

Chemistry: Idea to Market

Workshop Lesson Plans- Session 1-6

Developed by Dr. Stephen Maw, Dr. Samantha Pugh and Dr. Patrick McGowan, University of Leeds

This resource was produced as part of the National HE STEM Programme



Session One: Introduction

Rationale

This module has been produced to help students develop their transferable skills (e.g. teamworking, oral presentations, information retrieval and problem solving) and commercial awareness, areas in which employers have noted a deficit in UK Chemistry graduates^{1,2}. The module has been designed around a series of team-based workshop sessions in an effort to reduce this deficit. It is also important that students know and can articulate their strengths so some self assessment/reflective components have been incorporated into the module.

Experience has shown students generally enjoy this inquiry based form of learning, however, this module is likely to be a departure from the type of teaching the students have previously experienced and also the topic area will be new for many. Some may not see the immediate need for learning about 'business' skills or feel apprehensive embarking on a less structured teaching situation. This session is to pre-empt those issues and through doing some simple tasks get the students to experience and gain confidence in working as part of team and all that it entails. Through working and subsequently reflecting on the team activity they will begin to see how teams, and they, function. Links can then be made to not only the desires of potential employers but how they undertake their academic study.

It is also an opportunity to set ground rules and expectations as well as explain the practical mechanics of how the course will run.

Suggested session outline

Introduction (10 mins) [see accompanying 'Introduction' Powerpoint]

Outline the need for the module. Highlight the benefits and expectations of Student Managed Learning (SML) and case study (scenario-based) learning as well as provide the practical details of how the module is going to run and be assessed

Skills Audit (5 mins) [optional]

Plastic cup Task (45 mins)

Reflection on Group Work (40 mins)

Get students to reflect on the plastic cup activity they have just performed.

Students given their Industry Case Study (10 mins)

Self Reflection Sheet (5 mins)

Resources

- Introductory slides (Introduction.ppt)
- Teamwork handout (Handout_Teams_and_Teamwork.docx)
- Handouts from Belbin.com [Team roles in a nutshell, Team role summary descriptions and Things to do and not to do, are available for free]
- Self Reflection Sheet (Appendix G in Module Handbook)
- Skills Audit (Appendix H in Module Handbook)

Session Requirements

- Sufficiently large room, preferably with moveable furniture, where students can work in groups without overhearing what other groups are saying
- Plastic cups: 5 per group
- Filling cards: 4 per student
- Means of listing feedback from sessions (poster board, white board etc)

References

- 1 Hanson, S. and Overton, T. (2010) *Skills required by new chemistry graduates and their development in degree programmes*. University of Hull: UK Physical Sciences Centre
- 2 Workshop1 'Introduction' PowerPoint Slides accompanying this workshop session

Useful web resources

www.kent.ac.uk/careers/sk/teamwork.htm

<http://library.leeds.ac.uk/skills-group-work>

www.leeds.ac.uk/lskills/TLTP3/

www.impactfactory.com/gate_articles.shtml

Session Two: Tools (Project Planning, SWOT analysis)

Rationale

This session is all about introducing the students to common business tools that they can use, both in the industrial case study as well as their other studies. The first part of the session is based around project planning and aims to build awareness of the skills and mechanisms for successfully planning and delivering projects. By asking students to use an interesting (and hopefully fun) activity to acquaint themselves with the approaches used in project planning it is hoped they will remember these tools and use them in future activities.

Secondly they will be introduced to SWOT analysis and have the opportunity to practise the technique on a fictitious spin out company. They will also use SWOT analysis in Workshop 4 and the Industrial Case Study.

Session Outline

Introduction to project planning tools

Tool intro, followed by practise following the leads and timings in the Powerpoint (Workshop 2 Useful Tools.ppt)

SWOT Task (30 mins including 10 mins for reporting back)

Self Reflection (5 mins)

Resources

- Introduction to Project Planning and SWOT analysis (Workshop 2 Useful Tools.aspx)
- BioBurp Handout (Bioburp.docx)
- Self Reflection Sheet (Appendix G in Module Handbook)

Session Requirements

- Sufficiently large room, preferably with moveable furniture, where students can work in groups without overhearing what other groups are saying
- Poster paper (+pens)
- Post-it notes
- Means of listing feedback from sessions (poster board, white board etc)

