

# CH3G4-15 Innovation 101

**22/23**

**Department**

Chemistry

**Level**

Undergraduate Level 3

**Module leader**

Tom Ritchie

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

85% coursework, 15% exam

**Study locations**

Distance or Online Delivery Primary

University of Warwick main campus, Coventry

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## Description

### Introductory description

Innovation 101 is an introductory level module that will cover foundational principles, tools and the mindset needed for creating innovation in any field or organisation. This module has been created with an aim to support the development of Chemistry students as adaptable, innovative, and impact-focused professionals for the evolving workplace of the 21st century.

Traditional Chemistry Education 'rarely examines how to foster scientists' creative, cross disciplinary problem identification and solving skills.' (Madden et al., 2013). At the same time students are looking for more optionality and diversity within their science degrees. This module will respond to those two gaps, upskilling students in leading innovation methodologies, and nurturing reflective and creative mindsets, significantly boosting their employability and the transferability of their science degree.

The module has been designed to complement core Chemistry Education and will engage learners in interdisciplinary concepts related to real-world problem-solving, giving students the tools to work with complexity, uncertainty, and create innovations in modern science and beyond. It intends to complement capstone Chemistry projects and authentic research projects available to students in Years 3 and 4, as well as the current Year 1 plans for an optional Group Project module.

The module will challenge you to think, learn and work in a different way, but you will receive plenty of support to help you develop as an innovative thinker and a reflective practitioner.

It has been designed with the latest innovation-thought leadership from organisations such as IDEO, Google Ventures and AJ&Smart. It will introduce you to a range of tools and skills that are in high demand in any industry looking for innovative thinkers and reflective practitioners.

While Innovation 101 is of relevance to all students, it might be of particular interest to those that want to explore an interdisciplinary module that is not specifically related to Chemistry, or for those that are interested in finding new ways to apply their Chemistry degree.

## **Module aims**

Having completed the module, students will be able to confidently and successfully undertake and contribute to participatory innovation and enhancement projects using innovation tools and models with real, diverse communities and complex scenarios.

They will understand what it means to have an innovation mindset, supported by their own research and knowledge of academic research in innovation, and will naturally translate this into action. They will have an effective repertoire of techniques and tools, as well as experience critically analysing and presenting these to an audience.

They will also have a critical appreciation of the limits of tools such as Design Thinking, and the negative impacts these may have when undertaken without a sound appreciation of how to generate, collaborate, and create value with innovation.

They will be well positioned to continue their work as innovative and creative thinkers. They might also consider further research in innovation, design thinking, and more advanced innovation tools and techniques.

## **Outline syllabus**

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

### **Week 1**

Introduction to Innovation 101: what is innovation, types of innovation, shifts in innovation, ways of thinking about innovation. We will also cover the fundamentals of teaching and learning on the module: navigating Teams, learning to reflect, giving and receiving peer feedback, and making the most of assessments.

### **Week 2**

Innovation Mindset: building on Week 1, we will further explore the fundamentals of innovation and what it means to have an innovation mindset. We will explore and reflect on key concepts such as failure, feedback loops, creativity, design thinking mindset (empathy, optimism, embrace ambiguity, make it, learn from failure, iteration, creative confidence), values led design, and generativity.

### **Week 3**

Insights for Innovation: understand the value of user insights and feedback in generating and

embedding innovation. We will explore and reflect on the different ways of conducting user research, such as ethnography and interviewing, what it means to have empathy and how to become better at practicing it. We will additionally cover working with competition, exploring the notion and tools such as blue and red oceans.

#### Week 4

Humans and Innovation: building on Week 3 we will explore several key ideas that will help understand human behaviour and introduce ideas such as human centred design in preparation for Week 5. We will cover nudge theory, working in interdisciplinary teams and with cognitive diversity.

#### Week 5

Design Thinking: explore the 5 stages of design thinking (Define, Empathise, Ideate, Prototype, Test) and the 3 design thinking mental spaces (inspiration, ideation, implementation). This session will equip students with key innovation tools, making connections to the fundamentals of innovation covered in Weeks 1-4.

(Critical Review submission at the end of Week 5).

