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## **Students and Supervisors' Views of Individual vs. Group Based Project Exams in Engineering Education**

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### **INTRODUCTION**

Aalborg University (AAU) has since its establishment in 1974 run a full scale problem and project based (PBL) curriculum – in principle with half of the students' time used in normal course lecture classes and the other half time in project groups. Those projects were assessed in group based project exams with each student receiving an individual grade. However, in 2006 the Danish government banned the use of group exams in the whole education sector. AAU therefore had to change its assessment of the projects to an individual project exam where each individual student sat alone with the examiners, one of which was the supervisor. During the last seven years, there have been several research studies on assessment methods in a PBL curriculum AAU [1,2]. The studies showed that both students and supervisors preferred the group based project exams. It was also clear that the students who had tried the individual project exam were more positive towards it than students who had not, but even this group also preferred the group based project exam. Results indicated that the individual exams were seen to be in contradiction to the intentions behind PBL. Another result indicated that in the individual project exam, there was a lack of assessment of core PBL competences as well as a lack of the overall response to students' project reports and results.

In 2012 a new government lifted the ban of group exams wherefore AAU reintroduced group based project exams from January 2013. The new group based

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project exams emphasize that it is now mandatory to have a part with individual assessment inserted into it. Therefore the new group based project exam at the Faculty of Engineering and Science at AAU consist of the following three parts: 1. Group presentation of the project. 2. Group discussion of the project where the examiners ask questions widely. 3. Individual part where each student individually is quizzed about issues in the project but the other group members are still present during this part. The grade of each student reflects the examiners' assessment of all three parts of the exam. In the past only the two first parts were always part of an exam, whereas the third part was only used by some of the study programmes at the Faculty of Engineering and Science. Groups usually consist of around six students. During the exam, the supervisor changes role and now becomes one of the examiners. The other examiner is either another academic staff member from AAU or someone from outside, determined in the study regulations.

We studied the first experiences with the new group based project exams to identify core issues. In this paper we particularly focus the individual assessment as this is an issue for group based assessment. How did supervisors (examiners) and students experience the individual assessment in a group based project exam? Do they believe that the group and individual part of the group based project exam each test important factors, and did the supervisors find it difficult to perform the individual assessment during the group based project exam. This includes investigating some of the issues with the group based project exam seen in the previous studies such as the possibility to hide and having enough time. We expected that the supervisors and students would be against the reintroduction of the group based project exam due to a critical debate prior to the reintroduction and due to a more general sceptism to change.

## **1 BACKGROUND**

### **1.1 Alignment in Problem and Project Based Learning**

The concept of alignment in education stipulates that assessment should be in coherence with the intended learning outcomes (ILO) and the teaching and learning methods. A course, or curriculum, is said to be aligned when the intended learning outcomes are formulated as operational competences, the exams measure precisely the ILO competences, and the teaching and learning activities match the ILO competences [3,4]. Assessment is a very influential factor in students' motivation and learning [5,6] and the assessment methods in a curriculum should therefore be carefully considered to support the learning methodology and the ILOs. Therefore, in a PBL curriculum such as the one practiced at AAU, the assessment methods should among other things be aligned with the team based and collaborative teaching and learning approach. In the literature, several studies report on assessment methods for group projects. [7] raise the issues of how we can effectively assess individual learning in PBL settings and emphasize that the individual assessment in a group setting might be experienced as problematic by many academic staff. [8] discuss various assessment practices and warn that assessment should avoid giving the students the impression that only individual achievement is important and that collaborative assessment has a touch of cheating. If this happens, they argue, the potential of PBL will never be achieved and this is one of the reasons that there should be alignment between learning and the assessment methods. [9,10] found that it is important in the assessment of PBL, and in particular project work, that students get response to both the content but also the learning process. Internationally, peer assessment of group learning is a method that is often used and for instance [11] finds that peer assessment can be used efficiently for assessing the

learning of group projects. In Denmark, however, peer assessment is not legally allowed as an assessment method for grading and only used for motivational and learning purposes. This type of assessment is therefore not part of the new reintroduction of group based exams.

