

# **DEVELOPING AND ASSESSING GROUP DESIGN WORK: A CASE STUDY**

**Dr Patrick Barber**

## **ABSTRACT**

The paper deals with the complex issues surrounding the development and usage of group work within the teaching of Engineering and Product Design. Group working is a proven and effective way of producing high quality design work yet it is a hard skill to learn. The teaching of group work is complex and difficult as it requires the development and assessment of both individual and group skills. The paper draws on the authors experiences and offers a selection of practical suggestions to improve the usage and development of group work

*Keywords: Group work ,Engineering Design, Development*

## **1 INTRODUCTION**

Being able to operate in a team or group is essential for any designer, as the majority of design work is done within teams. The problem is how can effective team work be developed, and individuals performance assessed as effective team work often masks the work of individuals. This problem became apparent to the author whilst teaching the Engineering Design module at The University of Derby[1]. In this module the students have to work in a group in order to complete the task but an individual mark has to be provided.

The paper explores the reasons, why team working skills are difficult to develop and why students tend not to like operating in groups. It then goes on to show how team working skills can be developed and methods of assessing an individuals contribution to a group.

## **2 THE REQUIREMENT FOR GROUP WORK**

The use of groups or teams in design work has been a common theme for many years as it has been found to be the best method of producing high quality engineering design work, especially if multi-disciplinary teams are used. This is due to a number of factors which make a team more effective than the sum of its parts. These factors being:-

- A selection of different views on how the product/ component should be designed e.g. its aesthetic quality's versus the ease of manufacture.
- A wide range of knowledge and experience is contained within a well developed group which can be brought to bare on the design problem, so allowing the problems to be tackled from a variety of view points
- A group provides a means on which ideas can be developed by more than one person in the group so increasing the effectiveness of the group

- Groups can often develop products/ components faster than using other methods as the whole process can be done within the group, so allowing a faster, more compact, product development process

These attributes of group work mean that it has become the development method of choice for many companies and industries over the past 20+ years and so group working skills need to be developed within engineering design courses[2].

This means that to prepare students for employment a well developed and industrially focused design course requires a large element of group work within it and needs to develop the students group working skills. Group working skills are developed late in a persons life, often only after they have passed their teenage years, in addition the current education system means that students often have little experience of working in groups before starting a University course.

### **3 BARRIERS TO GROUP WORK DEVELOPMENT**

Having identified the need for group work, the next step was to determine and analysis the reasons why group work is so difficult to develop effectively within the majority of university design courses. The barriers were identified by means of the authors own observations and experiences of teaching engineering design at undergraduate level and interviews and comment from current and pasted students about their experiences of group work. The author also used knowledge gained about the current educational environment within the schools sector[3] as it was determined that students from this environment were the ones not engaging fully in group working activities.

The following are the barriers to group work that have been identified:-

- Exams, the majority of students coming from a school background are used to constantly sitting exams from the age of 14. In many cases been put under considerable pressure by the school and parents to perform well in these exams. This leads to students becoming focused on exams and passing exams and in order to achieve this they develop good short term memory and fact assimilation skills, but often they cannot apply the knowledge well or communicate it.
- The other commonly used means of assessment within schools is course work, here the emphasis is on the individuals efforts and again it is often the ability to transfer of facts from the student to the assessor, that is being assessed. The emphasis is again on the students individual efforts.
- The often talked about culture of “continuous assessment” within schools means that students are often convinced that there is a “score for everything” again the emphasis is on individuals and little on how they work in or as a group.
- The “blame culture” that is prevalent in the UK currently means that if a student is working poorly in a group then there is always someone else to blame, this often leads to a large amount of arguing within poorly performing groups.
- The fear of getting a “slacker/passenger” within your group connected to the above problem means that students often do not want to participate in group work as “all their work” is credited to the rest of the group.
- The issue of “Fairness” as all the above issues mean that students feel that they are put at a disadvantage if they have to work in a group and not individually.

These issues and barriers mean that it is extremely hard to get students to consider group work as a worthwhile exercise as they see it as a way in which their marks could be reduced. They also find the extra work of keeping the group together and working on the same objective very hard and so tend to give up on it.

With these elements identified it was felt that the next step was to look at the experiences of students and teaching staff when it came to group work and to see how these experiences mapped onto the barriers which have been identified above.

#### **4 GROUP WORKING EXPERIENCES**

The experiences shown here have been observed and recorded by the author over 3 years of teaching engineering design and through the experiences of other members of staff teaching on the same programmes. In order to understand what is happening with group work, both from the perspective of the student and the lecturer running the module. It became clear that neither the students nor the lecturers were gaining much in the way of positive experiences from the use of group work.

##### **4.1 The student experience**

The students first worry when confronted by group work is “who’s going to be in my group” this is always a problem, it does not matter if the groups are selected by the lecturer or the students as in both case someone the student doesn’t want or know could end up in their group. The fact though is that in industry they will often have to work with people they do not like or respect.

The next problems students face is finding and communicating with their group as often they cannot find, or claim they cannot find, certain members of their group. This appears to happen most when students are placed in groups with people they do not know. This situation leads to the group splitting into two or three disparate sections which never appear to meet and who blame each other for the problem. This then leads to petty arguments and the students worst fear, low marks.

