University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

FUTURE SKILLS FRAMEWORKS

IN THE LIFE SCIENCES 2025

5TH JUNE 2025

The Future Skills Frameworks in the Life Sciences event was hosted at the University of Glasgow, with valued support from the Scottish Universities Life Sciences Alliance (SULSA) and the School of Infection and Immunity at the University of Glasgow.

This report is a summary of the key outcomes and insights from the event. It aims to support the ongoing development of skills in further and higher education across Scotland's life sciences sector by providing recommendations for a cohesive yet flexible skills framework, encouraging the adoption and sharing of effective practices, and strengthening collaboration among institutions.

"Skills development is as much a part of the academic journey as knowledge acquisition. It is our responsibility in the education sector to guide and support students through their skills journey, preparing them for a wide range of job opportunities in academia, the life sciences industry and beyond. This event is an important step in helping institutions and educators create meaningful, relevant and student focused skills frameworks that truly support their journey"
Dr Laura McCaughey, Event Organiser and Senior Lecturer in Microbiology at the School of Infection and Immunity, University of Glasgow.

We would like to extend our sincere thanks to the members of the organising committee for their contributions in shaping the event and for their active participation on the day.

The report was produced by Laura McCaughey (University of Glasgow) and the organising committee: Tracy Maxwell (University of Glasgow), Gemma Barron (Robert Gordon University), Susan Chalmers (University of Strathclyde), Virtu Solano (University of Aberdeen), Rhona Gibson (University of Aberdeen), Janis MacCallum (Edinburgh Napier University), Linda Scobie (Glasgow Caledonian University), Lynsay Pickering (University of Dundee), Anna McGregor (University of Glasgow), Samantha Campbell Casey (Edinburgh Napier University) and Lynsey Brosnan (Robert Gordon University).

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

TABLE OF CONTENTS

Executive summary.....3

Skills frameworks overview 5

Workshop sessions overview 8

Key themes and recommendations from the event 9

Core theme:.....9

Theme 1- Supporting students use and understanding of skills frameworks10

Theme 2- Aligning of skills frameworks: 19

Theme 3- Adapting skills frameworks for the future 23

Appendix A: Additional information 28

Appendix B: Shared examples of skills frameworks.....31

EXECUTIVE SUMMARY

The first Future Skills Frameworks in the Life Sciences event on the 5th June 2025 was led by academics, careers professionals and support services staff from seven Scottish universities (University of Glasgow, University of Strathclyde, Glasgow Caledonian University, Edinburgh Napier University, Robert Gordon University, University of Aberdeen and University of Dundee). The event was sponsored by Scottish Universities Life Science Alliance (SULSA) and the University of Glasgow's School of Infection and Immunity. A total of 54 life science representatives including academics, careers professionals, support services staff, current undergraduate students, graduate students and industry representatives were in attendance for a day of presentations and workshops that addressed two key areas around skills passports, awards and frameworks (herein referred to collectively as skills frameworks):

1. Best practice in skills frameworks
2. Enhancing industry alignment of skills frameworks

Three main themes and ten associated recommendations were identified through the workshops and discussions (Table 1), all with a common core theme of contextualisation. Implementing these recommendations across the further and higher education sector will ensure skills frameworks are not only aligned with the needs of the life sciences industry but are also useful, accessible, and empowering for students.

Note: although suggestions of how to implement some of the recommendations are given, the workshop did not focus on detailed practical ways to implement these recommendations. This has been outlined as the focus of a follow up event.

Table 1 – Identified themes and recommendations

Core theme	Theme	Recommendation
CONTEXTUALISATION	SUPPORTING STUDENTS USE AND UNDERSTANDING OF SKILLS FRAMEWORKS	1. FRAME SKILLS PASSPORTS AS A SPACE TO CELEBRATE YOURSELF AND BUILD CONFIDENCE
		2. ALLOW STUDENTS TO TAILOR SKILLS FRAMEWORKS TO REFLECT THEIR OWN INTERESTS AND GOALS, REINFORCING INDIVIDUALITY
		3. SUPPORT STAFF TO ENGAGE WITH SKILLS FRAMEWORKS
		4. EMBED THE USE OF SKILLS FRAMEWORKS INTO THE CURRICULUM
		5. IMPLEMENT TECHNICAL AND STRUCTURAL IMPROVEMENTS
	ALIGNING OF SKILLS FRAMEWORKS	6. AIM FOR UNDERSTANDING OF SKILLS LANGUAGE WITHOUT OVER-SIMPLIFICATION OR RESTRICTION
		7. EXPLICITLY CONNECT DEGREE ACCREDITATION AND SKILLS FRAMEWORKS
		8. ENHANCE INDUSTRY ALIGNMENT AND VISIBILITY
	ADAPTING SKILLS FRAMEWORKS FOR THE FUTURE	9. BUILD ON WHAT SKILLS FRAMEWORKS CURRENTLY DO WELL
		10. ADAPT SKILLS FRAMEWORKS TO ADDRESS THE CURRENT AND FUTURE SKILLS GAPS IDENTIFIED BY INDUSTRY

SKILLS FRAMEWORKS OVERVIEW

Skills frameworks are structured tools used to signpost, support and track the development of transferable, technical and digital skills. They help individuals identify existing competencies, recognise areas for growth, and plan their ongoing development throughout their career journey. Often used in educational and professional settings, these frameworks typically involve reflective writing to encourage deeper self-awareness and critical thinking about personal progress. By aligning skills development with clear criteria, they provide a consistent method for measuring growth and setting meaningful goals.

BACKGROUND TO THE FUTURE SKILLS FRAMEWORKS EVENT

The Scottish Life and Chemical Sciences Skills Summit in 2023 explored how to improve workplace entrant readiness skills and identified integration and recognition of wider skills as a solution to widening graduate skillsets. It was recognised at this summit that students are introduced to a wide range of skills in further and higher education (transferable, technical and digital skills), however these skills are often hidden in the curriculum and invisible to the students. Some education providers have skills frameworks that help to signpost these hidden skills to students. However, this approach is not cohesive and engagement by students with these frameworks could be improved. One of the recommendations from the summit under the banner of integrating and recognising wider skill sets was the introduction of a national skills framework programme (http://researchrepository.napier.ac.uk/output/3397973).

The purpose of the Future Skills Frameworks in the Life Sciences event was to bring together colleagues from across Scottish institutions to share best practice and begin a national dialogue on the use of skills frameworks for widening student skillsets. Although the topic of a national skills framework was covered, the scope of the event was widened to look at all aspects of skills frameworks and how these can be better aligned to the future needs of students and the life sciences industry.

The event was invite only, ensuring a balance of academic, careers professionals, support service staff and student representation across the nine Scottish universities who could attend. Staff were invited based on their work creating and managing skills frameworks, surfacing skills in the curriculum, embedding skills into the curriculum and running

workplace integrated learning programmes. The structure of the day included morning presentations showcasing best practice in skills frameworks, followed by workshop discussions on the relevance of skills frameworks for transitioning into the workplace. Afternoon presentations and workshops brought together industry partners and students to explore alignment between skills frameworks and the core competencies needed for future workforce success.

This report is the key output from the Future Skills Frameworks in the Life Sciences event with the aims of:

- supporting skills development across Scotland's life sciences sector
- providing recommendations for cohesive and flexible skills frameworks
- encouraging adoption of shared best practice across institutions
- enhancing collaboration across Scotland's life sciences sector

Though focused on Scotland, the report has the potential to inform and inspire broader conversations across the UK and internationally around skills frameworks.

If you use the recommendations within this report to strengthen or create new skills frameworks for your institution we would love to hear from you. Please email Laura.McCaughey@glasgow.ac.uk.

PRESENTATIONS OVERVIEW

The event opened with a welcome from Laura McCaughey (University of Glasgow), followed by keynote addresses from Sarah Hunt (Skills Development Scotland) and Yvonne Bayne (Fife College), who provided high-level insights into the skills landscape within life sciences. A series of short three-minute presentations then showcased best practice in skills frameworks, with contributions from academic staff, careers professionals and support service staff across nine Scottish universities, each sharing their experiences and approaches to embedding skills development in further and higher education. This was followed by a Labour Market Information (LMI) presentation, delivered by representatives from the Universities of Aberdeen, Dundee, and Robert Gordon, highlighting current and future skills demand across sectors. In the industry perspectives session, speakers from companies including BioAscent, Sygnature Discovery, RSK Biocensus, SGS Vitrology, and IQVIA discussed the skills most needed now and in the future, and how students can more effectively articulate their skills to employers. Finally, the student perspectives session gave voice to learners from six of the universities, who reflected on how well their current skills align with their future career goals and how skills frameworks have supported, or could better support, their development. The event was closed by Professor Claire Garden, Head of Teaching and Learning at the School of Applied Sciences, Edinburgh Napier University and Chair of the SUSLSA skills committee, who aligned the Future Skills Frameworks in the Life Sciences Event to the previous, and upcoming Scottish Life and Chemical Sciences Skills Summit.

Sarah Hunt, Claire Garden, Yvonne Bayne & Laura McCaughey

WORKSHOP SESSIONS OVERVIEW

There were two workshops during the event that explored different but complementary aspects of skills development and the use of skills frameworks in further and higher education. Workshop 1 focused on best practices for implementing skills frameworks, examining key challenges such as embedding frameworks within curricula, aligning them with accreditation requirements, and addressing the breadth of skills, from common and transferable to specialised and technical (e.g. teamwork vs practical laboratory skills). Workshop 2 turned attention to the external landscape, exploring the alignment between skills frameworks and the evolving needs of industry. It examined emerging skills that are currently underrepresented, the enduring value of core competencies, and how both students and employers perceive the relevance and usefulness of skills frameworks. The session also looked at how students can better articulate their skills in ways that resonate with industry expectations.

KEY THEMES AND RECOMMENDATIONS FROM THE EVENT

CORE THEME:

The importance of contextualisation in skills development emerged as the core theme underpinning discussions. Merely embedding or signposting skills within a curriculum is not enough; students need help making connections. We need to contextualise their learning. This includes contextualisation of skills needed for both industry and academic roles, contextualisation of the varied language used to describe those skills in different settings, and contextualization of the broader range of transferable skills developed through assessments and practical sessions. When students see why a skill matters beyond the immediate assessment or practical element, they are more likely to engage meaningfully i.e. understanding that writing a lab report isn't just for a grade, it develops data interpretation and communication skills. Contextualisation not only enhances student motivation and supports deeper understanding but also makes skills signposting more visible and impactful.

This core theme adds a critical layer to the broader recommendations, highlighting how skills development becomes meaningful when students can imagine their future selves using those skills.

THEME 1- SUPPORTING STUDENTS USE AND UNDERSTANDING OF SKILLS FRAMEWORKS

RECOMMENDATION 1 - FRAME SKILLS PASSPORTS AS A SPACE TO CELEBRATE YOURSELF AND BUILD CONFIDENCE

Many students see skills frameworks as a tool for employability. This can be positive and/or negative depending on where the student is on their employability journey, with some students avoiding skills frameworks due to anxiety around employability, and some students feeling employability skills development is something they can focus on at the end of their degree.

