Students' Attitudes Towards Group-based Project Exams in Two Engineering Programmes

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ABSTRACT

At Aalborg University, engineering students spend half the time each semester in groups working on projects in a problem-based learning (PBL) curriculum. The projects are assessed through group exams, except for between 2007 and 2013 when the law forbade group-based project exams. Prior to 2007, a survey showed that students preferred the group-based project exams and a new study was consequently conducted after the 2013 reintroduction of group exams. Again, the results demonstrated that students prefer the group exam, but that there are significant differences between students from various engineering programmes. We compare the two programmes "Architecture and Design" and "Software Engineering", and find that students in the latter programme feel more positively towards the group exam. A further result is that one-third of the students testified that facing a new type of exam did not affect their behaviour at all. This might suggest that the "backwash" effect of an exam on student behaviour is not as present in these students as is often expected and argued in education research. We also argue that what the students' base their views upon forms part of the informal or experienced curriculum, which is not necessarily equal to the formal curriculum.

INTRODUCTION

At Aalborg University (AAU) in Denmark, problem-based project work is quite extensive, and in the engineering programmes students spend half the study time each semester working in groups consisting of three to eight students on projects in a problem- and project-based learning curriculum (PBL). A PBL curriculum is characterized by students working in teams on projects involving several steps from problem analysis, through problem solving to

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metacognition (de Graaff & Kolmos, 2007). Although Kolmos, Holgaard and Dahl (2013) conclude that there is not *one* dominant Aalborg PBL model, the education at AAU is in general organized based on shared PBL principles (Barge, 2010), which are: Problem orientation, Project organization, Integration of theory and practice, Participant direction, Team-based approach, and Collaboration and feedback.

At AAU, the projects are assessed through oral group-based project exams, usually lasting around four hours for a student group of six. The project exam consists of three phases: first, a group presentation of the project; second, a group discussion phase in which an external examiner and the supervisor examine the group through questions and in which the students may comment on each other's answers; and finally, a third phase where students must answer questions individually. Each student then receives an individual mark that may or may not be the same mark as the other group members.

From 2006 to 2012, the Danish government banned the use of group-based project exams across the whole education sector. However, the PBL curriculum did continue with student groups working on PBL projects during the semesters, and with a replacement of the group-based project exams with individual oral exams of around half-an-hour's length per student. This situation gave rise to a number of research studies on assessment methods in a PBL curriculum, such as the one at AAU. These studies in particular focused on the students' and staff's attitudes towards and experiences of two very different types of assessment: individual exams and group-based exams of project learning.

The focus on attitudes and experiences was on the one hand based on the assumption that a change of the exam format would create a misalignment in the formal curriculum, but the real driving force for a change away from a PBL curriculum would be based on the stakeholder's opinions and cultural practices. As was seen in many academic institutions, student-centred learning practices were under constant pressure from disciplines to be more at the core of the curriculum – and at AAU, this was also an underlying tension in the curriculum, which could easily become stronger , if assessment were changed. So the intention with the first studies was to study the attitudes and experiences as an element in this top-down change.

However, some of the early studies (Holgaard, Kolmos and Du, 2007; Kolmos & Holgaard, 2007) concluded that the students, the academic staff, and the external examiners preferred the group-based project exams, although 30% of all engineering students, who had tried both types of exam, preferred an individual exam. The fact that nearly one-third preferred the – at that time, new – individual exam form was an indicator for a cultural movement to a more individually dominated curriculum and away from PBL.

These early studies also concluded that the individual exams suffered from an inability to assess core PBL process competencies, such as collaboration and teamwork. Such

competencies include "complement and expand on others' answers" and "participate in teamwork". As argued by Mosgaard and Spliid (2011), such process-competencies are not learned without practice and involvement by the students, and the individual project exam did not assess that part of the learning. This created a situation of misalignment between the PBL teaching method and the assessment method.

In 2013, the group-based project exam was reintroduced at AAU. However, the Faculty of Engineering and Science (FES) did not simply revert to the former group-based exam model. It is now a requirement that the group exam has an individual phase inserted into it. During this individual phase, each student is questioned without the possibility of interference, or help, from the other group members. The questions put to the students during this phase are either chosen by the examiners or randomly drawn by the student from a poll of questions.

When the group-based project exam was re-implemented, we wondered how the new group-based project exam was being received by both the older students who were used to the individual project exam and the new students who had not tried any group-based project exam before. Would there now be more opposition to the group-based exam among both students and academic staff? Since we had learned that the cultural factor is an important factor in the curriculum, we furthermore wondered if there might be differences between various engineering programmes. The focus for this paper is therefore a comparison of students from two engineering programmes in relation to how they perceive the new group-based project exam.