Once the group has been formed and the above two problems have been hopefully overcome in the students eyes the next part is seen to be reasonably easy as it involves the development of the project often with a deadline which is felt to be a long way off. Here it is often liked by the students if a clear leader appears in the group to help them along and organise the required tasks, if this does not happen then often the group will drift along with little being actually achieved.

With the development period over the next big problem in the students eyes is preparing the work for submission, here the deadline often creeps up on them and if the group by this stage is not very coherent then a wide range of problems happen, including lost work miss-communications and elements being missed. Some examples of what can happen in this situation are:-

- One member of the group deciding that the rest have done nothing and so doing all the work themselves, then becoming angry with the rest of the group for either doing the work later or letting them do all the work.
- Elements of the group disagreeing with the rest of the group and producing a counter proposal/ second submission
- The “unfound” members of a group doing nothing and then appearing for any final presentations/interviews and taking credit for the work and nobody in the

group voicing any opinion on this for fear of causing trouble and so being marked down.

- The last minute rush to complete the work leading to duplication of effort or missing sections. The worst being missing sections were everybody thought somebody was doing that particular part.

Often leading to splinter groups, accusations etc being cast about. This is the nightmare situation for a student as they see their grades been affected and the lecturer doing nothing about it.

All this means that the average student dreads the development of work for a group project as it can go wrong so easily in their perspective. The workings of the group also perplexing the student.

The final area of trouble for students is the assessment of the final output as all students tend to feel hard done by when they receive their final mark. Often they feeling that their mark does not represent the work they put into the project. Students feel that other members of the group “pulled down” their mark, by not doing as good a job as them, or that the lecturer marking the work did not notice their contribution to the work as it was masked by the rest of the group, often they feel a sense of injustice as the “slackers” in the group somehow got the best marks.

All these experiences mean that the student experience of group work is often a negative one with little positive benefits from their point of view.

#### **4.2 Lecturers experiences**

The lecturers that the author has interviewed about this topic and including the author, have all had bad experiences when dealing with group work, often finding that it is more demanding and time consuming than any other type of teaching or assessment.

The first problem faced by lecturing staff is the choosing of the groups, this is a potential mine field due to the issues outlined in the students experiences. Proactive students will often lobby the lecturer to be placed into the group they want, on the other hand the vast majority of students will just leave it up to the lecturer. The lecturer also has the added problem of whether to mix full and part time students or to segregate them. Experience has shown it is best not to mix them as these two types of students almost live on different planets in terms of work effects, motivation and social life.

Once the groups have been selected the next problem is how do you know if the group is actually working together or if they have even found each other. In the current situation of ever increasing demands on lecturers time this is becoming increasingly difficult to monitor and influence. Many lecturers use a lassie faire approach, waiting for the students to come to them with problems and then attempting to sort it out. This approach works but the lecturer can only know about the problems that are brought to their attention.

The next stage is to monitor the progress of the groups in the experiences of those lecturers questioned. This is a very difficult process as unless the students are formally assessed on their progress they will not provided much evidence to the lecturer.

At this point the worst problems of all from a lecturers point of view, in the authors opinion, start the “bickering”. Students in the groups begin to fall out with each other and make decisions on who they feel is a “waster/ slacker” in their group and then start to make moves to rubbish that person or get them removed from their group. This places the lecturers under a great deal of pressure, as you cannot be sure the stories you are been told are true in addition one of the objectives of group work is for the student to

learn to work with people they don't like. This leads to the feeling within the student body that the lecturer does not care in the authors opinion. There appears little a lecturer can do about this problem.

The next stage and the most time consuming and possibly the most critical for the lecturer is the assessment stage. Here the student requires an individual mark for their work. It is often very hard to develop this mark as it is often unclear as to the contribution a student has made. This means that the members of a group often end up getting the same mark. This mark is then disputed by individual students so leading to a long winded appeals process. That has been known to roll on for a whole academic year or more. This difficulty in providing an individual mark also encourages "slackers" as they feel they will get a good mark as the rest of the group will drag it up for them.

These problems mean that the whole process of group work tends to leave the lecturers feeling lost and not in control Lecturers feel it is hard to monitor what is happening and even harder to determine a fair assessment for each student and the "bickering" which is often directed at the lecturer, which makes the lecturer feel like a referee.

## **5 INDUSTRY'S VIEW**

The use of group work is wide spread throughout the industry's[4] that the students from Derby are likely to working. This means that the students have to learn how to operate effectively in a group and group work must form part of the academic courses. This view is always emphasised by visiting employers who say that they require people who can work well in groups and have the ability to communicate their ideas well.

## **6 THEORY**

The current literature shows that group work is considered to be an effective way for students to develop skills and learn. The theory works on the principle, that people learn better in a group, as they gain information and advice from their peers within the group. These elements work effectively once the students have learnt how to operate in a group.

The current theory on group working shows that it is a skill and that it is developed late in human terms, the abilities required only being developed during the late teens[5]. This means that by the time many students start University they have not fully developed their group working skills and as highlighted earlier in this paper it is a set of skills that is not practiced regularly in schools.

