Issues in Organisation and Management of Multidisciplinary Group Design Projects

Ken Keating  
Technological University Dublin

Claire Brougham  
Technological University Dublin, claire.brougham@tudublin.ie

Graham Gavin  
Technological University Dublin, graham.gavin@tudublin.ie

Ger Reilly  
Technological University Dublin

Follow this and additional works at: https://arrow.tudublin.ie/engschmanconn

Part of the Engineering Education Commons

Recommended Citation

This Conference Paper is brought to you for free and open access by the School of Manufacturing and Design Engineering at ARROW@TU Dublin. It has been accepted for inclusion in Conference Papers by an authorized administrator of ARROW@TU Dublin. For more information, please contact yvonne.desmond@tudublin.ie, arrow.admin@tudublin.ie, brian.widdis@tudublin.ie.

This work is licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 License
ISSUES IN ORGANISATION AND MANAGEMENT OF MULTIDISCIPLINARY GROUP DESIGN PROJECTS

Ken Keating, Claire Brougham, Graham Gavin, Ger Reilly

SCHOOL OF MANUFACTURING AND DESIGN ENGINEERING
DUBLIN INSTITUTE OF TECHNOLOGY, IRELAND
The BSc in Medical Device Innovation

Dublin Institute of Technology

Different to a typical undergraduate programme.

- Varied age, experience, and demographic profiles

Provides up-skilling for the unemployed from various educational backgrounds

- Design, science and engineering

The traditional working boundaries involve

- Engineers, designers, scientists, medical professionals and business professionals
Multidisciplinary Groups in Biomedical Device Design Industry

- Crossover between science, design and engineering
- May be geographically disparate from each other and may initiate, exist, evolve and devolve over the life of a project.
- Exchange and interaction of knowledge within the team is a central component of effective team working
• Different perspectives and specialist skills.
• Communication and management is an essential

• Individual Motivations
• Clashing personalities and egos

• Lead to different thoughts and actions

• Influences a person’s level of collaboration


Design Process

Task processes

Collaboration processes,

Outcomes generated
Cooperative learning

- Less interdependence
- Tasks heterarchically divided
- Individual identity more important
- Expect to be assessed primarily on own contribution
- Failure to reflect individual effort promotes laziness and irresponsibility in others

Collaborative learning

- More interdependence
- Tasks and processes encourage a high degree of interdependence
- Students accept that their group identity is more important
- Expect to be assessed on the quality of the group performance
- Generally content with their peers assessment of their performance.

Student Expectations and Perceptions

Collaboration, Contribution, and Performance

Peer-assessment
Self-assessment

Focus of Paper
Statements, Observations and Comments Extracted from

<table>
<thead>
<tr>
<th>Project Stage Reports</th>
<th>Performance Appraisals</th>
<th>Interview Reports</th>
</tr>
</thead>
</table>

Data Collated Under The Following Categories

<table>
<thead>
<tr>
<th>Collaboration, Contribution</th>
<th>Interpersonal Dynamics</th>
<th>Expectations, Motivations</th>
<th>Evaluation Perceptions</th>
</tr>
</thead>
</table>

Questionnaire Developed Asking Questions on the Following Themes

<table>
<thead>
<tr>
<th>Collaborative Activities</th>
<th>Group Skills Developed</th>
<th>Personal Expectations</th>
<th>Difficulties Encountered</th>
<th>Conflict Management</th>
<th>Freedom of Expression</th>
</tr>
</thead>
</table>
Qualitative Comments and Quantitative Evaluation of Contribution and Performance
<table>
<thead>
<tr>
<th>Students Assessment Process</th>
<th>Tutors Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Distributed 100 points between the group</td>
<td>• Marks for group/individual team performance</td>
</tr>
<tr>
<td>• Peer marked each stage of the design process</td>
<td>• Marks for each stage of the Design process</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students Assessment Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perceptions of group performance</td>
</tr>
<tr>
<td>• Comments on individuals contribution to tasks</td>
</tr>
</tbody>
</table>
Data Apportioned to the Following Categories

- Expectation
- Perception of performance
- Perceived contribution
- Assessment
<table>
<thead>
<tr>
<th>THEY EXPECTED</th>
<th>THEY DID NOT EXPECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• work to be allocated equally</td>
<td>• collaboration to be so much hard work</td>
</tr>
<tr>
<td>• hard working groups people attending meetings, handing work in on time</td>
<td>• lazy people doing very little work</td>
</tr>
<tr>
<td>• members to be polite, show respect to one another</td>
<td>• conflict</td>
</tr>
<tr>
<td>• everyone to work away on their own tasks</td>
<td>• everyone having a different perspective</td>
</tr>
<tr>
<td>• groups to be well organised and efficient</td>
<td>• so much time wasting</td>
</tr>
<tr>
<td>• everyone sharing the same goals and standards</td>
<td>• everyone needed to be treated differently and let be themselves</td>
</tr>
<tr>
<td>• better communications, agreed leadership</td>
<td></td>
</tr>
<tr>
<td>• everyone would have a similar level of interest</td>
<td></td>
</tr>
</tbody>
</table>
Groups that fell into this category had a poor correlation between the individual self-assessment of their performance and their performance as assessed by their peers in the group.