Further Reading

Phil Baguley (2010) *Improve Your Project Management: Teach Yourself*, London: Hodder Education

Session Three: Protecting your idea

Rationale

This session has two principal aims. Firstly, through self study and investigation to introduce the students to ideas around Intellectual Property Rights and how they may wish to protect an idea, and secondly to provide them with a well-recognised approach by which they can tackle set problems, namely the. So following a brief introduction to IPR and the Maastricht 7 Step approach the students will spend the majority of the session using that approach (or a variation of it) to answer the questions posed in the case study. Given within a Chemistry context patents are the primary way to protect an idea, patents are the main focus of the session. An end of session handout gives then some further information to digest and consider when working on the Industrial Case Study.

The students have spent the last two sessions working as part of team. They are now been given more freedom in a PLB-style approach. For the purists this is not pure PBL, but does present an opportunity for students to be given more freedom in how they research an issue or tackle a problem. Essentially the aim is to build up their ability and confidence before they tackle the Industrial Case Study by themselves. Some groups will need some reassurance in this session.

Session Outline

Introduction to IPR (15 mins)

IPR Task (75 mins +15mins for reporting back))

Summary (as time allows)

Self Reflection (5 mins)

Resources

- Introduction to IPR and protecting your idea (Workshop3 Protecting your idea.pptx)
- Maastricht 7 Step Approach Handout (Handout_How_to_Tackle_a_Problem.docx)
- Patent Case Study (Patent_Case_Study.docx)
- End of Session Handout (Handout_Ways_to_protect_your_idea.docx)
- Self Reflection Sheet (Appendix G in Module Handbook)

Session Requirements

- Sufficiently large room, preferably with moveable furniture, where students can work in groups without overhearing what other groups are saying
- Internet access with sufficient PCs or Laptops so the groups can effectively do their own research

Further Reading

- Intellectual Property Office Publications or visit online (www.ipo.gov.uk/)
- European Patent Office (www.epo.org/)
- World Intellectual Property Organization (WIPO) (www.wipo.int/portal/index.html.en)
- Friese, J., Jung, U., Röhm, T. and Spettmann, R. (2006) Intellectual Property: An underestimated and undermanaged asset? *Journal of Business Chemistry*, **3**(1), 42–48

Session Four: Marketing

Rationale

This session is to build awareness of the marketing processes and commonly used tools/techniques. Students will be asked to consider a well-known company; half the group will consider Ryanair, the other half Apple Inc. There will then be the opportunity for the groups to compare the two companies. Ryanair and Apple Inc. have been chosen as both are likely to be familiar to students, can evoke strong feelings and have been in the news recently but obviously other companies can be used. The companies provide a contrast between a localised (i.e. European) service industry compared to a multi-national company producing a range of products. Equally, they have very different attitudes to price.

<http://marketingteacher.com/> provides an outline of the product mix.

Through analysing familiar companies the students can increase their awareness of marketing techniques before applying them to their Industrial Case Study. Should the session need extending then students may wish to consider whether either company behaves in an ethical manner.

A **prerequisite** for this session is that the students have read 'Introduction to Marketing' and viewed the suggested videos.

Session Outline

Introduction to session (5 mins)

Brief outline of what the session is about and what they will be expected to do.

Marketing Task (60 mins)

The students are given their marketing task

Company Comparison (30 mins)

Combine the groups 1 Ryanair with 1 Apple Inc. Once the groups have joined together one group should summarise their findings (10 mins) before swapping round allowing the second group to report their findings. Identify any common themes and key differences. Which tools (i.e. SWOT, Boston Matrix) worked well, and which less well?

Whole Group Feedback/Discussion (as time allows)

Opportunity for feedback and to collect key themes from the whole group.

Self Reflection (5 mins)

Using standard sheet students can reflect of what they have learnt and need to learn.