THEORETICAL FRAMEWORK

Engineering culture and diversity

The theory of constructive alignment (Biggs & Tang, 2011) is a systemic approach to curriculum theory that offers an explanation of how the teaching system's separate parts work and interact. It is based on constructivist learning theory stating that knowledge is actively constructed by the learners themselves through active engagement with the subject. The theory also states that in order to ensure that students learn the intended learning outcomes (ILOs), the teaching should be constructively aligned to the ILOs and to the exam. ILOs should therefore be formulated as operational competencies, the exams should measure the ILO competencies, and the teaching activities should match the ILO competencies.

The constructive alignment theory underpins studies stating that an upcoming assessment is a central factor in the students' motivation and learning (Gibbs, 1999; Boud & Falchikov, 2006). One can, therefore, argue that in a PBL curriculum, the assessment method should be aligned with the team-based and collaborative teaching method and the ILOs on process

competencies. Several studies have researched assessment methods for group projects. For instance, Willis et al. (2002) found that when assessing PBL project work, it is important that the students respond to not only the content but also the learning process: that is, the process competencies. Process competencies, therefore, constitute some of the ILOs in the curriculum. Romberg (1995) discusses the advantages of group exams and lists the following competencies: "reflection on one's own thinking, reasoning and reflection, communication, production, cooperation, arguing, negotiating" (p. 165). Hence, it can be argued that a group exam is a suitable means to assess process competencies of communication and cooperation at AAU.

The types of problems addressed in the PBL model varies according to the profession, and AAU's PBL model is developed "on the basis of both professional and educational argumentation" (Kolmos, Fink and Krogh, 2004, p. 9). The ILO represents the formal curriculum, but as many researchers point out, the formal or official curriculum is not the same as what is actually taught or assessed. What is actually learnt, and the cultural factor plays an important role in students learning for example, in the hidden curriculum or the experienced curriculum (Bauersfeld, 1979; Barnett & Coate, 2004; Pollard & Triggs, 1997). What we study in this paper is the students' experience with the group-based project exam, ergo the informal curriculum, which may or may not be similar to the formal curriculum (see Table 1 below for illustration).

	Formal curriculum	Informal curriculum
Group-based project exam	Alignment among curriculum elements	This study
Individual group exam	Missing alignment for a number of curriculum elements	The study from 2007 (Kolmos and Holgaard, 2007)

Table 1. Illustration of area of study – informal curriculum

In particular, this study focuses on two different cultures within engineering. Normally, engineering is regarded as one culture, but this study has found within this discipline very different cultures and approaches to learning. Therefore, students' attitudes are an important element in the alignment of the curriculum and we were especially concerned with individualistic versus collective approaches to learning. In engineering, technological innovation and engineering design are seen as social processes involving several individuals (Bucciarelli, 1994; Goldberg & Sommerville, 2014). Engineering education should, therefore, align the learning methods to the expected work organization (Sheppard, Macatangay, Colby, & Sullivan, 2008). However, during the last 30 years, the definition of "engineering" has become broader as new programmes have been established across traditional disciplines. Several studies indicate several differences in cultures, attitudes and motivation among engineering students from different engineering programmes, which most often are analysed

according to gender and/or motivational factors for choosing engineering (Alpay, 2012; Kolmos et al., 2013).

Choice of programmes for comparison

At AAU, a new programme, Architecture and Design (A&D), combines architecture and civil engineering through a combined design approach. This programme has attracted many students that have an interest in architecture, and from the very beginning the group-based project approach has been challenged by students' expectations for a more individually oriented study programme (Kiib, 2006). Therefore, we decided to choose A&D as one of the programmes for this study. A&D provides students with knowledge, skills and competencies within the interdisciplinary field of architecture, technology and design, and students are exposed to various aspects of artistic creativity, technological knowledge, and design theories. It was decided that the other programme should be from a more collaborative area, and on examination of the programmes, we selected an engineering programme with a system-oriented approach and with a rather large number of students in order to be able to conduct comparable statistics; thus, our second programme choice was Software Engineering (SE). SE students learn to develop software focused on business and technical problems, including programming and various types of technology underpinning the interaction between machines and humans. Therefore, both programmes emphasize the relationship between humans and technology but with different foci.