#### Week 6

Innovation Tools 1 (Design Thinking Sprint): remote facilitated workshop for student groups to work on a design challenge and practice the tools and techniques covered in Weeks 1-5. Reflections from this will be used towards the final assessment and outcomes/outputs of the Sprint can be used as one of the innovation projects. This session can potentially be moved offline and delivered in small groups across several slots, depending on student numbers and student availability.

#### Week 7

Leading Innovation: understanding how to popularise and embed innovation. We will continue connecting ideas from Weeks 1-7 and further explore how to work with stakeholders, introduce learner to the basics of project and change management. We will additionally focus on what it means to create value and how to use storytelling to inspire and mobilise action.

#### Week 8

Innovation Tools 2 (Lightening Decision Jam): remote facilitated decision making activity for student groups to work on an innovation challenge . Reflections from this will be used towards the final assessment and outcomes/outputs of the Lightening Decision Jam can also be used towards innovation projects. This session can potentially be moved offline and delivered in small groups across several slots, depending on student numbers and student availability.

(My Innovation Journey submission at the end of Week 8).

#### Week 9

Reflect and Prepare: reflecting on and summarising the module. Allowing students the opportunity to ask questions about assessment and their 3-minute project presentation, as well as any other aspects of the course. This session will also allow to maintain flexibility within the module and respond to student needs. The session can also be repurposed to cover additional and more advanced material, if students are keeping up with content and are positively engaging in Teams.

#### Week 10

3-minute project presentation: Allowing students and Learning Circles to come together in person

to consider what innovation means to them (30 seconds) and to present their individual projects (2 minutes, 30 seconds) to a panel. The presentations are the culmination of the module and will be marked live. Feedback given in the session will then be used to students to finalise and submit their projects.

## **Learning outcomes**

By the end of the module, students should be able to:

- SKU: Develop theoretical and practical knowledge of innovation mindset, techniques and tools.
- SKU: Evaluate and apply theory and practice of innovation to making impact and translate the knowledge across a multitude of contexts and challenges.
- KS: Research skills and practical use of innovation insight gathering methods such as ethnography and interviewing techniques.
- KS: Team work and collaboration skills, working in teams and interdisciplinary stakeholders to create effective, feedback-driven dynamics to constructively move forward.
- KS: Leadership and ability to lead innovation processes and teams of people in problem solving scenarios; ability to provide thought leadership in a consulting capacity.
- CS: Creative thinking and ability to look at familiar problems, experiences and environments and re-imagine them in a new way.
- CS: Critical thinking and ability to deconstruct arguments and ideas, avoid bias, create informed arguments.
- CS: Storytelling and ability to inspire action with stories that are meaningful and powerful; ability to develop compelling arguments and presentations.
- SSS: Empathising and connecting with target audience to draw valuable and in depth insights from user research to inform action.
- SSS: Effective, innovative and interdisciplinary decision making and problem solving.
- SSS: Recombine and come up with ideas that are radical, innovative, creative, whilst being focused on the target audience and intended impact.

## **Research element**

Developing an online publication and innovation project will require students to utilise their research skills. The Critical Review assessment also has a substantial research element to it and students will have to explore both academic and non-academic resources to write on a timely innovation topic of relevance to global audience. Weekly online discussions and reflection exercises will equally challenge students to create their own meanings, draw their conclusions, and ultimately create new knowledge. By using Microsoft Teams, students will regularly share inspirations and insights, which covers research articles and other resources that students find interesting. This additionally allows to create a culture of intellectual curiosity and research on the module.

## **Interdisciplinary**

Innovation is inherently interdisciplinary. It connects multiple strands of research such as psychology, sociology, organisational studies, design, etc. Developing an innovation mindset and

practising the use of innovation tools and techniques will allow students to draw on multiple disciplines and viewpoints to solve wicked problems effectively. Students will be constantly encouraged to reflect on the premise and value of concepts covered each week, broadly as well as in relation to the discipline of Chemistry, thus making new interdisciplinary connections to their core studies.

The module will involve external expertise from guest speakers via video and podcasts. Exposure to diverse voices will further student interdisciplinary experience on the module.

## **International**

The syllabus in itself will explore innovation examples and case studies of global significance and from a range of organisations and guest speakers.

Students will be strongly encouraged to take part in the Intercultural Awareness Programme delivered centrally and will be explained the significance of having a global mindset, both to innovation and for their employability.

Students will be challenged to share their stories and bring their diverse backgrounds into the online discussions throughout the module.

