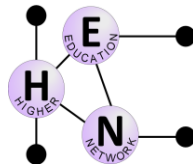


Improving Communication and Group Work in Engineering Design Projects

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Aim

- This talk explores communication issues in **Petroleum Engineering design project groups** with the aim to **improve group work** and to **identify good pedagogic practices** in this area.



Outline

- Introduction
- Design Projects overview
- Assessment and Feedback
- Projects Outcome Examples
- Communication Issues
- Proposed Strategies



Introduction

- Petroleum Engineering Design Project BEng (CAPE3010) is a compulsory module for level 3 Petroleum Engineering students.
- The module is a major component for level 3 Petroleum Engineering. It has the highest number of credits (40 credits) in the BEng programme. It runs over both semesters.
- The module is co-taught between staff from the School of Chemical and Process Engineering (SCAPE) and School of Earth and Environment (SEE), each with a particular expertise:
 - David Harbottle, Ali Hassanpour, Thibaut Charpentier (SCAPE)
 - Paul Glover, Piroska Lorinczi (SEE)
 - External consultant: Nick Shaw

Module overview

- Module is concerned with the **field development plan** of a **hydrocarbon reservoir** in line with the degree programme.
- It involves review and selection of a **production strategy**, **data collection**, **reservoir simulation** and **estimation of production profile**, **design of drilling** and **well completion** as well as **surface processing units**.
- **Health and safety**, as well as **environmental aspects** are considered in order to minimise risks; **project management** and **cost/financial evaluation** are undertaken to assess the economic viability of the project.



Fig. Carbonate reservoir analogue, UK.

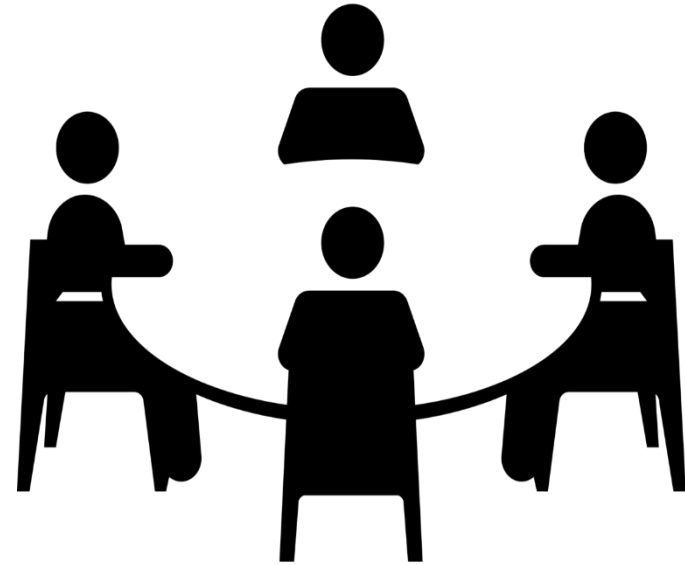
Project Groups

- Students are split into groups; typically **8-10 students** in a group. Typical cohorts: 30-40 students; commonly 4 groups.
- The **allocation of students** into groups is done based on:
 - students' **performance** from level 1-2, to ensure that each group has a similar number of students who obtained a 1st, 2:1,....
 - number of **native English speakers**: native English speaker students will be equally distributed amongst groups.
- These criteria ensure that the groups to have a **similar performance level**.



Design Projects: Meetings

- There are several meetings that each group is required to attend:
 - One **weekly group supervisory meeting**: with all supervisors, where the group comes with a list of questions to ask the appropriate staff members.
 - **Two** (or more, if necessary) **weekly group meetings**.
- Each group is required to set up a **group manager** and a **secretary**. **The manager** leads the discussion in the supervisory meetings and **the secretary** writes minutes for each meeting.
- The meetings are trying to mimic a **real oil and gas industry working environment**.





Assessment

- The assessment has several components; major components:
 - Semester 1 (40%): Part 1 report: 40% – group contribution
 - Semester 2 (55%): Design report: 40% – individual contribution
Part 2 report 15% – group contribution
 - Final individual presentations
- Students are required to provide an online **peer assessment** for all group members on a regular basis (every 2 weeks).
- Each student's mark will incorporate a component based on the **peer assessment** from the rest of the group members.