By positioning skills frameworks, not as a compliance or employability tool, but as a personal space for self-recognition, self-celebration and confidence-building it can reframe the act of reflection as something positive and affirming. Framing around recognition of growth reduces the pressure to have a fixed career goal or to 'have it all figured out':

> "You can develop employability skills before you know your career." – workshop attendee

To make the process feels more manageable and meaningful we need to help students understand that skills development is a journey, they will encounter new skills and revisit others many times during their career. To help this positioning, we need to guide students away from "CV buzzwords" and toward authentic, contextual reflections that show who they are in their initial engagements, moving towards more structured reflections using, for example, the STAR framework (where STAR is a commonly used acronym: Situation, Task, Action, Result) as their confidence grows. To help build confidence and promote self-celebration we should encourage reflection on micro-successes; not just recording the big wins like good grades or good experiences, but small wins and personal breakthroughs i.e. giving a first presentation or overcoming lab anxiety. We should also incorporate opportunities to try, fail, reflect, then try again, boosting both skills and student confidence. This leads on to encouraging the idea that reflection is not performance and that skills frameworks should be a safe place to reflect on challenges and how they were overcome.

This framing aligns with broader aims of wellbeing and authenticity in higher education, especially in supporting students to feel confident and supported.

RECOMMENDATION 2 - ALLOW STUDENTS TO TAILOR SKILLS FRAMEWORKS TO REFLECT THEIR OWN INTERESTS AND GOALS, REINFORCING INDIVIDUALITY

Students perceive the value of skills frameworks as a structured way to reflect on and express what they've learned, especially transferable skills. However, with the ever-increasing competitiveness of the life science job market, students are looking for ways to stand out to employers. In these discussions it came across strongly that students want to feel like individuals, not generic products of a course. In the workshop discussions, students were concerned that skills frameworks can be too generic, and they become a tick-box exercise to be done to keep on the same playing field as everyone else. This demotivates students and also perpetuates the idea that once checked off that 'skill' is acquired, rather than skills development being a lifelong process.

> "Skills are not Pokémon — don't just collect them and move on." – workshop attendee

Skills frameworks need to be designed to evolve beyond formal education and into lifelong development that can support career mobility, upskilling and importantly achievement of personal goals. To help address this we recommend embedding options for personalisation and individuality into skills frameworks; make students feel in control of their narrative. Not all students on the same course are at the same point in their skills journey or have the same ambitions and skills needs. This is where the value and importance of reflection, articulation and evidencing needs to be highlighted as a tool for showcasing individuality. Everyone will have an example of working in a team, but how students describe that teamwork, what they learned from it, and how they will adapt and apply their learnings in future settings is unique to the student. Giving students choice and support to reflect on the aspects of a task they value most enables that personal narrative i.e. students who do not want to enter lab-based work may not place as much value on their development of practical skills, but they can be supported to reflect on the transferable skills, like resilience and time-management, they developed while undertaking the practical work.

The ability to use extra-curricular examples and life experiences to personalise skills frameworks came across strongly from industry representatives on the day. Part-time jobs, volunteering and hobbies are excellent ways to develop a range of skills and using skills frameworks to articulate and evidence these is a good way to reinforce uniqueness as well as strengths.

RECOMMENDATION 3 - EMBED THE USE OF SKILLS FRAMEWORKS INTO THE CURRICULUM

Students have ever-growing commitments on their time, be it caring responsibilities, part-time work to fund their studies or long-commutes. To ensure parity and visibility we should schedule time within the academic timetable for skills reflection and skills framework engagement.

To fully embrace embedding of skills frameworks into the curriculum, skills development should not be an add-on. Skills should be meaningfully embedded into course Intended Learning Outcomes (ILO's), course timetables and coursework and mapped across all years of study to ensure vertical alignment and repetition of skills. Skills frameworks should be presented front and centre to the students, not hidden on their Virtual Learning Environment (VLE), or timetabled at the end of semester as a 'one and done' session. There should be a cohesive approach to the use and rollout of skills frameworks across all years of a student's education. This approach also supports accreditation of degrees, as awarding bodies such as the Royal Society of Biology expect skills development to constitute a meaningful part of a life science degree.

A key recommendation to come out of the discussions around this topic was to start early and build incrementally, when students are more open to exploring different paths and less constrained by fixed ideas of their future careers. The idea is to increase students' familiarity with skills frameworks in foundation years and transition into more independent use as they progress through their education. However, context, exposure, signposting and knowledge of opportunities coming from lecturers, careers professionals and support service staff is still important at all stages. For example, when assessing coursework, include time for a reflection session where students explain how the assessment connects to real-world roles or challenges, or use downtime during practical sessions to reflect on skill development. To support recommendations 1 and 2, this in-timetable time should be structured to signpost to students the skills being developed on the relevant timetabled course but also to support students to reflect on the aspects that they value most, including related extracurricular activities and life experiences. Skills development is a journey of growth that is important for social and occupational mobility as well as lifelong learning, so the value and importance of this should be made clear to students by giving it prominence in the curriculum. Teaching reflective practice and embedding it as a normal part of a life science education equips students with the tools to articulate their learning and maximise their potential during their studies and beyond.

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

Case study 1: Embedding skills and reflection into year 2 labs

At the University of Glasgow, all Life Science students take a 30-credit Year 2 course that integrates essential bioscience knowledge with core practical skills. A key component is a four-week lab module, which explores the link between genotype and phenotype using PCR and restriction digests to investigate how genetic variation affects bitter taste perception.

Reflection is built into the lab manual for all four weeks of the lab to support skills development and deepen learning. Students are prompted to reflect on their numeracy skills after the first pre-lab task (example 1), on how they went about learning and understanding new techniques like PCR, how they managed working with a lab partner, and how they utilised the lab support materials on offer. These structured reflection points help students connect technical tasks with their broader development as scientists. The course demonstrates how practical teaching can build scientific competence while fostering reflective, growth-oriented mindsets aligned with future industry needs.

Example 1:

THE COMPLETE GRADUATE REFLECTION PROMPT

Numeracy and accurate lab calculations are essential in academia and the Life Sciences industry because even the smallest measurement error can lead to flawed experiments or misleading results. From calculating reagent concentrations to analysing statistical data, strong numerical skills ensure experiments are both reliable and reproducible. In industry, precise calculations directly impact product development, quality control, and regulatory compliance, core elements that affect public health and safety. Many Life Sciences employers have expressed concern that recent graduates often lack strong numeracy and lab calculation skills.

Use your digital diary on The Complete Graduate to reflect on how competent you think you are with numeracy and lab calculations. If you think there is room for improvement, identify ways you may improve on this in the next 12 months and add that to your reflection.

This reflection doesn't have to be polished or take more than a few minutes. Your digital diary is your space to reflect on your current tasks and celebrate your growth over a semester, a year and your overall degree.

RECOMMENDATION 4 - SUPPORT STAFF TO ENGAGE WITH SKILLS FRAMEWORKS

To embed skills frameworks into the curriculum, academic and support service staff across programmes and institutes need to be actively involved. The level of familiarity with skills frameworks, or the importance put on skills development, will vary between staff, courses and institutions. Some academic staff may be reluctant to embed skills frameworks into their courses, for reasons including workload and the time to implement changes, not placing as much value on skills development as they do on knowledge gain, not wanting to remove content from a course to embed skills frameworks, or not wanting to have something imposed on their course. To overcome some of these issues we recommend leading with the value that skills frameworks have for students. Staff want students to have the best higher education experience and outcomes they can, so demonstrating that the purpose of skills frameworks is to ensure equity, and social mobility, as well as employability may help staff engagement. Using evidence, such as student or employer feedback on improved student articulation or skills development may also help convince hesitant staff. Importantly though, providing staff training on how to use skills frameworks and possible examples for how to embed their use in courses, alongside giving staff the space to reflect on their own course(s) may promote ownership rather than a feeling of imposition.

It is not just academic staff who can support embedding of skills frameworks into the curriculum. Careers professionals play a vital role in this, but so too can technical staff who support lab work. This has the benefit not only of students learning technical skills from trained professionals, but their role in assessment and competency testing gives continued professional development (CPD) opportunities to technicians who may want to apply for fellowships.

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

Case study 2: Stamping Success: Empowering Staff to Embed Skills Frameworks in Lab-Based Learning

In evaluating lab skills, the University of Dundee wanted to provide a full feedback cycle so that assessment was not just measuring attainment but ensuring and motivating attainment. They introduced a highly granular skills sheet for each module. The inclusion criteria were:

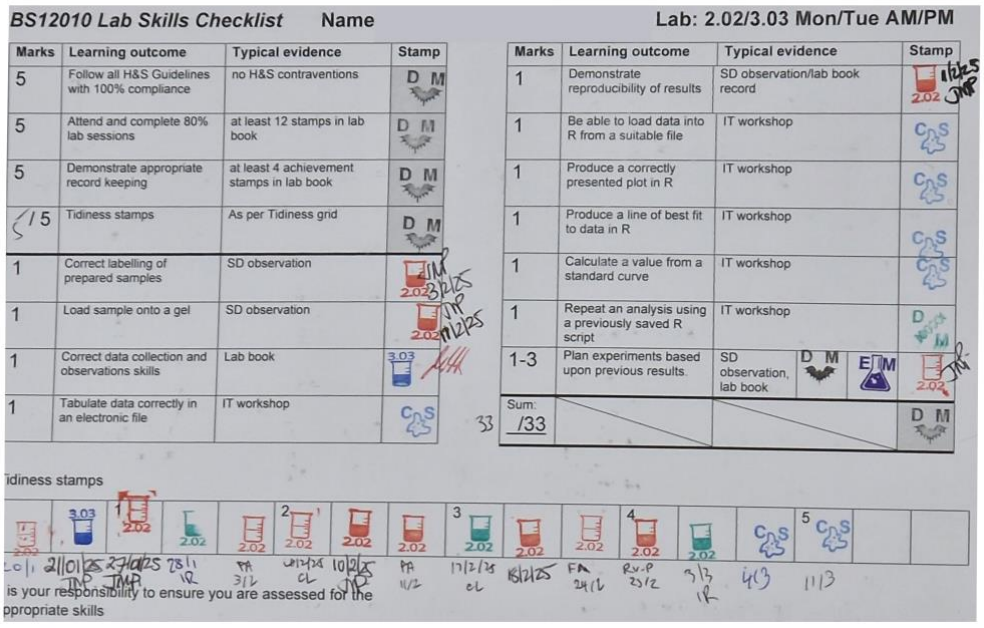
1. The skill had to align with the stated learning outcomes.

2. There had to be multiple opportunities to practice and be assessed on the skill.

This allowed for a high standard of competence to be set with failure and repeat assessment following feedback a normal part of practice.

The implementation was by means of a physical record in the student's laboratory journal. Technical staff along with academic staff noted the achievement with personalised loyalty stamps, which not only gave a physical record but also encouraged discussion between staff and students on why specific symbols had been chosen by the staff member to represent their interests.

