

Oil Extraction Challenge

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Age group

14 – 16 years

16 – 18 years

Curriculum focus

STEM, Economics, Enterprise, Business Studies, Mathematics

Learning objectives

Students will:

- ▣ understand some ways in which STEM subjects (Science, Technology, Engineering, Mathematics) underpin business performance and profitability in the oil industry
- ▣ explain how they made decisions based on incomplete information and in the presence of risk
- ▣ prepare simple financial information on investment and profit
- ▣ describe some ways in which events and market reactions can influence company performance

Time needed

115 mins

About this activity

This activity uses a realistic scenario to challenge student teams to identify and develop an oil field to maximize the returns for their oil company and its shareholders. It includes three stages.

Introduction

- ▣ Students watch a slide presentation about the many factors that affect the potential of an oil field and the options for developing production facilities.
- ▣ Students must form a company and assign key roles, including that of CEO, Financial Director, Reservoir Engineer, Facilities Manager and one or more Risk Analysts.
- ▣ Teams receive an industry briefing, review three potential oil fields and bid for the block they wish to develop.

Planning and forecasting

- ▣ Using additional information on their chosen or assigned block, the teams choose from 4 investment options then model this using a spreadsheet to predict a 10 year profit or loss for their investment.
- ▣ Teams hand in their initial investment and revenue predictions.

Operation

- ▣ Students then modify their forecasts as they respond to market developments in a series of yearly news bulletins.
- ▣ After ten 'years' they compare final results and reflect on their company's performance against its competitors.

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What you will need

- Slide presentation and the two short video clips on a laptop
- Facilitator (Market Analyst) spreadsheet on a laptop
- Projector or interactive whiteboard
- For each time:
 - One laptop with students' spreadsheets saved
 - Set of five Role Cards (Sheets 1a, 1b and 1c)
 - Block Overview (Sheet 2)
 - Block Bid Submission (Sheet 3)
 - Block Data (Sheets 4a, 4b and 4c)
 - Development Investment Submission (Sheet 5)
 - Set of 10 Annual Financial Reports (Sheet 6)
 - Risk Decision (Sheets 7a, 7b and 7c)
 - Calculator and spare paper/pens
- Prizes, if you wish to run as a competition

Timings and structure

Total time: 115 mins

Activity	Time (mins)
Introduction and Q&A	5
Activity 1: Industry briefing	20
Activity 2: Form your company	5
Activity 3: Bid blocks	10
Activity 4: Drilling options - planning and forecasting	30
Activity 5: Operation	25
Activity 6: Reports and results	15
Round up	5



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Introduction and Q&A (5 mins)

Introduce yourself and the topic of engineering.

1. Introduce yourselves, what you do at BP, and explain that you're going to help students learn more about how Science, Technology, Engineering and Mathematics all help BP to perform as a business.
2. Use slide 2 to review what will happen during the session.

Activity 1: Industry briefing (10 mins)

Briefly explore the industry background that teams will need to make their best decisions and deliver top performance for their shareholders.

1. Ask students to suggest the main steps involved in extracting oil and some key equipment they might need to invest in as part of developing their chosen oil field.
2. Use slides 3 – 11 to review some core background information that teams will need.
3. Using the example of a bottle of fizzy water to illustrate pressure in a well. Shake it up and open it to demonstrate that natural pressure will only let out some of the oil. The rest needs to be forced out by water injection.
4. Talk through the idea of sharing facilities using slide 12 and discuss the pros and cons.

5. Using slide 13, briefly explore the big picture: that BP provides oil in order to deliver a return for its shareholders.

Activity 2: Form your company (5 mins)

1. Show slide 14. Ask students to agree a team name: they have 30 seconds to decide.
2. Briefly review each key role using slide 15 and the Role Cards (Sheets 1a, 1b and 1c).
3. Teams assign each role to a student. To save time, they could allocate based on the descriptor at the top of each card (e.g. Good mathematician) and then each student read his or her role card in full. Note: If there are teams of four, omit the Facilities Manager; if there are teams of six, double up on Risk Analysts.
4. Ensure teams are ready to listen to the industry briefing 'in role'.