Research questions

This study reveals students' attitudes to exam formats. As already stated, alignment in the curriculum is an important aspect; however, even when the curriculum elements in principle are aligned at a formal structural level, the experienced and learnt curriculum might be quite different. Therefore, students' attitudes and experiences are core elements in the analysis of an aligned curriculum.

The overall objective for this study was to discover the differences between students' experiences and attitudes to group-based project exams by comparing engineering students from A&D with students from SE. The research questions were therefore the following: (1) Do the students prefer the group-based project exam? (2) How do the students from the two different programmes perceive the individual part of the group assessment? (3) How do the students compare the former individual project exam with the new group project exam? (4) Do the students find that the examination form influences their behaviour during the project work, including preparation for the exam?

The results of these questions will help further develop an understanding of how to secure alignment between ILO and exams in general by drawing attention to not only the formal

curriculum level, but also the cultural differences that might exist among different education programmes. The study will also contribute to the ongoing discussion of whether a group-based project exam is an appropriate type of exam, and whether there is a "one size fits all" in terms of assessment of PBL projects in general.

METHODS

Design of the questionnaire

In order to make some comparison with studies done at AAU since 2006, this study applied a quantitative survey using some of the same constructs (Kolmos & Holgaard, 2007). Another reason for reusing some of the same constructs was to enhance the validity of the present study by reusing constructs that have worked well previously. However, such a comparison is to be conducted with great care since the group exam prior to 2006 was different from that implemented in 2013; also, the study programmes the students are involved in would have undergone some changes.

This study collected data in two phases according to the re-implementation process of the group-based project exam, which was first reintroduced to the first-year students in 2013. In the first phase, questionnaires were emailed to all first-year students at FES two weeks after the end of all the January 2013 exams. The email contained a link to a questionnaire in SurveyXact. The purpose of the study and the researchers were introduced, and the expected time for filling out the survey was given. As part of the questionnaire, the respondents were able to add personal comments and some of these were transformed into new questions in the second phase. This component added to the validity of the study as, in fact, the January survey also functioned as a pilot study preparing for the larger study we had prepared for June 2013.

In the second phase, the questionnaires were emailed to all students at FES at the end of June 2013 when all exams were finished. As with the January survey, the email contained a link to a questionnaire in SurveyXact and provided similar information to the respondents. The questionnaire contained 20 questions, of which most of had sub-questions consisting of several items where respondents should indicate their level of agreement. We used a 5-step Likert scale with a neutral option for answers. We did not want to omit the neutral option, since we did not want to force our participants to have an opinion and, hence, jeopardise the validity; Garland (1991) furthermore argues that bias might occur both with and without the neutral option. Furthermore, we asked the students who had experienced the individual assessment of the group-based project during 2006-2012 to compare this with the new project group exam.

Response rate

In June 2013, 4,588 engineering and science students from FES received the questionnaire and 1,136 responded. This gives a response rate of 25%. Seventy-nine students were from A&D while 50 were from SE. It was unfortunately not possible to obtain the response rates from each of the two study programmes separately. The response rate of Kolmos and Holgaard (2007) was also at 25%, while the response rate of the January survey (Dahl & Kolmos, 2013) was at 36%. Below, Table 2 gives an overview of the response rates in our various studies.

Study	Response rate
2007	25%
2013, January	36%
2013, June	25%

Table 2. Illustration of response rates

The response rate was therefore lower than we had hoped for; however, this is not unusual for course evaluations or online surveys (Nulty, 2008). Paper surveys obtain higher response rates but this was not possible in practice for this study and, furthermore, Krosnick (1991) found that answers in surveys completed in class, compared to those completed online, more frequently suffer from "satisficing" where respondents tend to choose the middle ground for fear of judgement, the pace imposed, or distractions.

RESULTS

Do the students prefer the group exam?

After having tried the group-based project exam for the first time during the January 2013 exam, only 21% of the first-year students stated that they would prefer to have an individual exam (Dahl & Kolmos, 2013). These students were new to the university and had not tried the individual group project exam and could therefore not make an actual comparison. With the second questionnaire to all FES students immediately after the June exams 2013, 34% of all FES students answered that they preferred the individual exam. Here, all except first-year students were accustomed to the individual project exam. Even though the majority of the students appeared to prefer the group-based project exam, there was a difference shown between students not having any prior experience with group-based project exams and students who had been used to individual project exams. In the June study we saw a significant difference in the answers of those who had tried the individual project exam compared to those (first-year students) who had only tried the group project exam (χ^2(1, N =

852) = 18.718, *p* < 0.001) with the older students being relatively more positive towards the individual exam than the first-year students. See Figure 1 below.