Resources

- PowerPoint: (Workshop 4 Marketing.pptx)

- Handout: Introduction to Marketing (Introduction to Marketing.docx)
- Marketing Case Study (Apple) (Handout_Marketing_Task_(Apple).docx)
- Marketing Case Study (Ryanair) (Handout_Marketing_Task_(Ryanair).docx)
- Self Reflection Sheet (Appendix G in Module Handbook)

Session Requirements

- Sufficiently large room, preferably with moveable furniture, where students can work in groups without overhearing what other groups are saying
- Internet access with sufficient PCs or Laptops so the groups can effectively do their own research

Session Five: Scale-up and manufacture

Rationale

The essential take home message from this session is you cannot simply multiply up what you've done in the lab and repeat on an industrial scale. There are unavoidable consequences of an increase in scale (e.g. reduction in surface area to volume ratio) and what may seem insignificant in the lab (e.g. a bit of foam) may be significant at scale (the bit of foam now has its own structure and impedes the addition of other materials). Also the session raises awareness that there are other non-chemistry constraints and factors to consider (e.g. external legislation, cost). In some ways this session is about showing students the limitations of their knowledge and making them aware that it is a proper course of action (and not a sign of weakness) to seek professional help (e.g. engineering perspective).

Session Outline

Very Brief Introduction to Scale-up and manufacture (5 mins)

Task 1 Avoiding disaster (15 mins + 10 mins feedback)

Students work in their groups to research a chemical disaster. Share their findings with rest of the group. The intended learning point is to see the reason for HAZOP and general regulation in the Chemical Industry

Points of an ideal synthesis and give out the handout (10 mins)

Task 2 Synthesis of Arimidex (25 + 15 + 15 +10 mins)

Again students work in their groups to evaluate the suitability of the discovery synthesis for scale-up. They then get the opportunity to look at the process synthesis and highlight its improvements but also recognise it's not perfect. Essentially this is an exercise for the students to apply the knowledge this have to have just received.

Summary (as time allows)

Self Reflections sheets (5 mins)

Session Requirements

- Sufficiently large room, preferably with moveable furniture, where students can work in groups without overhearing what other groups are saying
- Internet access with sufficient PCs or Laptops

Resources

- Scale up presentation (Workshop5 Scale up.pptx)
- Arimidex® case study (Arimidex_Case_Study.docx)

- Handout information (Handout_Scale_up_and_Manufacture.docx)
- Self Reflection Sheet (Appendix G in Module Handbook)

Further reading/information

Chemical Reaction Hazards' Second Edition - Barton & Rogers, ISBN 978085295464
(http://books.google.co.uk/books?id=xfndkVtk_-cC)

HAZOP and HAZAN by T. Kletz; ISBN 1 56032 276 4
(<http://books.google.co.uk/books?id=DxDtXq4kBScC>)

Hazard Identification and Risk Assessment by G. Wells; ISBN 0 85295 353 4

www.hse.gov.uk

Session Six: Practise Project Pitch

Rationale

This session has a number of functions. Firstly it gives the students an opportunity to practise their project pitch. Not only that, they will be acting as the panel for another group's pitch. This will provide an opportunity for the students to develop their critical evaluation skills and since they will be using the same marking sheets as the final panel it will ensure they are aware, and engage with, the criteria against which they will be assessed. It is also an opportunity to give feedback to others and in doing so they are likely to better understand the nature of feedback and hopefully most students will better understand how they receive and react to feedback.

There are sections on **presentations** and **feedback** in the module handbook which **students need to have read** prior to the session.

Session Outline

Very Brief Introduction to the session and time to alter room to an appropriate layout (10 mins)

Group A Pitch to Group B (15 mins + 10 mins for questions)

Group A should be doing a different case study to Group B.

Reflection. Each individual from Group A reflects on his/her performance. Group B decides on feedback that they are going to give Group A (10 mins)

Changeover (5 mins)

Group B Pitch to Group A (15 mins + 10 mins for questions)

Reflection. Each individual from Group B reflects on his/her performance. Group A decides on feedback that they are going to give Group B (10 mins)

Group A feeds back to Group B (10 mins)

Group B feeds back to Group A (10 mins)

Summary (as time allows)

Session Requirements

- Sufficiently large rooms, preferably with moveable furniture and projection facilities where students can work in groups without overhearing what other groups are saying
- Internet access with sufficient PCs or Laptops

Resources

- Student Instructions (Workshop 6 Student Instructions.docx)
- Self Reflection Sheet (Appendix I in the Module Handbook)
- Continue Start Stop Student Feedback Sheet (Appendix J in the Module Handbook)
- Project Pitch Assessment Sheet (Appendix B in the Module Handbook)

Further reading/information

Students should have read and familiarised themselves with the Feedback and Project Pitch guidance sections of the Module handbook.