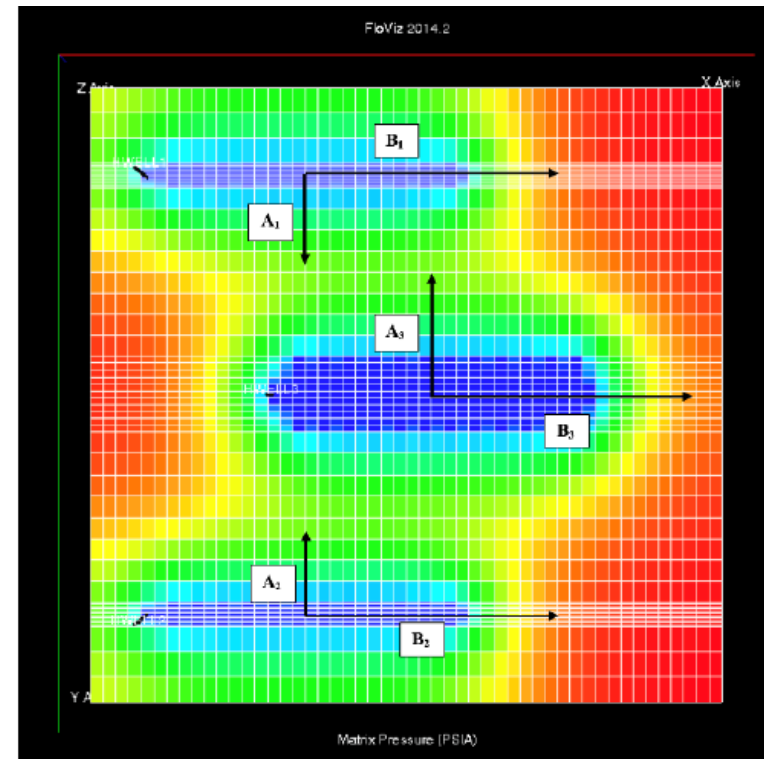
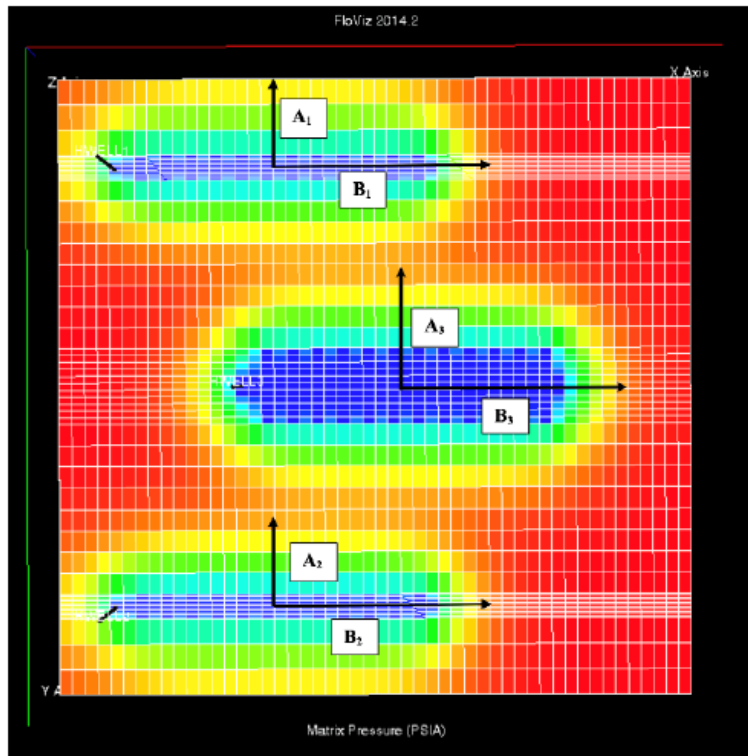
Feedback

Students' progress is monitored via:

- Submission of a **project plan** – with sections allocations, based on students' choice (semester 1)
- **Group presentation** of preliminary results (semester 1)
- Part 1 report (week 11, semester 1)
- Plant Equipment Design report (week 21, semester 2)
- **Individual presentation** of individual design (semester 2)
- Participation and response to questions asked in weekly meetings
- Attendance in lectures and tutorials.

Design Projects: Outcome Example

- Example of an individual section for Reservoir Simulation (Report PE3, 2018):



- Several scenarios are investigated to determine the ideal drainage area for the wells drilled in a 3 km x 3 km reservoir in the Marcellus Shale.