Figure 1. Answers by all students to the question: To what extent do you agree or disagree with the question: "I would prefer to have an individual project exam", compared with answers to the question: "I have tried the previous individual project exam before" (Yes/No)

Regardless of the difference, the majority preferred the group-based project exam. We had expected that the students would be more resistant to the group-based project exam, given their little previous experience with such an exam and based on the above mentioned informal reports stating critical views among the students prior to the reintroduction. When we compare these results to the studies made in 2007 where students went from a group-based project exam to an individual exam, it seems that the percentage of students preferring an individual exam is the same, despite the curriculum and experiences.

We then compared the A&D students and the SE students (Figure 2) and found that 43% of the A&D students preferred an individual project exam, while only 18% of the SE students shared that opinion. Although only a minority of both student groups agreed, we saw a significant difference ($\chi^2(1, N = 121) = 8.296$, $p = 0.004$) with the A&D students being the more positive towards an individual assessment.
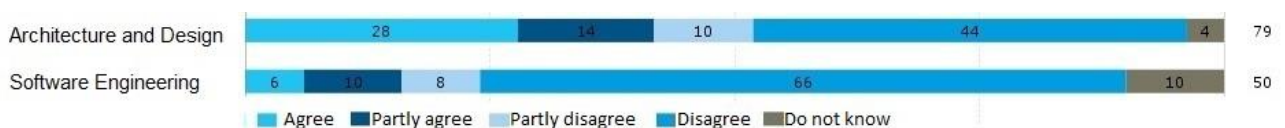

Figure 2. Answers to the question: "I would prefer to have an individual project exam"

A majority of both A&D and SE students therefore felt positive towards the group exam, but there was a significant difference in *how* positive they were. The question is, then, to what extent did the first-year students in these two programmes answer the questions above differently from the rest of the student body in these two programmes?

As illustrated below (Figure 3), we saw no significant difference between first and upper year SE students: $\chi^2(1, N = 182) = 1.712, p = 0.189$):
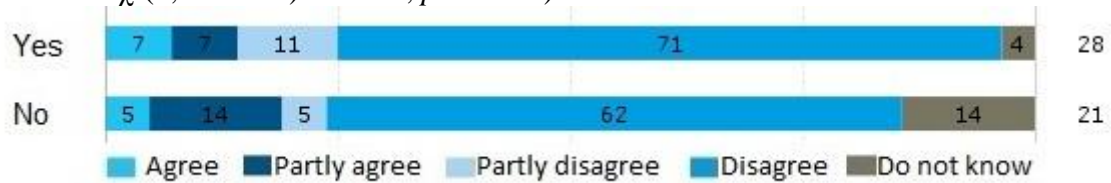

Figure 3. Answers from SE students to the question: To what extent do you agree or disagree with the question: "I would prefer to have an individual project exam", compared with answers to the question: "I have tried the previous individual project exam before" (Yes/No)

The A&D students (see Figure 4), however, showed a significant difference: $\chi^2(1, N = 192) = 23.502, p < 0.001$). A majority (59%) of students who had previously tried the individual project exam (older students) were in favour of the individual project exam, while a majority (70%) of students who had not tried the individual project exam were in favour of the group-based project exam (see Figure 4 below).
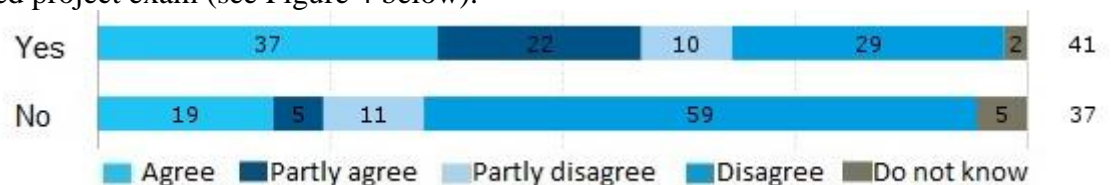

Figure 4. Answers from A&D-students to the question: To what extent do you agree or disagree with the question: "I would prefer to have an individual project exam", compared with answers to the question: "I have tried the previous individual project exam before" (Yes/No)

It therefore appears that, although the overall picture shows that students are strongly in favour of the group-based project exam, some student groups are, relatively speaking, less positive than others, with the SE students being far more positive. Also, when taking into consideration the students' prior experience with a group-based project exam, there is an evident difference. There is no significant difference between the new and the older SE students, but a significant difference between the new and the older A&D students.