Research on the change in 2006 from group based project exam to an individual project exam at AAU clearly indicated that students, academic staff, and external examiners preferred the group based project exams. Students and academic staff experienced that the changed practice to individual exams resulted in a missing feed back to the project results and a lack of test of core PBL competences such as collaboration and teamwork [12,13]. In general these studies concluded that the government's decision created a miss-alignment between the assessment methods the teaching and learning methods. [14] furthermore found that especially the external examiners from the private industry preferred significantly more the group based assessment system compared to external examiners from other academic institutions. In 2012, a new government again allowed the group based examinations and from the January 2013 exams, the group based project exams were re-installed and we decided to continue the study.

## **2 METHODOLOGY**

### **2.1 Questionnaire to first-year students and their supervisors**

In order to make comparison with some of the studies done since 2006, the questions in this survey were partly based on the old questionnaire. The questionnaire was piloted on colleagues and also sent to some students for comments. As part of the questionnaire, the respondents were given the opportunity to add personal comments. The quantitative analysis reported here was done using tools in SurveyXact and [15].

### **2.2 Response rate**

Two weeks after the end of all the January 2013 semester exams we sent questionnaires to all 1358 first-year students at the Faculty of Engineering and Science and all 115 supervisors of these students. After two email reminders, the response rate was 64% for supervisors and 36% for students. [16] argues that with a 95% confidence level, we can accept a response rate of 51% for samples of 1000-2000 students and 87% for samples of 100-150. [17] argues that a response rate of 33% is adequate for samples above 200 (95% confidence interval). Therefore, the response rate of this study is rather satisfactory, although both could be higher.

## **3 RESULTS**

### **3.1 The supervisors' views**

The result of the analysis was that 27% of all supervisors ( $N = 71$ ) answered agree or partly agreed to the question, if they preferred to have an individual exam and 31% ( $N = 71$ ) agreed or partly agreed that it was difficult to perform an individual assessment. This result indicates that the vast majority of supervisors were content that the group based project exam had been re-introduced and that they did not find that performing an individual assessment was difficult. However, even though the majority of supervisors did not find it difficult to perform the individual assessment, one can also argue that the fact that almost one third of the supervisors *did* find it difficult is a too high number and that this potentially jeopardise the validity of the students' grades.

Since the group based exams had been banned in 2006, a great number of new academic staff had been employed at AAU who do not necessarily know how the group based project exam was being done prior to 2006. We anticipated that the level of experience would have an impact on the supervisors' views and we therefore compared the group of supervisors who had tried the former group based project exam ( $N = 37$ ) with those who had never had any experience with it ( $N = 21$ ). This group had not themselves been students at AAU, external examiners at AAU, or met a group exam elsewhere. The result was that 60% (see Figure 1) of the inexperienced supervisors preferred an individual exam where the student sits alone with the examiners while only 9% of the experienced supervisors agreed or partly agreed to this question.



Fig. 1. Experienced and inexperienced supervisors' answers to: "Do you agree or disagree to the following statement: I would prefer an individual exam."

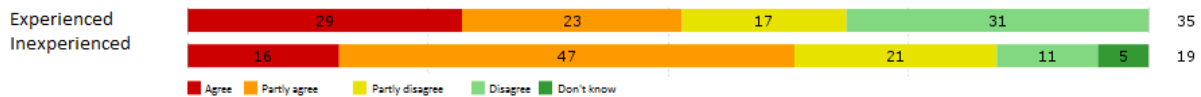
Also 60% of the inexperienced supervisors (see Figure 2) found it difficult to perform the individual assessment whereas only 20% of the experienced supervisors were of this opinion.



Fig. 2. Experienced and inexperienced supervisors' answers to: "Do you agree or disagree that it was difficult to perform an individual assessment of the students?"

The difference between the two groups' opinion was investigated through a chi-square test of independence. Since such a test assumes that the expected counts in each cell is not less than five, and the number of supervisors who had responded is relatively low, the categories agree and partly agree as well as the categories disagree and partly disagree were combined. We found both relationships to be significant:  $\chi^2(1, N = 53) = 17.73, p < .001$  and  $\chi^2(1, N = 58) = 7.64, p = .006$ ; respectively. We can therefore reject the null hypothesis that there is no relationship between experience and view of individual exam; and experience and view of difficulty to perform an individual assessment. The test, however, does only indicate that a relationship exists between these variables, not the exact nature of such a relationship. On the other hand, we will argue that it seems that the level of experience affect the answers to these questions and that inexperienced supervisors were much less positive about the group based exam and the possibility to perform individual assessment. Furthermore, even though experienced supervisors were much more comfortable doing the assessment, one in five still found it difficult which in itself can be regarded as too high.