## **Subject specific skills**

The module has been designed on the premise of developing a mindset and skills for student success in the 21st century diverse workplace.

These include:

- Innovation and impact (ability to recombine and come up with ideas that are radical, innovative, creative, while being focused on the target audience and on making impact).
  - Interdisciplinary decision making and problem solving (drawing on mindset and tools such as design thinking, ability to solve problems and make decisions faster, more effectively, and innovatively).
  - Research skills (familiarising with methods such as ethnography and interviewing techniques, complementary to students' academic research mindset and skills).
  - Empathising (ability to connect with target audience and draw valuable and in depth insights from user research to inform action).
  - Working with failure and uncertainty (reflecting on and building on past failures to learn from positive and negative experiences).
- Working with wicked problems to develop tolerance to uncertainty and risk, where no previous solutions exist or no longer work).
  - Public Engagement and Communication (written through the critical thinking blog and verbal through the 3-minute project presentations).

## **Transferable skills**

The knowledge and skills gained on the module will be highly transferable. At the very core of the module is embedded the use of digital collaboration tools. Students will develop effective practices

of using these tools in preparation for the modern workplace. In addition to this, students will practice reflection and will be challenged to reflect on the content, skills, and weekly peers' contributions. The module will expose students to global and interdisciplinary innovation challenges, supporting their development as critical thinkers.

Additional transferable skills include:

- Team work and collaboration skills (working in teams and creating effective dynamics to constructively move forward).
- Creative thinking (ability to look at familiar problems, experiences and environments, and re-imagine them in new ways).
- Critical thinking (ability to deconstruct arguments and ideas, avoid bias, create informed arguments).
- Leadership (ability to generate and lead innovation processes and teams of people in problem-solving scenarios; ability to provide thought leadership in a consulting capacity).
- Storytelling (ability to inspire action with stories that are meaningful and powerful; ability to develop compelling arguments and presentations).

All of the above skills will be interpreted and linked to the Chemistry Skills Badges and the Warwick Skills Award. These will be highlighted on the module's virtual spaces (Teams and Moodle), as well as any resources as appropriate.

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## Study

### Study time

Type	Required
Seminars	2 sessions of 2 hours 30 minutes (3%)
Online learning (scheduled sessions)	20 sessions of 1 hour (13%)
Online learning (independent)	20 sessions of 1 hour (13%)
Private study	50 hours (33%)
Assessment	55 hours (37%)
Total	150 hours

### Private study description

Students will be given access to a number of online module resources and additional resources such as podcasts, articles, videos, and external training suggestions that students might like to explore in their own time. Students will also be signposted to and encouraged to participate in activities offered by Student Opportunities, including: Intercultural Awareness Programme, critical-thinking online modules, active listening, and self-awareness workshops will be of particular relevance to student development on this module.

The module will additionally provide access to a series of short interviews with innovation experts from various industries. These will replace face-to-face external speakers and will allow students

to explore the interviews in their own time and revisit these when working on their final assignments.

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group D

	<b>Weighting</b>	<b>Study time</b>
<b>Innovation Project</b>	40%	20 hours
Students will have to write an innovation project – this can be either fictional (i.e. design fiction that realistically explores a real innovation challenge (Lupton, 2017)) or real. It will showcase their experience of the module, innovation activities, and case studies.		
Students will need to select and analyse a global innovation challenge and propose a solution for value creation. Students will be required to seek feedback from a diverse range of peers and colleagues within and outside of their core discipline to understand the value of collective intelligence for innovation.		
Students can make a formative submission of their projects and will receive formative feedback on these, alongside the feedback on their 3-minute Innovation Project presentations.		
Assessment will seek to understand how well students engaged with the material, their understanding of and ability to use innovation tools, defining innovation problems, and proposing solutions.		
It will facilitate mapping of the learning and skills development onto professional development and growth of dynamic capabilities and epistemic fluency.		
Students will be expected to present their work in a creative way and use digital communication tools (YouTube, LinkedIn, Weebly, Wix, Loom, Canva, Keynote, etc.) to frame their work in a way that will showcase their personal brand and individual approach to innovation.		
Students will synthesise this project work to prepare a 3-minute project presentation, which they will present to a panel in person in the final week of the module.		
<b>My Innovation Journey</b>	15%	10 hours
Reflective essay is a personal account of individual learning journey on the module. It will seek to understand individual student engagement with the module and their development, challenging them to reflect on their learning and innovation mindset. Students will be able to utilise their weekly reflective entries as part of the Learning Community Engagement and Participation aspect		

## Weighting

## Study time

of the module.