Group Decision Example

- The best case scenario is chosen for the reservoir: (Report PE3, 2018):

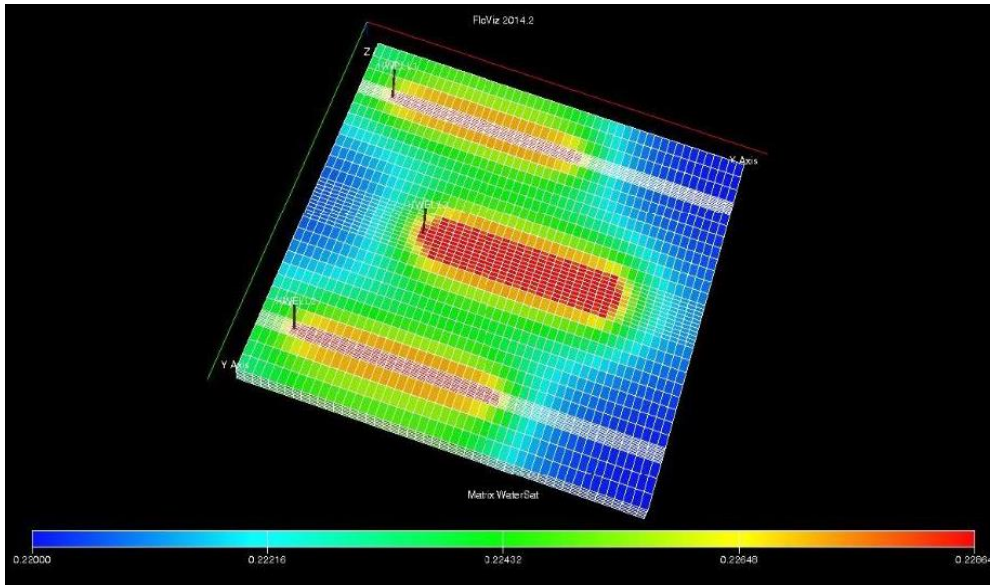
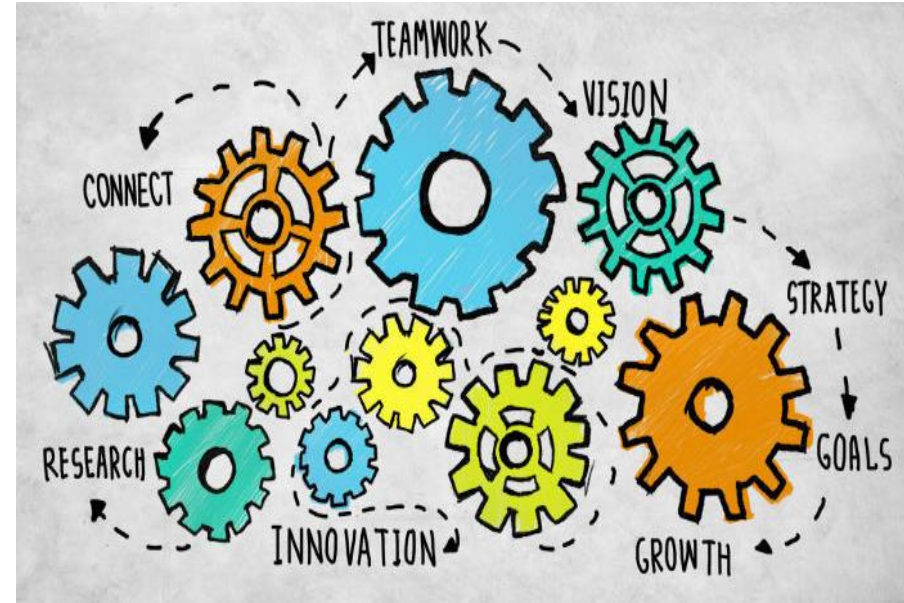


Fig. Water saturation grid for Marcellus shale at latest stage of production, scenario 2 (Report PE3, 2018).