The outcome was extremely successful. Students engaged very positively, and staff could see the outcome in terms of attendance and achievement. It replaced a terminal assessment that was both stressful and poorly performing in terms of quality assessment and gave confidence in teaching and in student ability.



BS12010 Lab Skills Checklist Name Lab: 2.02/3.03 Mon/Tue AM/PM

Marks	Learning outcome	Typical evidence	Stamp
5	Follow all H&S Guidelines with 100% compliance	no H&S contraventions	D M
5	Attend and complete 80% lab sessions	at least 12 stamps in lab book	D M
5	Demonstrate appropriate record keeping	at least 4 achievement stamps in lab book	D M
/5	Tidiness stamps	As per Tidiness grid	D M
1	Correct labelling of prepared samples	SD observation	
1	Load sample onto a gel	SD observation	
1	Correct data collection and observations skills	Lab book	
1	Tabulate data correctly in an electronic file	IT workshop	

Marks	Learning outcome	Typical evidence	Stamp
1	Demonstrate reproducibility of results	SD observation/lab book record	
1	Be able to load data into R from a suitable file	IT workshop	
1	Produce a correctly presented plot in R	IT workshop	
1	Produce a line of best fit to data in R	IT workshop	
1	Calculate a value from a standard curve	IT workshop	
1	Repeat an analysis using a previously saved R script	IT workshop	
1-3	Plan experiments based upon previous results.	SD observation, lab book	D M E M
Sum: /33			D M

Tidiness stamps

is your responsibility to ensure you are assessed for the appropriate skills

Case study 3: Technical Team Support of Student Skills Development

ENU Tech Team is integral to the development and implementation of skills teaching. This allows students to learn from practiced professionals from a variety of backgrounds who are required to maintain practical competencies, but also allows the technicians to develop academically, through their support of teaching and learning. Through a grassroots approach, ENU Techs support this development from Primary/Secondary Schools, and throughout a student's time in HE, while bringing more visibility and recognition to the technical contribution.

Induction Labs/Professional Practice Labs

The team provide help students reinforce their basic lab skills, demonstrate skills and assess student technique. This extends across the curriculum from induction to the Professional Practice module, where 4th year students develop their practice before honours projects and graduation. Technicians have also developed digital resources (SOPs, Demonstrations, quizzes) used by students and staff to support practical teaching. The ENU Tech Team received an Above & Beyond Award for Innovation for their work in this area.

Advanced Therapies Skills Training Network

The Advanced Therapies Skills Training Network (ATSTN) was a joint project, hosted by ENU and Charles River Laboratories in Edinburgh, and funded by SULSA and supported by technical staff. This project was to deliver upskilling opportunities for students looking to return to work or retrain. Students were grateful for the opportunity to develop in a supportive environment. Our partners at CR were impressed with the quality of training that we offered, with 5 of the student cohort being interviewed for roles at CR afterwards.

Outreach Activities

Our technical team provide outreach labs and activities for a range of age groups through relationships with local Schools, to provide on-site practicals and host School groups at ENU. These include microscope demonstrations (such as onion root mitosis), DNA extraction from fruit, or sugar rainbows for younger groups, PCR, or ELISA experiences for AH Biology students.

RECOMMENDATION 5 – IMPLEMENTING TECHNICAL AND STRUCTURAL IMPROVEMENTS

For skills frameworks to be useful they need to be practical, actionable and as easy to use as possible for both staff and students. Some recommendations that were identified during discussions include skills frameworks:

- Being digital, easily updated, and exportable for use in job applications and further study
    - Building a skills framework into the students Virtual Learning Environment (VLE) means staff and students are familiar with the technology and there are no additional support costs
- Enabling students to track and visualise their skills progression across courses and years, and ideally into future employment
- Being used for development rather than being credit bearing
    - This allows space for learning and growing through failure, and avoids 'passing' rather than the development of competence
    - Tying competence into recognition on Higher Education Achievement Report (HEAR) transcripts is a good way to give students recognition while also allowing for personalisation
- Covering both curricular and extracurricular activities

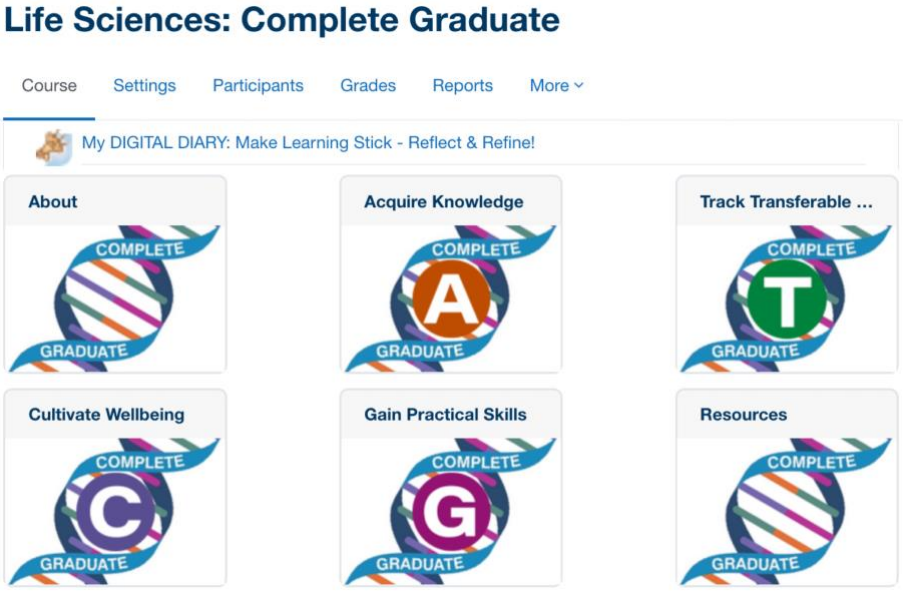
One of the main barriers to engaging with skills frameworks that students identified during discussions was information overload leading to disengagement. Skills taxonomies with 80-100 skills are useful at an institutional level, but they should be searchable and filterable (e.g. by degree/job family) to reduce cognitive overload. Making skills contextual and relevant to their specific degree/future job role increases clarity and engagement. This also feeds into the topic of skills language and the confusion that can arise when similar things are said in multiple ways (see recommendation 6).

Case Study 4: The Complete Graduate: A Digital Framework for Skills Surfacing and Reflection

The Complete Graduate is a digital skills framework and portfolio tool embedded within the University of Glasgow's VLE (Moodle). It is designed to help the ~ 2000 Life Science students at the University of Glasgow (SCQF levels 7 through 11) recognise, reflect on, and articulate their learning. Organised into four key areas, Knowledge, Transferable Skills, Practical Skills, and Wellbeing, the Complete Graduate enables students to track their development across their degree journey.

A standout feature is the inclusion of searchable, filterable databases within the Knowledge, Transferable Skills, and Practical Skills sections. These databases allow students to explore intended learning outcomes (ILOs), assessed and non-assessed skill development opportunities, and practical competencies by degree, course, year and skill. This functionality supports both forward planning, such as choosing future courses, and reflective review of past learning. Students can also build personalised checklists to monitor their progress and maintain a reflective 'Digital Diary'. This is supported by interactive reflective writing worksheets and writing guides, making the framework both structured and adaptable to individual goals (see appendix B).

For staff, the platform is easy to integrate into teaching and advising, with minimal additional support required. It also connects to broader employability goals by helping students export reflections for job applications and link achievements to HEAR transcripts. By making skills development visible, contextual, and student-owned, the Complete Graduate supports both staff and students in building a future-ready graduate identity.



THEME 2- ALIGNING OF SKILLS FRAMEWORKS:

RECOMMENDATION 6 - AIM FOR UNDERSTANDING OF SKILLS LANGUAGE WITHOUT OVER-SIMPLIFICATION OR RESTRICTION

A major topic discussed in the workshops is the inconsistency in skills terminology used across institutions, countries, and job roles. Related to and alongside this, the idea of a national skills framework was discussed. The idea that inconsistent skills language creates confusion for students, especially in international or interdisciplinary contexts was discussed. It was recommended that instead of enforcing rigid lists across institutes, industry, and job roles, which might result in misinterpretation or context being lost in translation, flexibility, autonomy and institutional individualism is supported by the creation of a skills dictionary and/or thesaurus for each institution.

"It's not important what you call the skill, what matters is whether the student can explain and demonstrate it." – workshop attendee

By each institution clearly defining the skills language they use e.g. their definition of "data analysis", "problem-solving" or "numeracy", alongside a list of synonyms and near-equivalent terms e.g. "transferable skills" vs "transversal skills" students are supported to interpret job adverts and articulate their own experience using language matching. These dictionaries and/or thesaurus should be expanded to include technical and practical skills with related or comparable techniques named e.g. definition of cell culture with similar techniques that share core competencies listed alongside, allowing transferability of knowledge. These should include what a skill means, how it could be applied within life sciences and how to best develop it.

These discussions on student mobility and institute identity led to the recommendation that a national skills passport, although having many positive aspects, may become too restrictive, and would be better substituted for the creation of a skills dictionary and/or thesaurus. It was also felt that a national skills passport would require a level of coordination and financial support that is not feasible in the current climate within the education sector. What was supported was the commitment to yearly regional and national skills frameworks meetings incorporating further and higher education staff, students and industry representatives, to share learnings and promote communication and collaboration.

RECOMMENDATION 7 – EXPLICITLY CONNECT DEGREE ACCREDITATION AND SKILLS FRAMEWORKS

For further and higher education institutes that possess them, accreditation and skills frameworks are both mechanisms for demonstrating competence in a range of skills. However, one is under the control of the institution and the other is under the control of the student. Students often don't understand the relationship between these two things as they often don't know what accreditation means or how it applies to them. They "hear the term," but don't understand its significance or how it connects to their learning and employability. Skills frameworks and degree accreditation should be designed to complement each other, with frameworks helping to demonstrate that the outcomes of accredited curricula are being met at an individual level. This mutual reinforcement can be strengthened by developing templates or examples showing how skills framework entries map to accredited learning outcomes and how they align with teaching practice. This feeds into recommendation two; by encouraging students to demonstrate and articulate the skills and competencies that are assumed of someone holding an accredited qualification*, it promotes individualisation and a personal narrative of skills acquisition.

* Not all life science qualifications are accredited. Life Science accrediting bodies include, but are not limited to: The Royal Society of Biology (RSB), Institute of Biomolecular Sciences (IBMS), Chartered Institute of Ecology and Environmental Management (CIEEM), Institution of Environmental Sciences (IES)

What is Degree Accreditation?

Degree accreditation in the life sciences is a formal recognition process led by professional bodies such as the Royal Society of Biology (RSB). It ensures that further and higher education programmes meet defined standards of academic quality, subject knowledge, technical ability, and transferable skills. The goal is to prepare graduates with the competencies needed for careers in the biosciences and to assure employers of the quality and relevance of the training provided.