How did the students perceive the individual part of a group assessment?

Regarding the question to the statement, the new individual part of the group-based exam is not necessary in order to give a fair assessment, 76% of the A&D students disagreed, while 50% of the SE students disagreed. Hence, both student groups found that the individual part of the group assessment is important to secure a fair assessment. However, the answers of the two groups were significantly different: $\chi^2(1, N = 118) = 6.483, p = 0.011$) (see Figure 5 below). If we compare older and new A&D students there is no significant difference ($p = 0.956$), and neither is there between older and new SE students ($p = 0.975$).
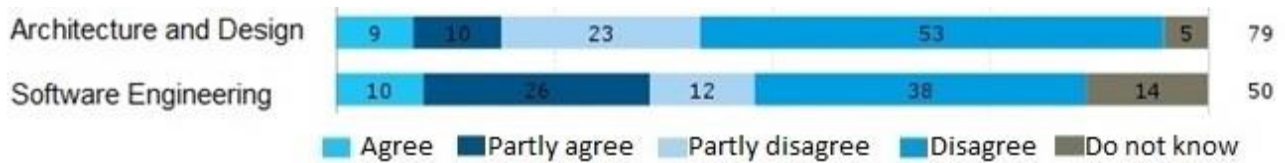
Figure 5. Answers to the question: "The individual part of the group exam is not necessary in order to give a fair assessment"

This means that, although both student groups agreed overall, the A&D students significantly felt even stronger than the SE students that the individual part of the group assessment is important. In relation to the question of whether the individual and group parts of the group exam each test different competencies while both are important, we see a similar picture: 83% of the A&D students and 65% of the SE students agreed. Again, a large portion of all students agreed and A&D students agreed more strongly than did SE students: $\chi^2(1, N = 110) = 4.497$, $p = 0.034$). There is no significant difference either between the first and upper year A&D students ($p = 0.269$), and the SE-students ($p = 0.119$).

How do the students compare the former individual project exam with the new group project exam?

All the students in the study except first-year students had tried an individual project exam and we therefore asked these students to compare the two types of project exams in a number of areas. One of the questions was about the possibility of receiving a fair grade, which is naturally something important to a student (see Figure 6).
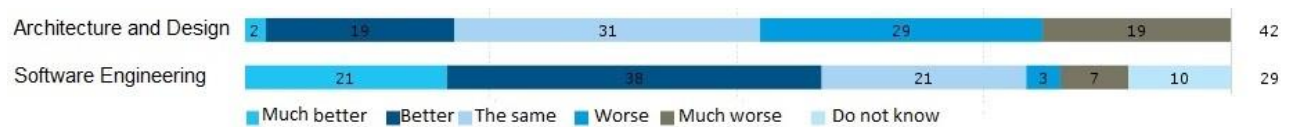

Figure 6. Answers to the question: "If you compare the new group project exam with the former individual project exam, to what extent do you experience the opportunity to get a fair grade?"

From Figure 6, we see that the SE students answer this question significantly differently from the A&D students: $\chi^2(2, N = 68) = 14.652$, $p < 0.001$. In fact, 48% of the A&D students believed that they are less likely to get a fair grade with the group exam, compared to 21% who believed that they are more likely to get a fair grade with this exam. The opposite pattern is seen in the SE students' responses where the majority (59%) appeared to think that the group exam gives them a better opportunity to receive a fair grade compared to the individual project exam, which only 10% preferred. Between one-third (A&D) and one-fifth (SE) of the students appeared to feel that the opportunity to obtain a fair grade is the same for both exams.

We also asked the students to compare the opportunity to unfold and tell what they know at the exam. The answers can be seen in Figure 7 below.
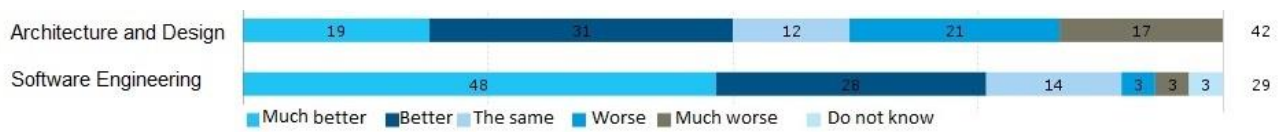

Fig. 7. Answers to the question: "If you compare the new group project exam with the former individual project exam, to what extent do you experience the opportunity to unfold and tell what you know?"