These factors mean that group work is a skill that students are still developing when they start a University course. Group work needs to be treated as a skill to be developed and not as something everybody knows how to do as is currently the case on many courses. This though does pose a problem as it becomes yet another item that has to be added to the curriculum.

## **7 IMPROVING GROUP WORK**

So far this paper has investigated a set of negative issues surrounding group work and its usage, the paper will now show the methods used at Derby University to improve the situation in order to make group work an effective way for students to learn. All the methods listed below are used by the author and his colleagues to develop the group working skills of their students and to improve the overall outcomes of the work produced.

### **7.1 Training in team work**

The aim here is to develop the students awareness of team work as a specific skill, many students have very little perception of what is actually happening within a group and how to behave in one. The training demonstrates to them group dynamics, Belbins[6] team types and how to gain from a group exercise. This type of training also has to deal with conflict resolution and dealing with people you do not like/ know. Typically this training takes the form of a series of lectures and group working seminars.

### **7.2 Group makeup**

The students within a group can make a great difference to its performance. It has been found through trial and error that mixing up groups so the same students don't always work together is an effective way of improving a students group working skills. They are forced to communicate with, and work with, different sets of people. This approach though is not popular with students as they get used to working with one set of people. Problems have been observed with mixing full time and part time students, they tend to operate with completely different mind sets, different motivations and time available to do the project. This means that it is best to keep these two groups of students separate but again to mix them up within their peer groups.

This approach has been used by the author to good effect within the engineering design module. The method (like all methods tried), will cause friction within the student body during the initial stages as they are often not happy about the makeup of there group. It has been found that a getting to know your group session is beneficial in this case as a way of reducing the number of lost group members.

### **7.3 Supervised sessions**

This technique has proved effective in creating group coherence and focuses on the task in hand. The method relies on the lecturer being present for the first 3 or 4 group meetings which are arranged with the lecturer. These meetings are of a formal nature with a chair and minutes being taken. To replicate to students the different "roles" they may need to play in a group. The chair is rotated at this stage so allowing all the group members to have a go at being the chair. The minutes of the meeting are circulated round all those who attended. In order to encourage the students to attend 5% of the modules mark is attributed to their performance/ attendance at the group meetings.

Once these initial meetings have been done then the students are left to conduct their meetings without a lecturer present however to make sure that they are still running effective meetings the students are expected to submit copies of the minutes to the lecture and to continue awarding marks to the members of group for their performance within the meetings.

### **7.4 Assessment methods**

This is the hardest area of group work to deal with as it is often very difficult to ascertain the true value of an individuals input into a group. The particular assessment systems in use in many University's, including Derby's, demand an individual mark for each element of work, so making the need for a means of determining each individuals performance vital.

The method the lecturer has had most success with is a combined assessment strategy were the group has to present its work to the lecturer and each individual within the group has to produce a report detailing what they have done towards the project plus a peer assessment form. The concept behind this approach is to discover how well the

students worked as a group through the presentation and to determine their individual contributions through the report. This method has worked well as it shows up good and bad group working. Groups which have functioned well produce reports that show this through evidence in the reports and ones that have worked poorly do the same. This approach allows an individual mark to be generated for each student which the author is confident reflects that students abilities.

The peer assessment is used as a final guide to what was happening within the group. The authors experiences and those of colleagues has shown that this method of assessment can be problematic as students often do not want to give bad marks to there fellow students, who are often their friends or they will have to work with them again, so in the authors opinion this method of assessment can only be used as a guide.

## **8 CONCLUSION**

The paper has demonstrated that there are a large number of challenges in the use of and development of group work, but to effectively prepare students for industry means it is an essential element within any Engineering Design course. The findings drawn from the authors and colleagues experiences show that it is an element of the course that has to be taught and developed through the whole curriculum, for it to be at its most effective.

The main areas of concern which have to be addressed are the students negative attitudes to group work and their often very low level of experience in operating as a group. These factors mean that when they attempt group work it does not go well so helping to reinforce the negative attitude. In order to improve the student morale they have to be taught how to work as a group and be provided with some positive experiences of group work.

## **REFERENCES**

- [1] Barber P R, Development of Concept Designs for a Disaster Relief Shelter a Student Project, 25<sup>th</sup> SEED Annual Design Conference, September 2003 Bournemouth University, Bournemouth, UK , ISBN 1 86058413 6
- [2] Smith P G Reinersten G D, Developing Products in Half the Time, Van Nostrand
- [3] Ellis Edwin J The Scope and Limitations of Using Performance Data to Improve School Effectiveness 2002
- [4] Teamwork:m Success Through people, Advisory Booklet ACAS, September 1996
- [5] Rust C Wallace J, Helping Students to Learn from Each Other, SEDA 1994
- [6] Belbin, R M, Team Roles at Work, Butterworth-Heinemann 1993

Contact Information:

Dr Patrick Barber,  
School of Arts, Design and Technology  
University of Derby  
UK  
Email: [pr.barber@derby.ac.uk](mailto:pr.barber@derby.ac.uk)