Accredited programmes typically include hands-on laboratory or fieldwork, problem-solving, and independent research experiences. They are assessed against national benchmarks and reviewed by expert panels. Accreditation enhances the employability of students, supports curriculum development, and helps maintain the UK's global reputation in life sciences education (https://thebiologist.rsb.org.uk/images/RSB_Accreditation_Handbook.pdf)

RECOMMENDATION 8 - ENHANCE INDUSTRY ALIGNMENT AND VISIBILITY

One of the most consistent themes to come out of the workshop discussions was the disconnect students feel between their academic coursework and real-world industry applications. While curricula are often designed with academic progression in mind, students also want to understand their broader career options and how their skills and interests relate to jobs outside of academia.

"Students choose their interests after school, not their career. Careers options need to be highlighted throughout further and higher education" – workshop attendee

There were several recommendations for how to use skills frameworks to enhance industry alignment and visibility of industry careers to students:

- Use micro-moments for careers awareness
    - Dedicate a few minutes at the end of lectures to highlight a career path or real-world application related to the topic covered in the lecture. This relates to recommendation three, where skills frameworks need to be front and centre and not timetabled as a stand-alone session at the end of term
- Engage with alumni and employers
    - Bring in guest speakers, case studies, or videos from industry professionals who can articulate how academic skills translate into their jobs
- Clearly demonstrate the relevance of academic skill(s) to industry applications
    - Instead of assuming students will "connect the dots," state where and how each skill is used in industry e.g. the importance of accurate pipetting in pharmaceutical quality assurance, literature reviews in regulatory affairs, lab report writing as data synthesis, and writing coherent lab notebooks as compliance tools
- Co-Design with Employers
    - Involve industry stakeholders in developing and validating skills frameworks and course content to ensure relevance (see recommendation 10 and case study 5)

Another important discussion with industry representatives about skills frameworks focused on the value industry places on these. It was agreed that a collection of skills on a summary page isn't useful to employers unless backed by real evidence and personal narrative. The value to industry employers of skills frameworks is not in the award or badge itself but in the frameworks aiding students to articulate and demonstrate their skills.

Case study 5: Enhancing alignment and visibility using Industry Advisory groups

In the early 2010's the Life Sciences programme team at Edinburgh Napier University were tasked with responding to the Scottish Life Sciences Strategy, which aimed to double the size of the sector in Scotland by 2020. This asked for Life Sciences graduates equipped with the skills and attitudes required of employees to service the needs of the sector, and the abilities to develop over the period of their career. A survey of these employers in Scotland revealed problematic skills gaps in graduate applicants, a significant proportion (40%) reporting issues not with qualifications, but with core skills and attitudes. Areas requiring increased professional development at that time included: problem-solving, team working, planning and organisation, as well as the ability to self-motivate and have a positive attitude to work.

As part of the response to this challenge we set up our Employer Liaison Panel. Edinburgh Napier University BioSciences Industry Advisory Group is now in its 12th year of running, and has been very successful as a collaboration between Industry and Academia in the following ways:

- Providing input into programmes, curricula development and industry related activities.
- Developing collaborative opportunities with students such as work placements or on dissertation projects.
- Sharing graduate roles and supporting Edinburgh Napier talent into pipelines.
- Developing opportunities for knowledge exchange and research.
- Providing the School with insight into current skills requirements in the sector.
- Developing networks across School for students, staff and graduates.
- Providing guest lecturing or associate academic opportunities.

THEME 3- ADAPTING SKILLS FRAMEWORKS FOR THE FUTURE

RECOMMENDATION 9 – BUILD ON WHAT SKILLS FRAMEWORKS CURRENTLY DO WELL

Skills frameworks are already proving effective in encouraging reflective analysis, helping students to deepen their learning and to adopt a growth mindset that extends beyond knowledge acquisition. They play a valuable role in broadening the scope of learning, but there is potential to strengthen their impact by more fully embedding reflective practice as a core component of life sciences education (recommendation 3). Since reflective writing often feels unfamiliar or unnatural to many science students, simplifying the process through structured, interactive tools, such as guided reflection worksheets (see case study 4), can lower barriers to engagement. Introducing students to industry-aligned reflective frameworks like STAR (Situation, Task, Action, Result) can also enhance students ability to reflect in a format recognised and valued by employers, bridging the gap between academic development and workplace readiness.

Interestingly, during the presentations and workshop discussions, students identified that skills frameworks best supported them in developing practical and communication skills. However, this perception is somewhat at odds with industry perspectives, which were that students often lacked competency in basic practical skills (see recommendation 10). One reason for this that was discussed was that students often see skills frameworks as a one-off, tick-box exercise, while employers value a mindset of lifelong development, where skills are refreshed, adapted, and applied in new contexts. To better align with these expectations, skills frameworks should be positioned not just as reflective tools, but as evolving records of personal and professional growth. Encouraging students to return to their reflections and build on them throughout their academic journey can help instill the habits of adaptability and continuous improvement that industry demands.

RECOMMENDATION 10 – ADAPT SKILLS FRAMEWORKS TO ADDRESS THE CURRENT AND FUTURE SKILLS GAPS IDENTIFIED BY INDUSTRY

The life sciences sector is evolving at an unprecedented pace, driven by rapid technological advancements, emerging interdisciplinary fields, and shifting global health priorities. As new roles and skillsets continue to emerge, there is a growing need for the workforce to adapt quickly and effectively. To keep pace, further and higher education programmes must pivot from a reactive approach to a proactive one, anticipating future demands and embedding the skills students will need not just today, but in the near future. By doing so, they can ensure students are not only prepared for the current landscape but are equipped to lead and innovate in the life sciences sector of the future. However, preparing students for the full range of specialised and technical roles cannot fall to the education sector alone. This must be a shared responsibility between the education sector and the life sciences industry, with collaboration key to ensuring students gain both the broad, transferable foundations and the more targeted, role-specific training needed to thrive in the sector's future.

The following current and future skills gaps were highlighted during workshop discussions, but also from labour market insights presented on the day:

Resilience and Learning from Failure
Gap: Students often lack resilience and the ability to learn from failure. These are key traits valued by industry along with the ability to pivot into different roles and apply core skills in new ways.

Action:

- Embed opportunities for iterative learning and failure (e.g. labs using real, messy data).
- Encourage reflective practice and growth mindset throughout assessments and feedback processes. Encourage reflection on failure through skills frameworks.
- Design scenarios that allow students to pivot and adapt, mimicking real-world challenges.

AI Literacy and Ethical Use of Technology

Gap: Students are underprepared for AI-integrated workplaces and lack training in ethical, responsible use of AI.

Action:

- Integrate AI literacy and digital ethics into the curriculum.
- Offer interdisciplinary sessions or guest lectures on emerging technologies and their implications.
- Encourage critical discussions and reflections about the limitations and societal impact of AI in science.

Project and Time Management Skills

Gap: Students report low confidence in managing projects, planning milestones, and time management. These are crucial skills across industry sectors.

Action:

- Embed more structured project management tasks in group assignments
- Teach time management and planning tools explicitly (e.g. Gantt charts, agile methods)
- Help students identify the components of a task
- Give more autonomy during practical sessions . i.e. students need to plan experiments, prepare and maintain lab stocks, equipment etc

Numeracy and Coding Confidence

Gap: Confidence in numeracy and coding is low, and students often lack context for their relevance.

Action:

- Clarify the types of mathematical and coding skills required in specific life sciences roles
- Build confidence through incremental, scaffolded learning and frequent, low-stakes practice
- Increase access to maths/coding support resources and peer mentoring

Practical Skills Competency
Gap: Students are entering the workforce without sufficient competency in basic practical skills, especially post-Covid.

Action:

- Prioritise practical experience within curricula, despite financial and timetabling constraints

- Work with industry to co-deliver practical training or placements
- Explore shared facilities, regional partnerships, or funded bootcamps to expand access to hands-on training.

Commercial and Industry Awareness
Gap: Students lack understanding of how businesses operate, including regulations, compliance, and real-world job roles.

Action:

- Include guest talks or modules on industry structure, regulatory frameworks e.g., Standard Operating Procedures (SOPs), Good Laboratory Practice (GLP), and role types (Case study 6)
- Embed SOP's and GLP into practical sessions
- Create short industry immersion experiences or case studies aligned with real job functions
- Partner with industry to co-develop and co-deliver applied content

Case Study 6: Graduate Employability Masterclass (GEM)

Established in 2013 as an outcome of the Glasgow Economic Leadership (GEL) Life Science Workstream, the Graduate Employability Masterclasses have become a cornerstone initiative in enhancing career readiness among life and chemical sciences graduates across Scotland. The programme was developed in direct response to industry needs and continues to deliver on its founding objectives.

The Masterclasses were designed to address 3 primary goals identified by industry stakeholders:
• Career Awareness: To help graduates explore the wide range of roles available within life science companies and organisations.

• Career Development: To support students in shaping their career pathways, while providing mentoring on CV writing and job applications.

• Industry Engagement: To foster stronger connections between university students, academic staff, and industry professionals.

The programme is delivered through a collaborative model involving 12 Scottish universities, organised into four regional clusters. This structure enables broad participation and regional relevance, ensuring students across Scotland have access to high-quality, industry-informed employability support.

In Academic Year 24/25 over 300 students took part in 25 workshops with 19 speakers from diverse life science companies contributing their expertise. Students engaged in hands-on activities such as writing Standard Operating Procedures (SOPs), gaining insight into real-world industry practices.

Student and industry representative testimonials reflect the value and impact of the Masterclasses:

“The masterclasses were excellently run and allowed me to gain valuable industry insight. I would recommend them to any current life sciences student.”

“The Graduate Employability Masterclasses continue to play a vital role in preparing life and chemical sciences graduates for successful careers. By combining academic insight with industry expertise, the programme delivers a dynamic and impactful learning experience that benefits students, universities, and employers alike.”

Image: Students from the Aberdeen Cluster

APPENDIX A: ADDITIONAL INFORMATION

ORGANISING COMMITTEE:

Laura McCaughey, University of Glasgow

Tracy Maxwell, University of Glasgow

Anna McGregor, University of Glasgow

Rhona Gibson, University of Aberdeen

Virtu Solano, University of Aberdeen

Lynsay Pickering, University of Dundee

Lynsey Brosnan, Robert Gordon University,

Gemma Barron, Robert Gordon University

Susan Chalmers, University of Strathclyde

Linda Scobie, Glasgow Caledonian University

Janis McCallum, Edinburgh Napier University

Samantha Campbell Casey, Edinburgh Napier University

INDUSTRY ATTENDEES

BioAscent: https://www.bioascent.com/

SGS Vitrology: https://www.sgs.com/en-gb/showcases/vitrology

Sygnature Discovery: https://www.sygnaturediscovery.com/

RSK Biocensus: https://rskbiocensus.com/

IQVIA Laboratories: https://labs.iqvia.com/

Causeway Therapeutics: https://www.causewaytx.com/

RLCX Consulting

SPONSORS:

Scottish Universities Life Science Association (SULSA)

SULSA is an alliance of twelve Scottish universities and one research institute that aims to advance Scotland's research and innovation in the life sciences through strategic collaboration across institutions, disciplines and sectors. SULSA focuses on increasing research funding into Scotland, supporting post-graduate development and improving the international standing of our life sciences research sector. SULSA is experienced in delivering externally funded projects including those that facilitate demand-led skills programmes co-designed and delivered by industry and educators.