Again, the two student groups answer this question significantly differently: (χ^2(2, N = 70) = 8.566, p = 0.014). The majority of SE students find that the group exam gives a better opportunity to unfold and tell what they know, whereas the A&D students appear more divided into two groups of almost equal size either agreeing that the opportunity is now better, or that it is worse. An similar pattern is seen in the answers to the question about the possibility of communicating their knowledge: (χ^2(2, N = 68) = 14.347, p < 0.001). It therefore appears (again) that the SE students feel more positively towards the group project exam than the A&D students when it comes to the opportunity to tell what they know.

The students were asked to give their opinion about a number of other subject competencies tested at the two types of exams. These included questions about the possibility to receive feedback on both the subject and the project management, explain concepts, show theoretical overviews, show analytical skills, argue for methodological choices, relate various concepts to each other, transfer knowledge gained from the project to other situations and solve problems. In these areas, there did not appear to be significant differences among the two student groups, and for all of these questions the majority of students favoured the group exam.

As stated above, some survey constructs from an earlier study (Kolmos & Holgaard, 2007) were repeated in the 2013 study. Two of these questions were about "process competencies", such as whether during the exam (1) "one can complement and expand on others' answers" and (2) "show one's ability to participate in a group work" (see Figure 8).
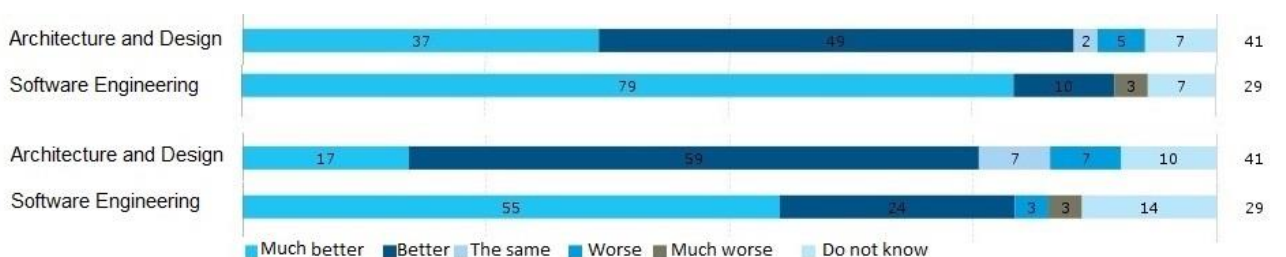

Figure 8. Answers in 2013 to the two questions: (1) "If you compare the new group project exam with the former individual project exam, to what extent do you experience the

opportunity to complement and expand on others' answers? (top) (2) … show ability to participate in a group work? (bottom)"

A majority of both student groups testified that the group exam gives them a better opportunity to show these project work competencies compared to an individual exam. Such competencies form a central part of a PBL curriculum where it is important that the exam is aligned with these competencies. The differences between the students from A&D and SE are not significant ($p > 0.6$ in both cases). This picture is, furthermore, quite similar to that from the earlier study (Kolmos & Holgaard, 2007).

Do the students experience that the examination form will influence their behaviour during the project work, including preparation for the exam?

We asked the students a number of questions relating to the fourth research question. One question asked whether knowing that they were going to be assessed in a group exam affected the way they collaborated in the group on a number of variables, such as "Distribution of work", "Mutual demand", "Desire to inform the other group members", and "Desire to once again work on a project in a group". These questions were asked in the June 2013 study because the students could compare exam forms. In relation to distribution of work, 84% of the A&D students said it had not affected them, while 93% of the SE students said the same. The difference was not significant ($p = 0.398$). An similar picture is seen in relation to the two questions about "Mutual demand" and "Desire to inform the other group members". Hence, regarding these questions, there appeared to have *not* been an effect, or just a very minor effect. However, at the fourth question – whether the students would like to work together on a project in a group again – the SE and A&D students answers were again not significantly different ($p = 0.95$) (see Figure 9), but here we saw that almost a third of the students stated that it had *some* effect. This data in itself does not show if the effect was positive or negative.
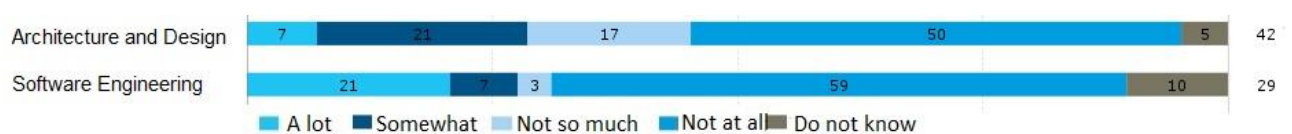
Fig. 9. Answers to the question: "To what extent has the fact that the exam was a group exam affected your desire to once again work on a project in a group?"