Activity 3: Industry briefing continued (10 mins)

1. Using slides 16 – 18, help students to brainstorm and discuss some of the risks (political, environmental and commercial) that oil companies might take. Ask students to suggest some market factors or other events that could change the price of oil and therefore affect the profitability of their investment.

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Activity 4: Bid for blocks (10 mins)

Students compete against each other and the clock to secure the best block for development.

1. Explain that teams must first identify the best oil field to develop. Show slides 19 and 20. (Note: You will need to edit these slides if you have fewer or more than six groups. If you had seven groups of five, you could add an extra block – West Africa (Offshore) G). Show the Block Bid Submission (Sheet 3) and describe how to fill it out.
2. Teams have five minutes to review the Block Overview (Sheet 2) and discuss the pros and cons of each area, remembering their industry briefing. Highlight that the information shows predictions only – there is no way to guarantee the size of a reservoir, so teams must take a risk that the predictions are accurate.
3. Teams send the CEO to submit their bid to the leader, using the Block Bid Submission.
4. Allocate blocks on a first-come, first-served basis. If a team requests a block that's been allocated (e.g. A), but the 'twin' block is available, (e.g. B), allocate that one before asking the team to make a second choice.
5. As you allocate blocks:
 - a. add the team name to the corresponding spreadsheet tab
 - b. change the name of the tab to the team's name, for ease of use
 - c. give the team the Block Data for their block (Sheets 4a, 4b or 4c).
6. Review which team has which block and ask CEOs to briefly explain why they made their decisions.

Activity 4: Drilling options - planning and forecasting (30 mins)

Students plan their investment and forecast their performance over ten years.

1. Use slide 21 to review what teams must do.
2. Students review the Block Data (Sheets 4a, 4b or 4c) options and costs. They should discuss or write down the pros and cons of each option, they must choose one and share their decision with the class. If necessary, remind students that the tie-in option is less expensive than building new facilities but can have problems of its own.
3. Select teams' CEOs at random to talk about their choices, alluding to risks. Once a particular option in a location has been chosen, no other team can select it. For example, only one team can have Middle East Option 4.
4. Once each team's option has been confirmed, teams should work out the total investment using the spreadsheet and then model the predicted 10-year profit or loss using the student spreadsheet. Note: You may have to talk the students through this process.
5. Talk through slide 22. Each team's FD should submit the Development Investment Submission (Sheet 5) to the Market Analyst with their choice of option and predicted 10-year profit/loss.
6. The Market Analyst should check each team's figures against the facilitator spreadsheet to make sure they are accurate. If not, the team may need some assistance to get their figures right.
7. Optionally, 'publish' teams' forecasted profits once all of these are in.

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Activity 5: Operation (25 mins)

Students work in teams to respond to market news, updating their financial forecast as they go along, before submitting their final performance.

1. Use slide 23 and 24 to ensure teams are clear on what they must do:
 - a. view each news report
 - b. make notes on anything that affects their company
 - c. amend their forecast after each news bulletin, using the spreadsheet (but make sure they understand that their 'option' is locked and cannot be changed)
 - d. submit their Annual Financial Report to the Market Analyst for an accuracy check.
2. Make sure teams are clear on when they can produce oil at each recovery rate, based on their investment option (referring to the options table in the Block Data).
3. Show the news bulletins for the first three years (slides 25 – 27). Keep each slide visible for 2 minutes while teams make their adjustments. You can choose whether to wait until all teams are finished, or to move on after a set time.
4. At each stage, prompt teams as required to consider whether they need to change any, all or none of:
 - a. reservoir size
 - b. recovery rate
 - c. oil price
 - d. production and revenue.
5. For each year, teams should fill out and submit an Annual Financial Report (sheet 6). The final page of the presenters' notes lists team actions that should be carried out at each stage.
6. At year 2, the West Africa and North Sea teams must decide whether they want to invest an extra \$50 million for infill drilling and, if so, add this to their investment cost.
7. At year 3, stop and ask the Risk Analysts to come to the front. Hand out the appropriate Risk Decision sheet (7a, 7b or 7c) to each of them. They should read and think about it while the rest of the team completes and submits the year 3 Annual Financial Report. Risk Analysts should then return to their team and share the new information. The team then needs to decide what to do. They should report their decision (i.e. whether they have decided to take action or leave things as they are). If you have time, this could lead to a class discussion in which each team presents their potential risks and how they have arrived at their decision.
8. Continue through the news bulletins (slides 28 – 34). You may choose to speed up the time in the last few slides to add excitement.
9. After Year 10 news, each team should submit a final Annual Financial Report with their final calculations. Show slide 35 as a final reminder.
10. Check these final reports using the BP facilitator spreadsheet and 'publish' teams' final results.