Contact: Dr Alison Hughes, Director, Scottish Universities Life Sciences Alliance (SULSA), Alison.Hughes@glasgow.ac.uk

School of Infection and Immunity (Sii), University of Glasgow

The School of Infection & Immunity (Sii) is one of eight schools in the College of Medical, Veeterinary and Life Sciences (MVLS) at the University of Glasgow. Sii is comprised of scientists and clinical investigators of global repute who work together to promote and develop research, drug discovery, and improvements in patient care. Their expertise is supported by state-of-the-art science technology, integrated seamlessly with translational clinical trial facilities to a facilitate a truly 'bench to bedside and back' approach to resolving crucial questions of this new millennium. Sii is committed to excellence in teaching and delivering internationally recognised research-led degree programmes that support the development of the next generation of researchers.

Contact: Dr Laura McCaughey, Senior Lecturer in Microbiology, Laura.Mccaughey@glasgow.ac.uk

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

EVENT AGENDA:

TIME	ACTIVITY
9.00-10.00	Registration, networking
10.00-10.55	Welcome: Laura McCaughey, University of Glasgow Keynote: Sarah Hunt, Key Sector Manager, Life and Chemical Sciences, Skills Development Scotland Keynote: Yvonne Bayne, Health & Life Sciences Partnerships Manager (Industry Engagement), Fife College
10.55-11:25	Best Practice in Skill Frameworks: 3 min presentations Anna McGregor, University of Glasgow Virtu Solano & Rhona Gibson, University of Aberdeen David Martin, University of Dundee Susan Chalmers, University of Strathclyde Janis MacCallum, Edinburgh Napier University Gemma Barron & Lynsey Brosnan, Robert Gordon University Alison Cullinane, Edinburgh University Clare Wilson, University of Stirling Adrian Pierotti, Glasgow Caledonian University
11:25-11:35	Break
11:35-12:30	Workshop 1: Best Practice in Skill Frameworks: This workshop will look at the challenges and areas for development around Skills Frameworks. i.e. challenges embedding frameworks, aligning with accreditation, different types of skills (common, specialised, software) and how well these can be addressed by skills frameworks
12.30-13.30	Lunch & networking
13.30-13:40	Labour Market Information presentation Rhona Gibson, University of Aberdeen Lynsey Brosnan, Robert Gordon University Lynsay Pickering, University of Dundee

	Industry perspectives presentations: what skills are most needed now/in the future & how can students best articulate these
13:40-14:10	Stuart McElroy & Brain Mcferran, BioAscent Laura Hutchinson, Sygnature Discovery Steve Coates, RSK Biocensus Ana Ion & Bernadette Young, SGS Vitrology Karen Smith, IQVIA
	Student perspectives: how students feel their skills align with their future careers
14:10-14:40	Victoria Wilde, Eilidh McDiarmid, Rebekah Smith, Uof Glasgow Laure Neveu, Uof Dundee Julia Brodowska, Elizabeth Poobalan, Yvonne Brown, Uof Aberdeen Christine Butt, Uof Edinburgh Will Flann, Katherine Thomson, Robert Gordon University Ruairidh Alexander, Edinburgh Napier University
	Workshop 2: alignment between skills frameworks and future industry needs
14:40-15:30	This workshop will look at the skills needs of industry now and in the future. i.e. what emerging skills are HE not addressing, what common skills will remain core, what value do industry and students perceive in skills frameworks, how can students articulate their skills in a way industry wants?
15.30-16:00	Afternoon tea/coffee, networking
16.00-16.45	Workshop 2 feedback and closing remarks by Prof Claire Garden

APPENDIX B: SHARED EXAMPLES OF SKILLS FRAMEWORKS

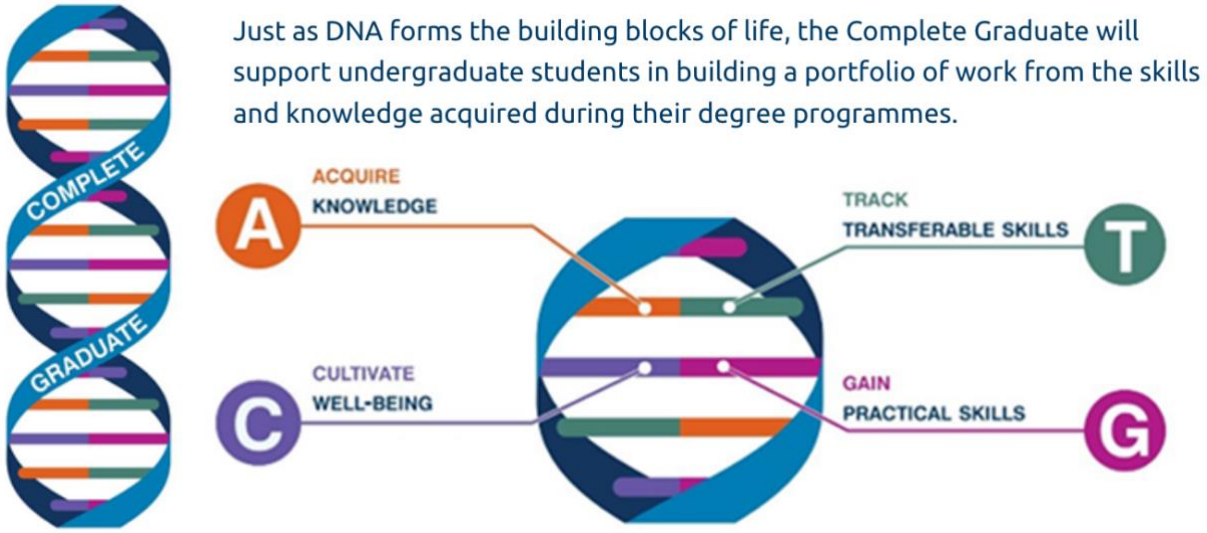
Below follows a series of case studies highlighting skills frameworks in life science programs across Scotland.

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

THE COMPLETE GRADUATE

DR LAURA MCCAUGHEY, DR ANNA MCGREGOR, DR LESLEY HAMILTON – UNIVERSITY OF GLASGOW



WHAT IS IT?

The Complete Graduate is a Moodle resource designed to signpost Life Science students to the learning content and resources available in their degrees, divided into sections on Knowledge, Transferable Skills, Practical Skills and Wellbeing, and arranged by relevant course and degree. It is also a portfolio tool, designed to guide students through reflecting on their learning by encouraging them to add specific and well-articulated examples of their learning to an ongoing personal Digital Diary (similar to a blog).

The goal of the Complete Graduate is to encourage employment-ready graduates by helping them to realise and articulate the vast range of knowledge and skills development that is embedded as part of their degree.

WHO CAN USE IT?

The Complete Graduate is available for all undergraduate Life Science students at the University of Glasgow from year one to final year (~2000 students). Its use is optional, but by embedding it into points in the curriculum (see the 'how do staff use it' section), the aim is to highlight to students its benefits and encourage self-directed use. For context the University of Glasgow has 14 BSc(Hons) life science degrees and offers the MSci programme for all of these degrees. Degrees include: Anatomy, Biochemistry, Genetics, Human Biology & Physiology, Immunology, Marine & Freshwater Biology, Microbiology, Molecular & Cellular Biology (with Biotechnology, & with Plant Science), Neuroscience, Pharmacology, Sport & Exercise Science, and Zoology.

HOW DOES IT WORK?

All Life Science students and staff are enrolled on the Moodle course. It has searchable databases for students to look up Intended Learning Outcomes (ILOs), transferable skills or practical skills for any year of any Life Sciences degree (see appendix). Therefore, students can look ahead to investigate what is yet to happen on their degree, which is useful for Year 1 and 2 students at the University of Glasgow as they do not finalise their degree choice until the end of year 2, or they can look back to remind themselves what they have learned. Students are also able to create their own checklists to track their personal development in each of the four sections.

On the Complete Graduate homepage, each student has their own private Digital Diary (similar to a blog), in which they can populate as many entries as they like. Students are encouraged to write on each of the four sections at the end of each semester. To help with this there is an interactive worksheet to guide them through their reflections (See appendix). There is also a short, written guide on reflective writing in the Resources section.

HOW WAS THE INFORMATION FOR THE DATABASES GATHERED?

For all core courses i.e. those that are a pre-requisite for any given degree, course ILOs, aims and outlines were gathered from the course catalogues. For the Practical and Transferable Skills sections, Moodle courses were manually searched, and activities and assessments mapped to a list of transferable skills. A definition for each skill was available before mapping began. Course coordinators are asked for any changes to transferable skills, practical skills and ILO's on a yearly basis.

HOW DO STAFF USE IT?

Staff encourage the use of the Complete Graduate either through their role as lecturer, course coordinator and/or Advisor of Studies. For example, during sessions that involve reflective writing, staff encourage students to upload their reflections to their Digital Diary, and/or encourage use of the reflective writing tools on the Complete Graduate to help with their work. Course coordinators/lecturers also point out any specific skills developed during a course and encourage students to reflect on these.

HOW DO STUDENTS USE IT?

The Complete Graduate was rolled out to all life science students in 2024/2025. Use of the tool was embedded in several courses and introductions to The Complete Graduate were given at the start of the academic year. Student survey responses and Moodle analytics have been positive for the first year. For 2025/2026 there is a student intern creating a student engagement plan, and there will be a push to embed the tool in more courses to further encourage its use.

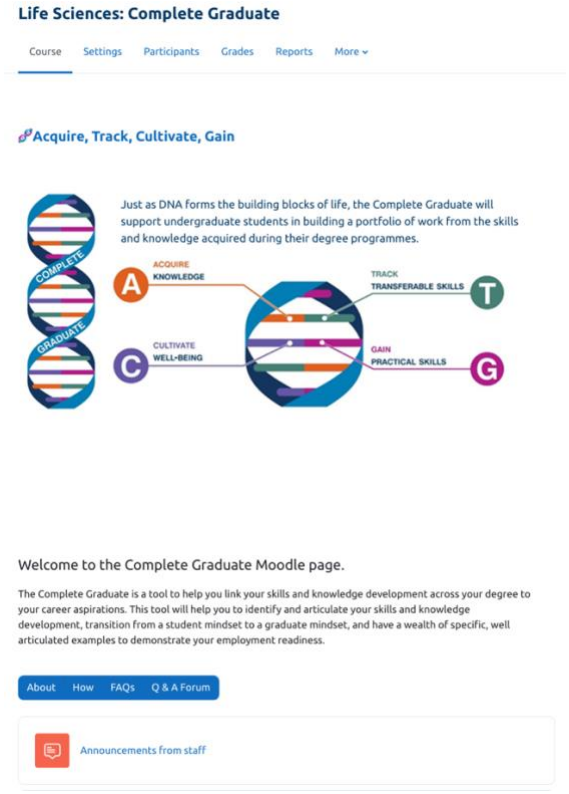
HOW WAS THIS PROJECT FUNDED?