The students were asked about internal competition. Here, we saw that the majority of both student groups testified that the future group exam did not affect their internal competition in the group (see Figure 10), which means that the introduction of the new exam type did not alter the strength of any previous internal competition. The difference between the two students groups was not significant ($p = 0.578$).

Figure 10. Answers to the question: "To what extent has the fact that the exam was a group exam affected the internal competition in the group?"

However, in relation to the question about how it affected their exam preparation, we saw another picture, shown below in Figure 11.

Fig. 11. Answers to the question: "To what extent has the fact that the exam was a group exam affected your preparation for the exam?"

We saw that around half the students testified that the fact that the exam was a group exam affected how they prepared for it. The difference between the two student groups was not significant ($p = 0.398$). In fact, one may wonder why a larger part of the students did not testify that the type of exam affected how they prepared for it. Why did not 100% answer at least "somewhat"? Around one third of the students testified that it did not affect their behaviour at all. It appears that these students either did not perceive the group exam to be much different from the individual exam (which would seem odd), or the changed exam did not, in fact, affect their preparation according to what they would otherwise have done. This might suggest that the effect of exams on student behaviour (called the "backwash" effect) is not as present in these students as is often expected and argued in education research (e.g. Boud & Falchikov, 2006).

DISCUSSION AND CONCLUSIONS

The aim of this study was to identify differences between two groups of students' experiences and attitudes to group-based project exams – in particular, whether the students preferred the group exam to the individual. As discussed above, given that our research method was a survey asking the students about their experience with the project exam, our research is not about formal curriculum (that is, how the project exam was formally intended to be), but it is a study of the students' experience of the informal or implemented curriculum and how the project exam was experienced. One usually anticipates that there is a connection between the formal and the informal curricula, but this is neither the focus of the study, nor something we can form conclusions about.

The study investigated the following research questions: (1) Do the students prefer the group-based project exam? (2) How do the students from the two different programmes perceive the

individual part of the group assessment? (3) How do the students compare the former individual project exam with the new group project exam? (4) Do the students experience that the examination format influences their behaviour during the project work, including preparation for the exam.

In relation to the first research question, overall, a majority of the students preferred the group exam even though the minority was quite large (34%). But we also found that there was a significant difference between students not having any prior experience with project exams and students who had been used to individual project exams ($p < 0.001$), with the older students being relatively more positive towards the individual exam than the first-year students. It is, therefore, a mixed student population when one-third of the student population prefers another type of exam than that offered by the university. One reason might be that the group exam was illegal during 2006–2012 and therefore AAU had to give individual exams.

In terms of the second and third research questions about how the students from the two different programmes perceived the individual part of the group assessment and the individual project exam compared to the group-based project exam, we found that the individual project exam, as experienced by the students, was not a perfect fit in terms of alignment to PBL. This means that both the formal and informal curricula here showed misalignment. However, taking a pragmatic standpoint, one might argue that AAU found a good second option when the preferred exam type was no longer available. Both types of project exams have merit, but on the other hand, when given the option of choosing between two types of exams, why not choose the exam format that by comparison is the better one? As stated in the introduction, we nevertheless suspected that engineering students are not alike in which type of exam they experience is the best fit. Ergo, a conclusion is also that there is *not* a "one size fits all" exam when assessing PBL projects, not even PBL projects in engineering, since engineering fields are quite different from each other. But the students mostly preferred the group-based exam, even when there were significant differences expressed among the A&D and SE students. Asking the students is one way of obtaining information. Other channels are also relevant, such as questionnaires and/or interviews with teachers, examiners and study board directors, as well as observation of different exams, and calculations of marks. In this paper, we only focus on how the students experience the situation.

The results from the study indicate significant differences between A&D and SE students for several of the variables in the survey. A majority of both A&D and SE students were, for instance, positive towards the group exam, but there was a significant difference in *how* positive they were, with the A&D students preferring the individual component. Furthermore, although both student groups agreed that the individual part of the group exam is important, overall, the A&D students significantly felt even stronger than the SE students that the individual part of the group assessment is important. The different views regarding the two exams is also reflected in the 48% of the A&D students who believed that they are less likely

to get a fair grade with the group exam compared to 21% who believed that they are more likely to get a fair grade with this exam, with the SE students showing the opposite pattern. These responses could either reflect that the group-based exam is, in fact, inadequate to fully secure a fair grade in architecture and design or that the exam in these programmes have not been managed properly. At least, this is how the students have experienced it.