In terms of the question if the individual and group based part of the project exam (part 2 and 3 mentioned above) each test important factors, 49% of all supervisors ( $N = 70$ ) agreed or partly agreed. There was not a significant difference between the experienced and inexperienced supervisors on this question:  $\chi^2(1, N = 53) = 1.12, p = .289$  (see Figure 3). We can therefore not reject the null hypothesis here, and therefore it appears that experience did not relate to their views of if the individual and group based part of the exam each test important factors.



*Fig. 3. Experienced and inexperienced supervisors' answers to: "Do you agree or disagree to the following statement: The individual and the group based part of the exam test important factors that each are important for a correct assessment."*

This indicates that experience influences their views and that many who were against the individual project exam are positive about having an individual part of the group based project exam.

In order to further explain these statistics we looked at the specific comments offered by the supervisors. In terms of performing an individual assessment as part of a group exam, one supervisor wrote the following comment (translated from Danish by the authors): *"I think it was possible to distinguish between them. In a way it is actually easier when we have them all in the same room compared to when there come in one by one. But it requires a good overview!"* The supervisors generally reported that difficulties around the individual assessment were related to a feeling of not having enough time to get into the depth or not being properly prepared to for instance fail a student. Another supervisor wrote the following comment: *"It was difficult to point to the students who ought to fail. If the student did not answer a question, I did not feel adequately prepared to argue for failing the student, even though the student was asked a number of individual question without giving a proper answer to them"*. Other supervisors point to the fact that they feel the students had not been properly prepared for this type of exam.

Some of these problems such as maintaining a good overview, having enough time, and being properly prepared to be able to judge when a performance is below passing is not problems that only relates to group based exams. In any type of exam, the examiners must be properly prepared and have enough time to do the assessment. This might also to some extent explain why the inexperienced supervisors were the most critical ones. It might not be unexpected that the inexperienced supervisors had these views, but the fact that a relatively high number of experienced supervisors found the individual assessment difficult to perform gives rise for concern. Some of this might be explained by the same factors as above, namely not having enough time to perform the assessment or perhaps not feeling prepared for the new third part of the group based assessment, which was new to all supervisors. This points to the importance of being prepared to do the assessment. If not, the alignment is only alignment on paper – not in reality. However, in general the vast majority of supervisors did not want the exam to be an individual exam.

### 3.2 The students' views

The result of the analysis was that on the question about the possibility of hiding during the group discussion, it appears that 27% of the students agreed or partly agreed that this was possible. 77% found that they have enough time to tell what they know about the project, while 54% also feel they should say something before they have finished thinking. 83% were at least partly satisfied with their own grade and 63% also at least partly agreed that all group members got a fair grade. 65% answered agree or partly agreed that the individual and the group based part of the group exam each test important factors. Also only 20% of the students would prefer just to have an individual exam (see Figure 4). Hence it appears that the students are vastly satisfied with the type of exam, the grades given, and the fact that there was an individual part of the group based assessment.