The Complete Graduate was funded by a University of Glasgow Learning and Teaching Development Fund grant in 2022, led by Drs Anna McGregor, Laura McCaughey and Lesley Hamilton. They were supported by a team of excellent student partners: Austin McCombie, Derbhla Duffy, Kirsty MacIver, Rachel Aitken & Sean-James Brownlie.

Dr Laura McCaughey, School of Infection & Immunity, University of Glasgow, Laura.McCaughey@glasgow.ac.uk
Dr Anna McGregor, School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, Anna.McGregor@glasgow.ac.uk
Dr Lesley Hamilton, MVLS Education Hub, University of Glasgow, Lesley.Hamilton@glasgow.ac.uk

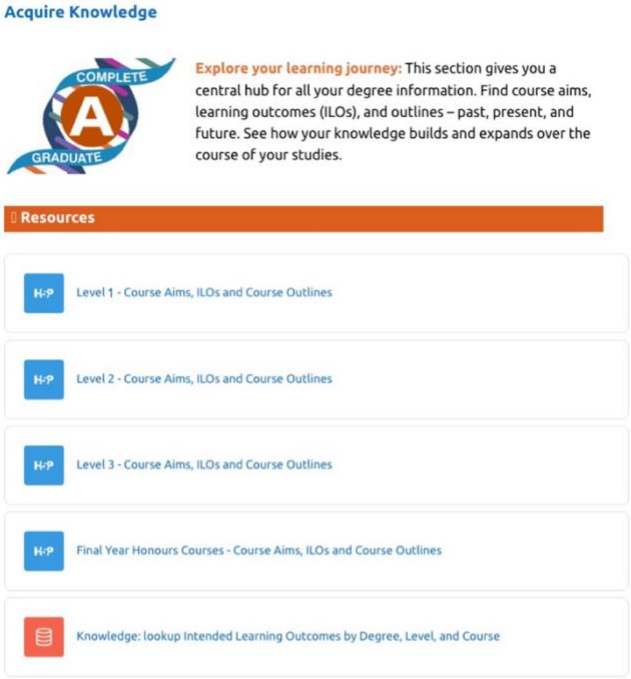
APPENDIX:

Complete Graduate Homepage:



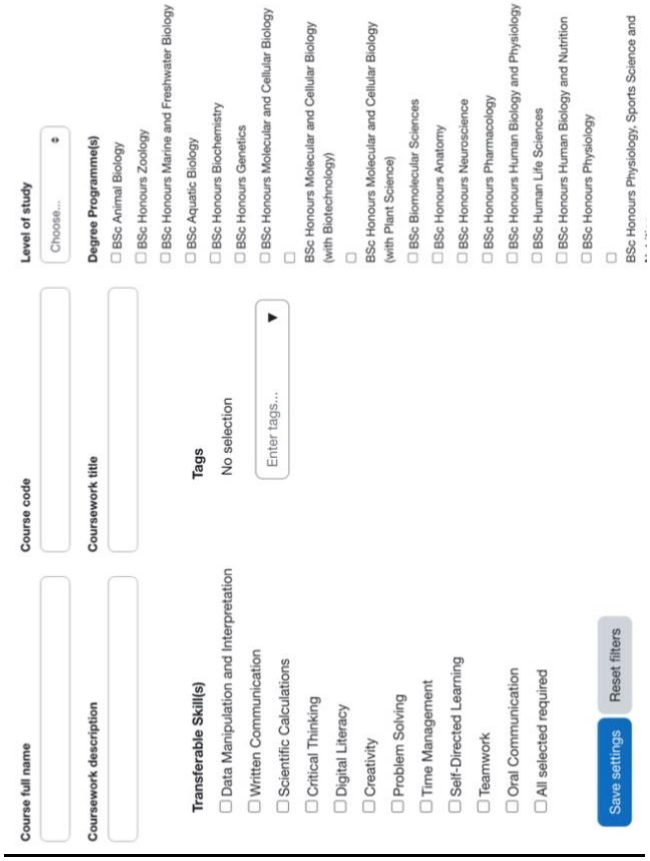
Practical Skills Main page:

Knowledge Main Page:

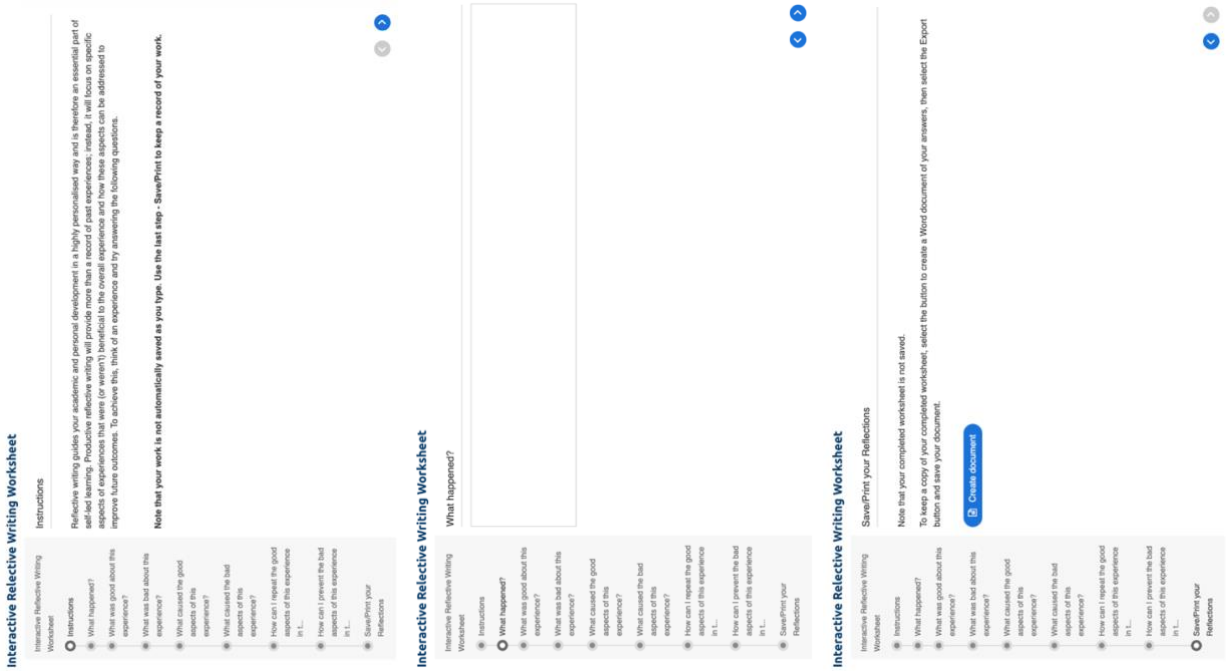


* The Transferable skills and Wellbeing sections have similar main pages with searchable databases and reflective prompts.

Transferable skills: Lookup skills by course and skill



Resources: Reflective writing interactive worksheet



University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

TRANSFORMING LABORATORY EDUCATION THROUGH EMBEDDED SKILL-BASED MODULES: THE DEVELOPMENT AND IMPACT OF PL2189 AND PL3189 AT RGU

CONTRIBUTORS: DR AAKASH WELGAMAGE-DON, DR GEMMA BARRON, DR JANINE COOMBES, WILL FLANN (STUDENT), KAT THOMSON (STUDENT) AND DR SHAUNA CUNNINGHAM

CONTEXT AND RATIONALE:

The BSc (Hons) Applied Bioscience academic team at Robert Gordon University (RGU) undertook a review of the course in preparation for the revalidation and Royal Society of Biology (RSB) re-accreditation in 2023. In the first iteration of the course in 2018, the curriculum followed the long-standing principles of other Life Science courses in the School of Pharmacy and Life Sciences (now the School of Pharmacy, Applied Sciences and Public Health) and incorporated laboratory practical sessions within knowledge-based modules to re-enforce the theoretical principles explored in lectures /tutorials. However, staff had noticed that in the capstone 4th stage Honours research projects, students frequently demonstrated deficiencies in fundamental laboratory skills, such as preparing dilutions, pipetting and measuring pH. The considered view of the academic team was that this eroded the employability of students and was not aligned with the stated aim of the course to prepare students for careers in the bioscience industry.

INTERVENTION:

In the academic session 2022-2023, the academic team decided there was a need to place more emphasis on the acquisition of laboratory-based skills and, as a result, developed two 'stand-alone' modules: bioanalytical skills I in 2nd stage and bioanalytical skills II in 3rd stage. In both modules, there are three general strands to the material covered in the modules:

1. foundational laboratory skills, such as accurate pipetting and aseptic practice.
2. mathematical and analytical skills required in laboratory practice, such as preparing solutions, dilutions and statistical analysis using R.
3. professional laboratory management, such as accurate record-keeping and health and safety.

These strands are explored whilst applying the principles set out in the Good Laboratory Practice regulations of the UK Government and exposing students to a variety of common laboratory techniques, including microbiological and mammalian cell culture, HPLC, spectrophotometry, flow cytometry and gene transfection. Further development of the modules could explore incorporation of the National Occupational Standards.

In 2nd stage, students are encouraged to complete their laboratory records in class according to a set of instructions detailing how to keep a record. In 3rd stage, laboratory records must be completed in class and students are not permitted to remove their laboratory records from the lab. The role of the laboratory record as legal documentation is emphasised throughout both modules. Laboratory records are hand-written, rather than digital; in future, we would like to expose students to digital record-keeping. The laboratory record is part of the summative assessment of the module, but students also assess samples of records to identify aspects of bad and good practice in record-keeping. In 2nd stage, students are given COSHH and health and safety risk assessment documentation to identify hazards. In 3rd stage, students are expected to undertake their own COSHH and health and safety risk assessments and complete the related documentation. This skill is also assessed summatively as part of an objective structured practical examination (OSPE).
Students also explore the reproducibility and quality assurance of their experiments and experimental design. In 2nd stage experimental protocols that highlight the use of controls and replicates are provided, and hypothesis-driven enquiry and experimental design introduced. In 3rd stage, these skills are developed further through opportunities to design their own experimental protocols to address specific problems with the requirement to include relevant positive and negative controls.
The students' development of data analysis, synthesis and presentation skills is supported by exposure to a variety of software; in addition to statistical analysis with R and Excel, students are also trained in the use of ImageJ and FlowJo using real research data in addition to data generated from their own experiments.

Scientific writing skills are also included in the modules and assessed summatively in the submission of a written laboratory report which is also orally assessed to assure academic rigour and integrity.
The OSPE is composed of eight stations designed in 30-minute activities spanning health and safety, practical tasks, and data analysis and interpretation. The OSPE takes place in two 2-hour blocks over the course of a single day. In both modules, mock sessions are provided where students can practice their skills.

IMPACT:

Whilst subjective, our impression is that the exposure of students to this integrated skills-based approach to laboratory practice has improved students' confidence and engagement with laboratory activities, which should reap dividends for the first cohort to complete both modules when they begin their Honours year modules in September 2025, including Research Methods and the Applied Bioscience Honours Research Project. Feedback from the students' has been very positive, indicating that students believe the wide breadth of experience to different disciplines in biology and the exposure to industry standards of practice on the course will both improve their employability and ease the transition from university studies into industry.