As stated above, the A&D students had always expected more individualized study programmes and their profession afterwards might be expected to be more individualistic than that of the SE students. In that sense, one can argue that an A&D study's ILO should also be aligned with the profession; hence, it might be better for A&D students if the project exams could become more individual. On the other hand, one might argue that even though the A&D students express these views, the reaction does not necessarily have to be to adjust to the students' own perceived needs. Our conclusions are only based on the informal curriculum; thus, another option might be to enter into a dialogue with the students about these issues. If one could argue that the perceived informal curriculum resembles the formal curriculum, this might also be an argument for greater flexibility regarding how the project exam is conducted, with perhaps a need for a larger part of the four-hour project exam being individual than usually happens at present. This might also be a reflection of the fact that, prior to the reintroduction of the group-based project exam, FES held several seminars about the new exam and gave out guidelines. The idea was to describe *the* new group-based project exam, but perhaps FES needs not *one* group-based project exam, but several versions in order to properly assess the ILOs.

One might also argue that the exam was not managed properly, as also suggested just above in relation to giving marks. However, it does not make much sense to conclude that the reason for the difference is that the group exam was not properly managed for the A&D students. When the respondents were asked about their opinion on a number of other subject competencies – such as the possibility to get feedback on both the subject and the project management, explain concepts, show theoretical overview, show analytical skills, argue for methodological choices, relate various concepts to each other, transfer knowledge gained from the project to other situations and solve problems – there was no significant difference among the two student groups, and for all of these questions the majority of students favoured the group exam. Furthermore, a large majority of both student groups testified that the group exam gives them a better opportunity to show these project work competencies compared to an individual exam. The differences between the students from A&D and SE were not always significant.

It is interesting to note what exactly constitutes such differences in cultures among different engineering programmes. This study cannot reveal this, but only register that the differences do exist for the students very early in the study. However, the study raises questions about alignment and students' culture and approach to individual and collective learning.

The fact that students within one faculty are expected to learn quite different types of competencies is also seen in Brabrand and Dahl (2009) who investigated the competence progression stated in the course ILOs of different science subjects at two other Danish universities. They found that different subjects each had their own distribution of competencies they required from the students. Assuming that exams indeed test competencies fairly close to those prescribed in the ILO, it is not surprising that when asked about exams, students from different subjects behave differently and perceive the same exam type differently. We might argue that other types of students are, perhaps, even more different; the competencies they learn in their subject are different and, hence, they would perceive the oral group exam in their own way. This also includes the views of the examiners, which might affect the perception of the students. However, this was beyond the scope of this study but would be a future relevant route. Kolmos et al. (2013) conclude that there is not *one* dominant PBL Aalborg model. We might argue that perhaps AAU, as well as any other PBL university, needs even more different types of PBL models and assessment types to accommodate the quite different types of students and subjects.

A further result, relating to the fourth research question, was that we did not expect that one-third of the students would testify that facing a different type of exam than previously did not affect their behaviour at all. This might suggest that the "backwash" effect of exams on student behaviour is not as present in these students as is often expected and argued in education research. However, one might also argue that when students work in groups they might also prepare for the exam in groups – regardless of the type of exam – perhaps because they experience that this is the best way to prepare for an exam. On the other hand, it is still remarkable that one-third answered that there was no change in their behaviour *at all*.

With different exam formats, one would expect that this would create different student behaviour, just as seen above in responses to many of the other questions; hence, it is striking that this difference appears less when it comes to preparing for the exam. A hypothesis could be that the two types of exams were not really that different since both have individual components, although the group exam is carried out in the group with individual questions whereas the individual exam was conducted only with the individual student. In both exam formats, there were group presentations before the exam. Another hypothesis could be that when students become really motivated during a learning process, they are less oriented towards exams – or, phrased differently, the exam format in a PBL setting might not have the same influence and importance compared to more traditional course exams.

This raises some questions regarding the hypothesis on alignment in curriculum, and especially the importance of assessment. Educational change might be very difficult if all curriculum elements always have to be aligned. It might be that sometimes a misaligned curriculum fosters motivation for change. However, one might also argue that in a misaligned

curriculum it might be very difficult to foresee and prepare for how students might act, and in fact what they learn.

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