

CH3G4-15 Innovation 101

24/25

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

Description

Introductory description

Innovation 101 is an introductory level module that equips students with the foundational principles, tools, and the mindset needed to drive innovation in any field or organisation. This module supports 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 responds 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 links to the UN Sustainable Development Goals throughout the module will provide students with the opportunity to apply their skills in a practical context.

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 Chemistry research projects available to students in Years 3 and 4, as well as build on the learning outcomes from CH169 Beyond Science.

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 redesigned with the latest innovation-thought leadership from across Warwick and beyond, including organisations such as Google, IDEO, the Civil Service, and World Bank. 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

By the end of this module, you'll be able to:

- Work on real-world innovation projects: You'll learn tools and models to tackle complex problems with diverse communities.
- Think like an innovator: You'll understand the mindset and research behind innovation, putting it into practice naturally.
- Master innovation tools: You'll gain a toolbox of techniques, including how to leverage Design Thinking and Artificial Intelligence (AI) to develop innovative solutions that could be developed into entrepreneurial ventures.
- Use innovation responsibly: You'll understand the limitations of tools and their potential downsides, and be able to critically analyse and present your ideas.
- Become a lifelong innovator: You'll be equipped to continue thinking creatively and potentially pursue further studies in innovation.

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: In-person induction to the module, outlining how to use the Teams chat, and podcast model, along with the 1-2-1 weekly rule, and run through of assessments, including introduction to the UN SDGs.

Week 2

Types of Innovation: 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 3

Innovation Mindset: building on Week 2, 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 4

Creativity: building on previous weeks, we will explore the role of creativity within innovation. We will explore key concepts of creativity scars, creative confidence, and the importance of failure. We will also use tools to enhance our creativity, including 30 circles challenge, crazy 8s, and systems thinking.

Week 5

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.

(Thought Leadership submission at end of Week 5).

Week 6

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 1-5.

(There will be an in-person masterclass on ideation in Week 6, to help prepare for the final innovation project submission).

Week 7

AI: We will continue connecting ideas from Weeks 1-6 and explore the role and impact of AI on innovation. We will additionally focus on some of the ethics and biases of AI applied to innovation and have critical discussions about its role in future.

Week 8

Entrepreneurship : This final week bridges the gap between creative ideas and innovations and real-world impact. We will discuss different aspects of the entrepreneurial journey, including market research, simple business plans, as well as some tips to translate your innovation ideas into actionable future plans.

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

(There will be an in-person masterclass on pitching and storytelling in Week 8, to help prepare for the 3-minute video submission).

Week 9

Reflect and Prepare: reflecting on and summarising the module. Allowing students the opportunity to ask questions about assessment and submitting their 3-minute recorded project presentation, as well as any other aspects of the course. Feedback given on the videos will then be used to students to finalise and submit their projects.

(3-minute video submission at end of Week 9).

Week 10

Final Project Submission: 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.

(Final project submission at end of Week 10).

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

Writing a thought leadership blog and innovation project will require students to utilise their research skills. The Thought Leadership 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, linked to the UN Sustainable Development Goals. Weekly online discussions and reflection exercises will equally challenge students to create their own meanings, draw their conclusions, and ultimately create new knowledge. The in-person masterclasses will complement these discussions and skills development exercises, and help students build towards assessments. 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 and AI 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, and in-person masterclasses. 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 from the UN Sustainable Development Goals, 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, and helping them learn how to apply these skills through completing critical reflections and project work on the UN Sustainable Development Goals.

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, interviewing, and surveying 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).

- How to translate innovation skills into entrepreneurial activities, through a pitching masterclass.

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 and AI. 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 through the UN Sustainable Development Goals, supporting their development as critical thinkers.

Additional transferable skills include:

- Team work and collaboration skills: Work in teams and creating effective dynamics to constructively move forward.
- Creative thinking: Develop the ability to look at familiar problems, experiences and environments, and re-imagine them in new ways.
- Critical thinking: Develop the ability to deconstruct arguments and ideas, avoid bias, create informed arguments.
- Leadership: Develop ability to generate and lead innovation processes and teams of people in problem-solving scenarios; ability to provide thought leadership in a consulting capacity.
- Artificial Intelligence: Develop a foundational understanding of Artificial Intelligence (AI) technologies and their application to Innovation.
- Entrepreneurial Mindset: Develop the skills and knowledge to identify opportunities, validate ideas, and build innovative ventures. This includes exploring market research techniques, business model development, pitching strategies, and fundraising approaches.

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.

Study

Study time

| Type | Required |
|--------------------------------------|-----------------------------|
| Seminars | 3 sessions of 1 hour (2%) |
| Online learning (scheduled sessions) | 17 sessions of 1 hour (11%) |
| Online learning (independent) | 20 sessions of 1 hour (13%) |
| Private study | 55 hours (37%) |
| 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.

The module will also have three synchronous masterclass sessions throughout the module to support learning, delivered by Warwick Enterprise, Innovation Group.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D2

| | Weighting | Study time |
|--|-----------|------------|
| Innovation Project | 40% | 20 hours |
| Students will have to apply their design thinking knowledge to create and write an Innovation project, linked to the UN Sustainable Development Goals. It will showcase their experience of the module, innovation activities, and case studies. | | |

Students will need to select and analyse a global innovation challenge (from the 17 UN SDGs) 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 video submissions.

The 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.

Weighting

Study time

Students will be required to utilise an AI tool during the ideation stage and critically review the responses it gives, in relation to the value it provides, and elements it ignores (thinking about bias, lack of empathy etc). This will be through ChatGPT, Gemini, MindJourney etc.

The assessment 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 record and submit in the penultimate week of the module.

My Innovation Journey

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 of the module.

Students will receive prompts to help structure the essay.

Thought leadership blog

15%

10 hours

Thought Leadership blog is a critical reflection 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 as part of the UN Sustainable Development Goals.

The 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 their perspective with 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

Weighting

Study time

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 Video
Presentation

15%

5 hours

Building on the skills developed in the module and the pitching masterclass, students will record a video to explain their Innovation Project to a week nine 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. We 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 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 and formal coaching 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](#)

Availability

Courses

This module is Optional for:

- UCHA-4 Undergraduate Chemistry (with Intercalated Year) Variants
 - Year 3 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 4 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated 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 F100 Chemistry
 - 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 Intercalated Year)