CASE STUDY: BASIC SKILLS TRAINING FOR THE IBIOIC MSC IN INDUSTRIAL BIOTECHNOLOGY

MORGAN A. FEENEY AND KIRSTY ROBB

STRATHCLYDE INSTITUTE OF PHARMACY AND BIOMEDICAL SCIENCES, UNIVERSITY OF STRATHCLYDE

INTRODUCTION

Industrial biotechnology is very often a collaborative, interdisciplinary endeavour, pulling in expertise from not just biology but also physics, engineering, economics, and more – so it comes as no surprise that the students who enrol on the IBioIC MSc in Industrial Biotechnology course come from very diverse backgrounds. Each year's cohort is relatively small (~12-25 students). Students usually have undergraduate degrees in one of the biological sciences (e.g., biochemistry, microbiology, neuroscience), or in fields such as chemical engineering, forensic science, or physics.

Because students come from such diverse backgrounds, it is imperative to ensure that they all have the necessary basic lab competencies before they proceed to the practical labs (e.g., the intensive two full-day practical labs delivered as part of their Applied Biocatalysis module) or to their summer placements with industrial biotechnology companies. Therefore, the IBioIC Skills team have designed, and deliver, a basic lab skills training day each year (Table 2). This is well-aligned with the students' semester 1 module in Applied Biocatalysis, following on from a formative quiz on basic units, significant figures, and calculations.

Table 1. Overview of the IBioIC Lab Skills Day Training

Context:	**One year MSc programme in Industrial Biotechnology** **Core modules**: Introduction to Bioinformatics, Big Data Fundamentals, Applied Biocatalysis, Bioprocessing, Synthetic Biology, Downstream Processing **Elective modules:** Renewable Energy Technologies, Project Management, Food Microbiology and Biotechnology, Circular Economy and Transformations towards Sustainability; Understanding the Regulatory Environment of Bioprocessing Industries; Food Commodities and Sustainability; Blue Biotechnology **MSc project** with industrial placement

Table 2 continued. Overview of the IBioIC Lab Skills Day Training

Delivery:	▪ One half-day session in the practical lab ▪ Semester 1 (usually week 6)
Supporting materials:	▪ Introductory videos on health and safety, aseptic technique, weighing, and pipetting ▪ MSDS data ▪ Formative lab skills quiz
Delivered by:	Dr. Morgan Feeney and Dr. Kirsty Robb With assistance from Sara Campbell

LAB SKILLS DAY: PREPARATION AND CONTENT

Students are encouraged to prepare for the skills lab by watching the online videos about basic skills and completing a formative quiz, which is a ten question MCQ and SAQ quiz reinforcing key concepts in health and safety, and basic lab skills and calculations (
Figure **1**). Students generally perform fairly well on this quiz (average 7.6/10, for AY 2024-25).

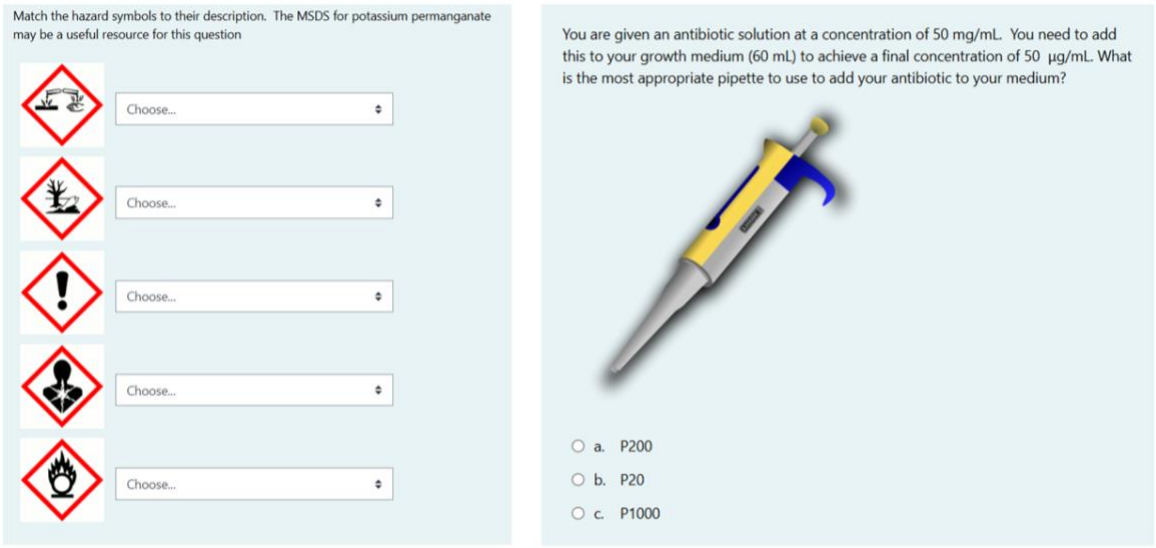


Figure 1. Example questions from the formative basic lab skills quiz. Left, a question about health and safety; Right, a question about the correct selection of a micropipette.

During the lab skills day, students complete three workstations covering different basic lab skills (Figure 2). These workstations are set up at different benches such that students move from one to the next. They could be completed in almost any order (though the correct use of pipettes covered in workstation 1 is reinforced by workstations 2 and 3, so attempting workstation 1 first is best). For larger cohorts, if lab space/resources are an issue, students could be split into groups and rotate through the workstations; in practice, however, we have the students complete the workstations in the same order together.

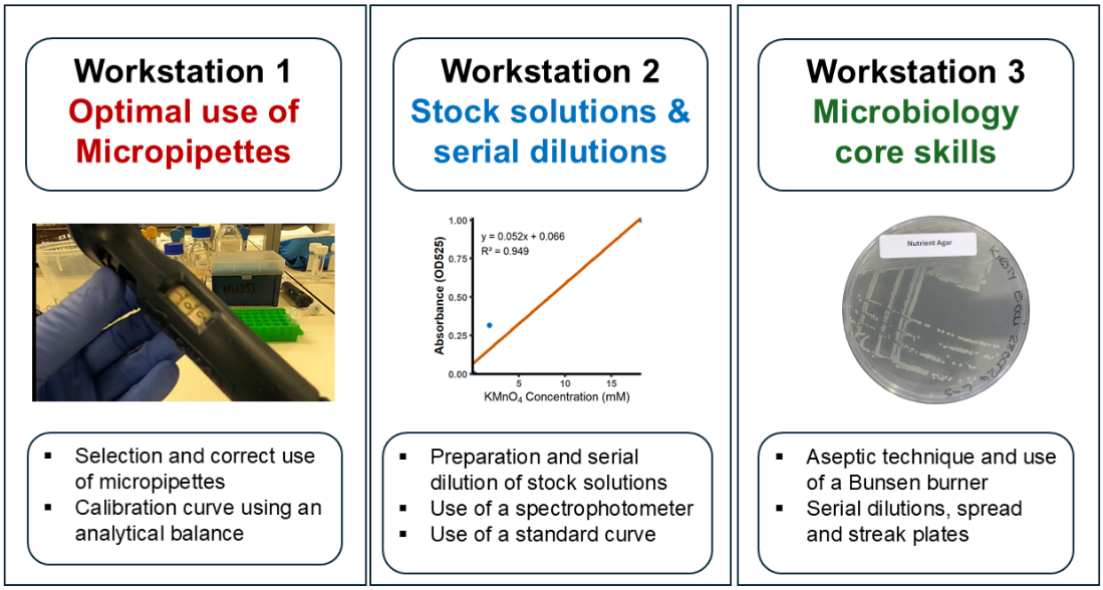


Figure 2. IBioIC Lab Skills day workstations.

In workstation 1, students use P20, P200, and P1000 pipettes to pipet different amounts of water into a small beaker placed onto a tared analytical balance, and use this data to generate a calibration curve. They calculate mean weight and standard deviation for three 500 mL aliquots, giving them an appreciation of the variation inherent to pipetting and potential sources of experimental error.

In workstation 2, students prepare a stock solution of $KMnO_4$ by weighing 0.2877 grams and dissolving it in 100 mL of water. They then perform four decimal serial dilutions using volumetric flasks, calculate the molarity, and measure the absorbance (525 nm) of each of these solutions (as well as a provided unknown). This workstation allows students to learn how to safely work with hazardous chemicals, reinforcing key points regarding health and safety covered in the pre-lab videos.

In workstation 3, students develop core microbiological skills: they pour nutrient agar plates, and use these to make both streak plates and spread plates (using serial dilutions that they prepare from a liquid culture of *Escherichia coli*). In addition to reinforcing the pipetting skills introduced in

workstation 1, this workstation teaches aseptic technique and how to safely work with microorganisms.

Overall, students gain experience with common lab equipment (pipettes, analytical balances, spectrophotometers, Bunsen burners) and the fundamental techniques needed for the practical labs taught in this course. Beyond these basic lab skills, students are also guided to develop good laboratory practices throughout (e.g., recording data, good labelling technique, proper disposal of wastes, correct use of personal protective equipment, etc.).

Although some students are already proficient in the skills covered in this session, many require a refresher or have never previously encountered them. More experienced students sometimes help their peers, but each student completes all three workstations individually.

FORMATIVE ASSESSMENT AND SKILLS REINFORCEMENT

Students are asked to submit their calibration curves (workstation 1) and standard curves (workstation 2). This provides an early, low-stakes opportunity for them to receive feedback on their data analysis and presentation skills. Most students can correctly calculate the concentration of the unknown potassium permanganate solution (workstation 2), but this exercise is nevertheless helpful in highlighting some weaknesses of presentation (e.g., missing or imprecise figure and axis titles), thus enabling students to improve their work for upcoming summative assessments in this course.

Students are also given formative feedback on their microbiology skills: their spread and streak plates from workstation 3 are photographed, and these images provided to them. They are then given further opportunities to develop these skills in later practical labs (e.g., for Applied Biocatalysis and Synthetic Biology).

PLANS FOR SKILLS TRAINING EXPANSION

Laboratory-based skills are not the only area where our students can benefit from upskilling: a two-hour workshop on basic scientific writing skills was added to our curriculum in AY 2024-5. We also plan to include a basic IT skills or data carpentries “bootcamp” in coming years.

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

CASE STUDY: ENHANCING EMPLOYABILITY AND LIFELONG LEARNING THROUGH THE MVLS UNDERGRADUATE SKILLS AWARD

Contributors: Tracy Maxwell, Dr Mary McVey and Dr Clare Rollie

OVERVIEW

In response to the evolving demands of the graduate job market, the College of Medical, Veterinary and Life Sciences (MVLS) at the University of Glasgow launched the Undergraduate Skills Award **(UGSA)** in 2023. This initiative reflects a growing emphasis on transferable skills—such as communication, teamwork, adaptability, and reflection—that are highly valued by employers and essential for career readiness. The UGSA offers a structured, yet flexible, opportunity for students to develop, evidence, and articulate these skills through extracurricular and co-curricular activities.