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Activity 6: Reports and results (15 mins)

Teams compare their results and discuss why some have done better than others.

1. Show slide 36 and then show teams' results using the results page on the facilitator spreadsheet.
2. Discuss the different factors that affected performance:
 - a. choice of oil field
 - b. choices of investment option
 - c. external forces: events and their impact on the market.

Round up (5 mins)

1. Thank students for listening and for the effort they have put into taking part.
2. Ask general questions to review what students have learned about the oil industry and business in general.
3. Hand out prizes if you were running the activity as a competition.
4. Wish students well for the future and remind them to put their learning into practice – BP recruits scientists, technologists, engineers and mathematicians across all its business areas, not just oil.



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TEAMS IN...			
Year	Blocks A or B North Sea	Blocks C or D Middle East	Blocks E or F West Africa (Offshore)
1	Change Y1 oil price to \$130	Change Y1 oil price to \$130	Change Y1 oil price to \$130
2	Change Y2 oil price to \$140 Add \$50,000 000 to investment costs if they select to do infill drilling	Change Y2 oil price to \$140	Change Y2 oil price to \$140 Add \$50,000 000 to investment costs if they select to do infill drilling
3	Change Y3 oil price to \$90 Change Y4 Recovery and Production to 0 if they choose to remove the bomb	Change Y3 oil price to \$90 Change Y4 Recovery and Production to 0 if they choose to evacuate the employees	Change Y3 oil price to \$90 Change Y4 Recovery and Production to 0 if they choose to invest in protective measures
4	Change Y4 oil price to \$70	Change Y4 oil price to \$70	Change Y4 oil price to \$70
5	Change Y5 oil price to \$90	Change Y5 oil price to \$90 Change Y5 Recovery and Production columns to 0 if they did not choose to re-route	Change Y5 oil price to \$90
6	Change Y6 oil price to \$80 Change Y6 Recovery and Production columns to 0 if they did not choose to remove the bomb	Change Y6 oil price to \$80	Change Y6 oil price to \$80
7	Change Y7 oil price to \$50	Change Y7 oil price to \$50 Option 4: Add 100,000,000 to cell D10 in student spreadsheet and 7 to cell D12 to find out new annual production totals. Use these totals for Y7 to Y10	Change Y7 oil price to \$50
8	Change Y8 oil price to \$60	Change Y8 oil price to \$60	Change Y8 oil price to \$60 Change Y8 Recovery and Production columns to 0 if they did not choose to invest in protective measures
9	Change Y9 oil price to \$80 Add 5,000,000 to cell D10 in student spreadsheet and 9 to cell D12 to find out new 'Annual production' totals. Use these totals for Y9 and Y10	Change Y9 oil price to \$80	Change Y9 oil price to \$80
10	Change Y10 oil price to \$100	Change Y10 oil price to \$100	Change Y10 oil price to \$100 Add 5,000,000 to cell D10 in student spreadsheet and 10 to cell D12 to find out new 'Annual production' totals. Use these totals for Y9 and Y10