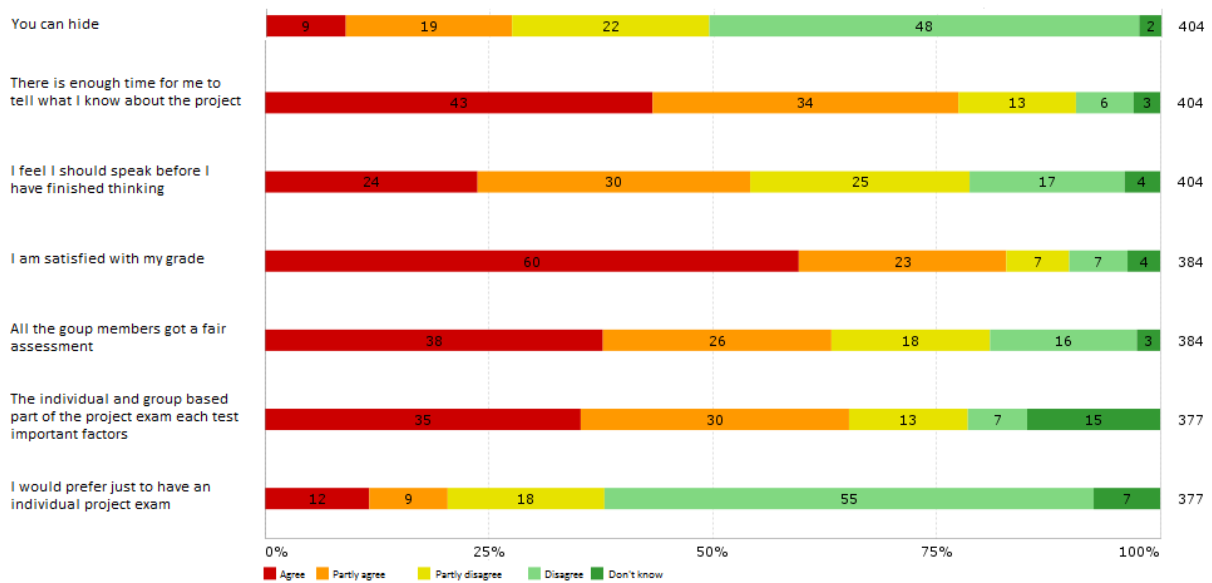


Fig. 4. Students' views of the exam and the assessment. The specific questions are mentioned left of the figure.

This again shows that generally speaking the first round of the reintroduction of the group based project exam went rather well.

In order to get more ideas on what lies behind the statistics, we also investigated the students' written comments in the questionnaire. In terms of the possibility of "hiding", one student remarked: "*Some hide behind others in the group since they do not know the material well. They come with flimsy and vague answers to direct questions. Their grades might get higher than they ought to be*". It appears however, that although this phenomenon occurred, in general the students find that their group members got a fair assessment. More than half the students find they have enough time to speak, apparently even though they also feel they need to start speaking before they have finished thinking about the answer. Only 7% of the students are not at all satisfied with their grades which indicate that although there are problems, overall the students are content with the exam. Going back to the discussion about the difficulty of performing an individual assessment, particularly by the inexperienced supervisor, it seems that the students nevertheless are satisfied with both their own grade and their group members' grades.

Some general statements about the group based exam were the following: "*What I like with a group exam is its depth. The examiners really search deeply into the knowledge of the group to dig all its resources up. However, the difficult part is to make the interplay in the group work. Often someone will try to get to say something relevant while someone else tries to lead the discussion to another place. Even though supervisor and external examiner to a large extent tried to keep track on this, it is my impression that the group needs a really good interplay and evenly distributed speaking abilities to make the individual assessment representative*". This statement points to some of the problems moderating a group exam but also the good possibility of getting into the depth of knowledge.

In the section above, we discussed the difference between experienced and inexperienced supervisors. This is supported by a statement of a student: "*The group discussion was moderated very well by our supervisors and benefited from the fact that they were experienced and had tried it before*". Another student had the quite opposite experience: "*I think the joint discussion got out of control since the most dominating students interrupted as soon as the supervisor and external examiner*

*had asked a question. I was left with a feeling that they had already said what I had intended to say, but did not get time to say. I had the feeling of being over-run because I was not fast enough to respond*". These student experiences appear to fit with some of the answers given by the supervisors who indicate that it requires a good overview to perform the assessment and that experience have an impact on ability to moderate the groups.

#### 4 DISCUSSION AND CONCLUSION

The first conclusion on how the re-implementation of the group based project exam went at the Faculty of Engineering and Science at Aalborg University is positive overall and our expectation for more negative approach to this type of exam has been groundless. Both students and supervisors appear to prefer this type of exam compared to a purely individual exam. However, the individual part during the group based exam is judged to be valuable. In terms of alignment, having both a group and individual part of the assessment might lead to an even higher alignment as some of the learning objectives of a PBL project are relating to principles, others to the individual student's knowledge.

This study also points to a problem when introducing such a type of assessment. Supervisors need to be properly prepared to perform such assessment – if not the supervisors are not able to moderate the group exam and giving an individual grade becomes difficult. In this case, the alignment is only on paper – not in practice. Even if there has been a lot of introduction and possibilities for training (as has been done at AAU), the learning is created and followed by experience. It is not surprising that academic staff members being asked to perform a type of assessment they have never tried before, are not too positive about this type of assessment. In fact, the opposite would have been a quite unexpected result.

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