Leadership inadequacies became significant barriers to successful collaboration in setting and achieving group targets.

Poorly managed groups had difficulty performing and poor communication appeared to be the most serious impediment to good group management.
Correlation between Group and Individual Perception of Performance

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>0.17</td>
<td>0.69</td>
<td>0.01</td>
<td>0.57</td>
<td></td>
</tr>
</tbody>
</table>
Large Impact
- experience, particularly experience in relevant technical skills

No Impact.
- Gender, age, and culture
- Group Size (3-5)

Issues arising
- leadership,
- cliques,
- exclusion
- perceived position in the group hierarchy
Group Members Recognised The Absence Of Leadership

Confused Control with Leadership

‘after six years in industry I know what I am doing and they don’t’.

‘it is impossible to lead this team’

‘I am not going to let a group go down a path I believe is incorrect or inaccurate’.

‘taking control was required’,
Group’s Collective Self-assessment

Average of Student’s Individual Self-assessment
Assessment

Group assessment of group performance
Average of student's individual self-assessment
Tutor's assessment of group performance
Team and Individual Assessment

Research & Concept Generation Stage

![Bar chart showing average individual assessment and group assessment for A, B, C, D, E. Bars for each individual are blue for average individual assessment and red for group assessment.]

- **Average individual assessment**
- **Group assessment**
Team and Individual Assessment

*Detailed Design and Prototyping Stage*

Average individual assessment

Group assessment
Project

Self- compared to Peer-Assessment

Weaker students

Stronger students

Self-assessment

Peer-assessment
Module Exam

Weaker students

Stronger students

Tutors Mark

Student Expectation
• The learning process
• The design process
• The design product

• The principle issues encountered

• Through the recognition
• Communication
• Reflection of the issues
Fewer issues in traditional problem areas such as

- Student motivation
- Initiative
- Quality of individual work

More issues related to

- Interpersonal relationships,
- Personal expectations in group-work
- Group dynamics
- Group management/decision making
- Pacing of the group project against a characteristic time schedule
Groups that collaborated well often performed well and achieved more than the sum of their parts.

Strong leaders could manage or dominate depending on the level of the collaboration in the group.
Otherwise Students May.....

- Inadequately understand the processes and criteria involved in learning and assessment.
- Be poor at evaluating their own performance.
- Overestimate their contribution to group activities.

For Successful Collaborative Work

- Reward contribution and encourage peer learning
- Acknowledge that group learning is messy, appreciate the difficulties
- Allow time for reflection and non-thinking time for ideas to evolve and grow
- Structure assessment processes with clear guidelines, and prompt feedback
- Developing a shared interpretation of the design problem and the design process
- Share the passion for the practice of design
- Promote realistic expectations and performance evaluation
- Intervene to correct and moderate unrealistic expectations or distorted self-evaluation where necessary
<table>
<thead>
<tr>
<th><strong>Tasks a tutor must perform in collaborative learning include</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Helping the group to formulate a coherent picture of the topic</td>
</tr>
<tr>
<td>• Sometimes redirecting the focus of discussion</td>
</tr>
<tr>
<td>• Encouraging and supporting contributions from the group</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Roles a tutor must play to accomplish this task include</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Observer</td>
</tr>
<tr>
<td>• Leader/instructor</td>
</tr>
<tr>
<td>• Neutral chair</td>
</tr>
<tr>
<td>• Facilitator</td>
</tr>
<tr>
<td>• Counsellor</td>
</tr>
<tr>
<td>• Commentator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Skills a tutor needs to carry out these roles include</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Asking</td>
</tr>
<tr>
<td>• Testing</td>
</tr>
<tr>
<td>• Clarifying/elaborating</td>
</tr>
<tr>
<td>• Bringing in and shutting out contributors</td>
</tr>
<tr>
<td>• Turning questions back on the group</td>
</tr>
</tbody>
</table>
David Jaques summarised group learning as ‘learning to be’ rather than ‘learning about’.

Collaborative group learning requires the creation of an all-embracing context, the stage, for the individual ‘to be’ on.

The set must be designed to encourage the development of requisite behaviours, skills, and sensibilities needed to collaborate successfully.

The roles are interchangeable, and the dialogue does not exist but will develop as the plot unfolds.

The tutor gives the stage directions and writes the reviews.

Thank You