- The decision is made taking into consideration the implication that the choice of well performance has on **several sections** of the project:
 - ✓ Gas production profile
 - ✓ Drilling and completion
 - ✓ Surface processing
 - ✓ Economics and finances
 - ✓ Health and safety
 - ✓ State regulations
 - **All group members** will be required to have an input in the **decision making process**.
- The scenarios are collectively analysed, compared; a feasibility study is undertaken.
 - The scenario offering most advantages is chosen; the choice will have an impact on all sections. **Decisions in all sections will depend on the choice.**
 - Therefore, there is an **imperative need** for a **high level of communication** amongst the group throughout the entire duration of the project.

Group Communication

- **Communication** is a major requirement in every group. In the **weekly group meetings**, each student should report on their **individual current progress** and get updates about the other sections.
- **Consultations** with other group members on any aspect of the design are constantly requested (**brainstorming sessions encouraged**).
- All the **major decisions** in the group need to be agreed by **all members** (e.g. number and type of wells, optimal position of wells, etc.) since these affect each section.
- Groups can use their preferred **online method to communicate** outside the meetings.
- Communication also very important in the **writing up stage**; members should read all other sections.





Communication Issues

- Students need to develop the skill of **sharing information** with other members of the group, learning how to **overcome any existing barriers** (i.e. culture, language skills) as well as different **personalities/backgrounds** and **interests**.
- Based on past experience, **group communication** is **not always smooth** and **straightforward**.
- **Issues** remain unknown to staff during the supervisory meetings, due to the fix time allocated to meetings.
- **Issues** are typically revealed on a personal basis (e.g. a group member requesting an individual meeting with one of the supervisors)
E.g. Student reporting a problem of language: other group members refusing to speak English throughout the meetings. Issue revealed only before submission in Semester 2 (2017).

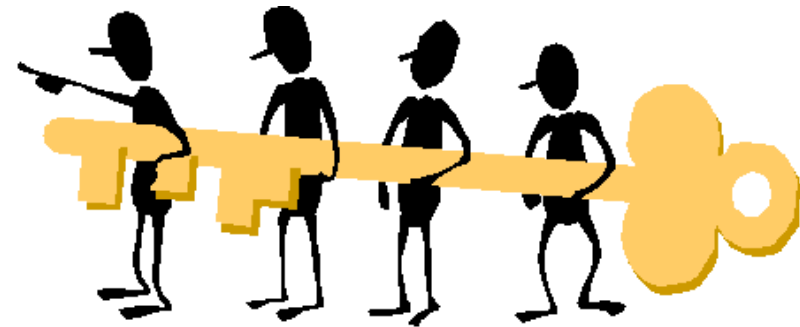
Improved Pedagogic Practices

- New **pedagogic practices** need to be continuously explored and identified to improve the group work. New practices:
 - Change in the way the student **peer assessment** was provided. Rather than asking for one final semester peer assessment, students are now asked to provide this on a **regular basis**. This ensures that any **deviation from an expected progress** is identified in time and that the issue is dealt with in a timely manner.
 - Implementation of **consortia**. Rather than having always group meetings, the members are allocated to specific consortia, and **consortia meetings** are held, where information on a topic is shared between the interested parties in different groups.
 - Regular **practical sessions** scheduled in the SEE computer cluster for the reservoir simulation consortia, where students can share programming practices.



Improved Pedagogic Practices: Benefits

- Students are more determined to have a constant good contribution to the project due to the **transparency of regular peer assessment**.
- **Consortia** has made the process of sharing ideas more easy; students working on the same topics in different groups can get a different perspective of similar issues.
- The benefits of the implementation of such practices into the design project module have been reflected in an **improved student performance** and **engagement** over time.
- An improved overall **learning** and **teaching experience** in evidence. Better module feedback.
- Enhanced skills leading to **higher employability chances**.





Improved Pedagogic Proposed Practices

- A Leeds Institute for Teaching Excellence (LITE) proposal for a fellowship in plan, focusing on improving the level of communication in the design projects and to offer more **one-to-one support** for the group members.
- The project would aim to organise regular **individual interviews** with each of the group members to find out about any issues that might occur in the projects.
- Specific **pedagogic strategies** to be investigated and adopted for overcoming the problems.



Conclusions

- The **Petroleum Engineering Design Project BEng** module is a major component of the Petroleum Engineering programme.
- **Communication** is a major requirement in all groups.
- Students need to develop the skill of **sharing information** with other members of the group, learning how to **overcome any existing barriers**.
- Various **pedagogic practices** have been proposed to enhance communication in design groups.
- Specific **pedagogic strategies** to be adopted for overcoming the issues.



Questions?