AWARD STRUCTURE

The UGSA is built around three thematic pillars:

- **Professional** (career and subject-related development),
- **Passionate** (pursuing personal interests),
- **Progressive** (growth and lifelong learning).

Students select four activities across the pillars and complete them over one or two academic years. These may include volunteering, work experience, university-run workshops, online courses, and roles in student societies. Each activity includes a reflection component, culminating in a final reflective piece that synthesizes the student's overall development.

The award is hosted on the university's Target Connect platform, which integrates with other career services and resources. Students receive formal recognition on their academic transcript upon successful completion.

IMPLEMENTATION AND PROMOTION

Co-created with student partners, the UGSA was designed to be accessible and meaningful to a diverse undergraduate population. Ahead of its launch, the structure and platform were tested by students to ensure ease of navigation and clarity. Promotion was carried out through a variety of channels including social media, campus posters, presentations in lectures, and support from academic advisers.

The flexible timeline and wide range of available activities aim to accommodate students from different degree programmes and with varying time commitments, including those balancing academic demands with part-time work, caring responsibilities, or mental health needs.

PERSONAL GROWTH, LIFELONG LEARNING, AND SOCIAL RESPONSIBILITY

A significant outcome of the UGSA has been the emphasis on self-directed development. Many students reported unexpected personal growth, such as managing anxiety, discovering new interests, and developing empathy through peer support and volunteering. Reflection played a central role, helping students internalize and articulate their experiences.

These outcomes strongly support the University of Glasgow's Learning & Teaching Strategy, which prioritises lifelong learning, active citizenship, and personal and professional development. The UGSA fosters this ethos by encouraging students to take ownership of their growth, not only as learners but also as contributors to society. Activities that promote social responsibility, such as mentoring, wellbeing support, and community engagement, help students understand their impact on others and develop a sense of purpose beyond academic achievement.

The structured reflection required by the award further reinforces the value of ongoing personal insight and intentional skill-building, key elements of lifelong learning. Students are empowered to identify gaps in their skillset, actively address them, and develop a reflective mindset that supports future learning and career transitions.

LESSONS LEARNED AND FORWARD VISION

The implementation of the UGSA highlighted the importance of:

- **Multi-channel communication** for awareness and engagement.
- **Student co-creation** in designing accessible and relevant pathways.
- **Platform usability** to simplify the student experience.
- **Flexibility** to accommodate diverse student needs and priorities.

Moving forward, the programme aims to deepen engagement through targeted outreach, enhance support for reflective writing, and evolve its offerings in line with emerging graduate skill needs—such as digital literacy and responsible use of AI. The UGSA has demonstrated its potential as a replicable model of employability-focused education that supports both academic success and broader student development.

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

THE SKILLS PASSPORT, SCHOOL OF APPLIED SCIENCES EDINBURGH NAPIER UNIVERSITY

AUTHORS DR JANIS MACCALLUM, DR SAM CAMPBELL CASEY

Edinburgh Napier UNIVERSITY | School of Applied Sciences

RATIONALE AND DESIGN PROCESS

Surveying Life Sciences employers in Scotland has revealed problematic skills gaps in graduate recruits applying for a variety of jobs across the sector (Skills Development Scotland, 2022), not regarding their qualifications, but more with their lack of skills and work-related experience. To address this, staff in the School of Applied Sciences along with the Employability and Opportunities team developed the Skills Passport to support students to work on key employability skills. The aim was to provide a mechanism within the curriculum to record development of and reflection upon their skills with a view to articulating them more effectively, especially at interview. This work builds upon research by Parry *et al* (2012) and Speake *et al* (2007) outlining the effectiveness of reflection in enhancing students' practical skills in Bioscience. The passport was developed following a survey of life sciences employers and is kept up to date through engagement with our Industry Advisory Group. A key focus of our RSB accreditation/reaccreditation in 2016/2021 was around skills development and how this is designed and evaluated in our programmes.

Skills opportunities are delivered in a variety of modes covering both practical and soft skills, including self-reflective elements and action planning with a Personal Development Tutor (PDT). The Skills Passport was initially trialled in 2013/14 and evaluated over a 5-year period to monitor engagement and to support improvements (Campbell et al, 2015, MacCallum & Casey, 2017). It is designed as a student focused document including a one-page list of skills covered (Fig.1.) and the Skills Evaluation and Evidence Record (SEER) (Fig.2.).

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

Skills Passport

	Self-report rating
Ability to translate research findings	
Ability to compare scientific and ethical positions	
Communication skills – verbal and written	
Teamwork	
Demonstrating initiative	
Personal responsibility/drive for results	
Time management, planning, organising and project management	
Personal development and reflection	
Attention to detail	
Critical reading and writing	
Innovative scientific approach	
IT, data retrieval, manipulation, critical analysis	
Numerical and statistical skills including lab maths	
Problem analysis and solving	
General laboratory housekeeping, maintenance and waste management	
Health and safety, PPE and risk assessment	
Knowledge of appropriate quality systems and standards	
Record keeping/lab book skills	
Ability to plan and execute experimental work	
Preparation, sterilisation and storage of samples	
Instrument calibration and care	
Handling chemicals	
Pipetting skills	
Use of balances	
Centrifugation	
Titration skills	
Electrophoresis skills	

Fig.1. One page Skills Passport self-assessment record. This lists the skills identified by employers as key employability skills. It includes so-called "soft skills" (highlighted in red) and subject-specific skills. The model is easy to apply to a range of disciplines and once subject-specific skills are identified a skills matrix can be developed based on the matrix shown in Fig.2.

DEVELOPMENTS FOLLOWING EVALUATION

Usage in early years of the programme was challenging. Over the course of our evaluations, we have seen mixed responses from students and their knowledge of and use of the tool varies across the years of a student's progress. Engagement and awareness increase in final year as they prepare for graduation. Successful engagement with skills development requires supported and structured interventions at regular intervals within the programme, in a way that is easy to access and use, and difficult to avoid. We have embedded assessed skills elements across the programmes in different modules and created a final year module called Professional Practice so that skills development and reflection on development is a key element of the final year of study. The module is taken by all final year students to help prepare students for their projects and life beyond their studies by exposing them to skills/attributes and areas of employability they may not already be aware of through a choice of optional workshops. Mandatory sessions on time management; risk assessment;

University of Glasgow
School of Infection & Immunity

SULSA
Scottish Universities Life Sciences Alliance

Ability to translate research findings

Negative	Positive	Exemplary
• Finds it difficult to gather information on a research topic. • Needs help understanding the key facts and findings of a research study. • Has difficulty summarising key facts and findings of a research study. • Is often inaccurate in their conclusions and may misunderstand research findings. • Unable to see the relevance of one set of research findings to an allied area of research.	• Gathers and understands information on a research topic. • Takes time to pull out key findings in a research study. • Makes an effort to compare and contrast findings in order to come to conclusions. • Summarises research findings with some clarity and accuracy. • Can sometimes see where these findings might also apply to other areas of research.	• Rapidly gathers and understands information on a research topic. • Easily focuses in on the key facts and findings. • Compares and contrasts differing research findings to come to useful conclusions. • Summarises research findings in a clear and concise manner which accurately conveys the key findings. • Takes findings from one area of research and extrapolates these into other areas.

Example competency questions to assess competence in translating research findings:

- Describe a situation where you were required to translate research findings. How did you go about this task?
- Give an example of a time when you were looking at a particular research topic and had to come to some conclusions about the main areas of progress.
- When you have had to summarise the findings in a particular research study or area, how did you do this?

Evidence for ability to translate research findings:

(remember the STARL format – Situation, Task, Action, Result, Learning)

Scoring your evidence

0 (Poor)	No evidence. Some evidence of Negative indicators. No evidence of Positive or Exemplary indicators.
1 (Basic)	Some evidence of Negative indicators. Some evidence of Positive indicators. No evidence of Exemplary indicators.
2 (Good)	Strong evidence of Positive indicators. Some evidence of Exemplary indicators. Little or no evidence of Negative indicators.
3 (Excellent)	Strong evidence of both Positive and Exemplary indicators. No evidence of Negative indicators.

Fig.2. SEER Extract: Each skill has a set of 'Competency Indicators" describing performance related standards against which a student can self-rate their current skill level. Students also record examples of where they have demonstrated a particular skill to a specific level of competency using STARL, a modified version of the commonly found STAR (Situation, Task, Action, Result) format. The final 'L- Learning' element identifies what they learned, what they could have done better, and action planning for improvement so encourages a reflective style of learning.

experimental design; using data; writing for different audiences; team working; professional behaviors; networking and interview skills are included for everyone with optional aspects including media and communication; ethics; teaching; quality management; consultancy; outreach and public engagement; policy and conservation. Students are encouraged to reflect on their skills and assessment is a combination of formative reflective blogs, a CV and cover letter application, and an oral interview, all of which focus on using a reflective cycle for the evidencing of skills.

ADAPTABILITY

The documents which form this tool are easy to use and tailor to different disciplines (Fig.1.) with the addition of subject-specific skills appropriate to each area based on the matrix shown (Fig.2.). The active engagement of staff as lecturers and Personal Development Tutors with the Skills Passport process and the progress of their allocated students is critical to success. Without this wider staff engagement, the circle of reflection and reinforcement cannot happen as anticipated, and training and support needs to be provided to ensure a coordinated approach across the programme team to support successful implementation.

REFERENCES

Campbell, S. A., Durkin, P., MacCallum, J., & MacNab, A. (2015, June). 'Skills Passport' for Life Sciences at Edinburgh Napier University: Helping students to help themselves. Paper presented at QAA Enhancement and Innovation in Higher Education Conference

MacCallum, J. & Casey, S. (2017) Enhancing skills development and reflective practise in students. *New Directions in the Teaching of Physical Sciences*, *12(12)* https://doi.org/10.29311/ndtps.v0i12.2368

Parry, D., Walsh, C., Larsen, C., Hogan, J. (2012). Reflective practice: a place in enhancing learning in the undergraduate bioscience teaching laboratory. *Bioscience Education*, 19:35-44. 10.11120/beej.2012.19000004

Skills |Development Scotland (2022). Skills for a Changing world. Strategic Plan 2022-27. Accessed 28.05.25 https://www.skillsdevelopmentscotland.co.uk/media/x5fjul51/sds-strategic-plan-2022-27.pdf?_gl=1*19sv1xk*_up*MQ..*_ga*MTA4NDE1MjQ3OS4xNzQ4NDQ3NDI3*_ga_2CRJE0HKFQ*czE3NDg0NDc0MjQkbzEkZzAkdDE3NDg0NDc0MjQkajYwJGwwJGgw

Speake, T., Fostier, M. and Henery, M. (2007) The use of reflective practice to support a final year team research project in biosciences. *Proceedings of the Science Learning and Teaching Conference 2007* ftp://www.bioscience.heacademy.ac.uk/events/sltc07/proceedings_full.pdf

CASE STUDIES: POSTERS