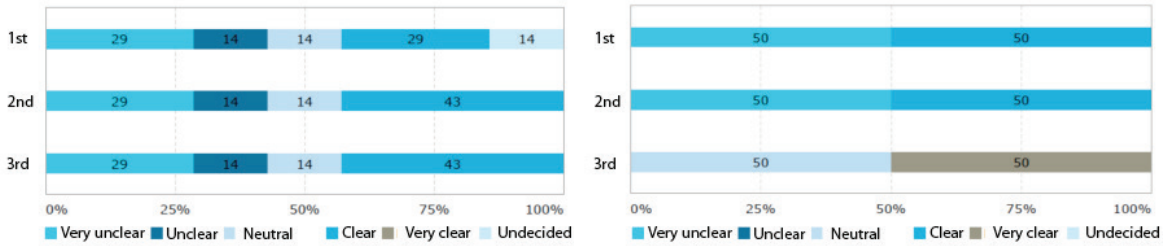

Figure 3. Class A on the left, Class B on the right

4 CONCLUSION AND DISCUSSION

One could argue the validity of the connection between the subject of the Survival Kit, the impact of a 2 hours lecture and the relation to the line of questioning. But as indicated earlier the shift in focus on

the peripheral and transitional aspects around the PBL project-oriented study of design engineering may in it self also has contributed to an increased awareness amongst students.
The main learning points from this small investigation is that focusing on communicating expectation towards attitude, engagement and commitment in the study of Industrial Design Engineering can increase the awareness and clarity of understanding the professional field as well as how to engage the study environment. The survey indicates that students can be 'moved' by little effort and focus on the matter, but there is no clear evidence in terms of absolutes, only the relative increase.
Furthermore the positioning of what type of "design" the program represent and the subsequent consequences in are important to continuously develop and communicate. When operating towards a glass-box perspective it has explicit consequences in terms of expectation towards student behaviour and attitude in a team based project.

4.1 Future perspective

This little experiment indicates that there could be a potential increase in students learning and willingness to study and experiment in the Industrial Design Engineering programme by being more explicit in the communication and facilitating the entry into the university system in the first few semesters. It is important to more explicitly put the expectations into perspective of both the professional field of study as well as the study environment as a project-oriented Problem Based Learning stage. This stage is important to stress that the responsibility of learning is on the student's shoulders, since learning is such an inherent part of the abductive reasoning in the design process that you cannot outsource the learning responsibility to "teaching" activities from lectures and supervisor. Stating the responsibility will not be enough to make a difference, it is equally important that the evaluation mechanisms support and rewards students that demonstrate the ability and willingness to study phenomena during a project, even if they are slightly out of scope of the official curriculum and specific learning objectives. But we need more investigation into what approaches, methods and organization of activities that helps create a culture of studying and exploring the field in a design engineering education context.

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