Students will receive prompts to help structure the essay.

Thought leadership blog

15%

10 hours

Thought leadership blog is a personal reflective article enriched with research and references, written for global audience. Students will be free to choose any topic, policy, challenge, or development in relation to innovation. Assessment will seek to understand individual student engagement with the module and their development journeys, challenging them to reflect on their learning and innovation mindset. It will additionally highlight their ability to critically analyse and creatively frame an innovation related issue, and communicate with a diverse and global audience.

Learning Community Engagement and Participation

15%

10 hours

Blended delivery will challenge students to interact frequently with the module leader and their peers online via Microsoft Teams.

Students will be placed in small groups of five (learning circles) and will be tasked with following the 1:2:1 rule:

-Share at least 1 reflection/thought after having covered all content blocks.

-Comment on 2 other posts in your circle. Students will be encouraged to ask for and offer feedback to their peers.

-Share 1 additional insight, resource, tool, or contact in your circle or in Teams, citing your source and explaining why they found it interesting in order to grow personal and collective innovation glossaries and toolkits.

Students will be introduced to various models of reflective writing and will hone in on this skills using feedback from peers and module leader. Assessment will seek to motivate students to engage in online discussions and will support students in their development as collaborators and reflective, innovative thinkers.

Students will receive weekly formative marks to help them develop their reflective thinking and writing. Students will also be encouraged to set expectations around hours of engagement within their groups.

3-minute Innovation Project Presentation

15%

5 hours

Building on the skills developed in the module, students will present their Innovation Project to a panel in the final week of the module. Students will have 3 minutes to explain:

- What innovation means to them (30 seconds);
- Their Innovation Project (2 minutes 30 seconds).

Students will be assessed on their ability to communicate ideas in their project clearly and concisely. The panel will want to understand the student's chosen global innovation challenge and proposed solution for value creation, as well as the feedback students have collected and



## Weighting

## Study time

analysed.

### Feedback on assessment

Weekly discussions in Teams will provide students with formative feedback on their understanding from module leader and their peers, helping students grow their capabilities and confidence and reflect on their progress.

Drop-in consultancy sessions will be available each week (either online or face to face, depending on student preference and availability) to which students are encouraged to bring work in progress. Students can receive formative feedback on any of the assessment components.

This module will challenge students to learn in a way different to Chemistry, potentially challenging their way of thinking, doing, and writing, so they will need more help to learn new effective teaching and learning habits.

This will also help teach lessons about feedback loops and support student development as reflective and innovative thinkers. Formative feedback will be given on the 3-minute Innovation Project presentation. Summative feedback will be given on the completed assessment, as they will go on to be used by the students to assist their further development of innovation mindset, capabilities, projects, and careers.

[Past exam papers for CH3G4](#)

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## Availability

### Courses

This module is Optional for:

- Year 4 of UCHA-F107 Undergraduate Master of Chemistry (with Intercolated Year)
- UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
  - Year 3 of F109 MChem Chemistry (with International Placement)
  - Year 3 of F111 MChem Chemistry with Medicinal Chemistry (with International Placement)
- UCHA-4M Undergraduate Master of Chemistry Variants
  - Year 3 of F105 Chemistry
  - Year 3 of F109 MChem Chemistry (with International Placement)
  - Year 3 of F125 MChem Chemistry with Medicinal Chemistry
- Year 4 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry (with Intercolated Year)

This module is Option list A for:

- UCHA-4 Undergraduate Chemistry (with Intercolated Year) Variants

- Year 4 of F101 Chemistry (with Intercalated Year)
  - Year 4 of F122 Chemistry with Medicinal Chemistry (with Intercalated Year)
- UCHA-3 Undergraduate Chemistry 3 Year Variants
  - Year 3 of F100 Chemistry
  - Year 3 of F100 Chemistry
  - Year 3 of F121 Chemistry with Medicinal Chemistry
- Year 3 of UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
- Year 3 of UCHA-4M Undergraduate Master of Chemistry Variants