Developing graduate employability in a subject context

Accreditation and skills development in the biological sciences

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The issue

→ Employers have long complained that graduates from life sciences degrees were not ‘fit for purpose’

→ ‘they know a lot but don’t know what to do with it’

→ Laboratory and field skills were missing

→ An understanding of the ‘real world’ was missing

→ Bearing in mind that many life science graduates do not directly practice their science post-graduation

→ That there are many roles where scientific knowledge is important, but the role is actually one of manufacturing and management

→ That there are many other roles where it is the problem solving and evidential skills which are important.
What do employers actually want?

→ Two ways to look at this
  → Pharmaceutical and research employers: ABPI Core Graduate Skills
  → ‘Generic skills for the (scientific) workplace

→ Core skills needs have changed over time, but the core needs remain:

<table>
<thead>
<tr>
<th>ABPI Reports</th>
<th>2005</th>
<th>2008</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Practical Skills</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>In vivo</em> skills</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry/Broader Scientific</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Computational Analysis</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modular degrees/Rigour</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Team working</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Application of knowledge</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
It Takes More Than A Major:

Employer Priorities for College Learning and Student Success

Key findings from survey among 318 employers
Conducted January 9 – 13, 2013

for

Association of American Colleges and Universities
Key Findings

- **Innovation is a priority** for employers, and they report that the challenges their employees face today are more complex and require a broader skill set than in the past.

- Employers recognize **capacities that cut across majors** as critical to a candidate’s potential for career success, and they view these skills as **more important than a student’s choice of undergraduate major**.

- Employers recognize the **importance of a liberal education** and the liberal arts. The majority agree that having both field-specific knowledge and skills and a broad range of skills and knowledge is most important for long-term career success.

- Employers endorse education practices that involve students in active, effortful work and the **application of skills**.

- Employers express **interest in e-portfolios** and partnerships with colleges to ensure college graduates’ successful transition to the workplace.
Majorities of employers want colleges to place more emphasis on selected outcomes.

<table>
<thead>
<tr>
<th>Skill / Outcome</th>
<th>More emphasis than they do today</th>
<th>The same emphasis</th>
<th>Less emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking/analytical reasoning</td>
<td>82%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Ability to analyze/solve complex problems</td>
<td>81%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Effective oral communication</td>
<td>80%</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>Effective written communication</td>
<td>80%</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>Apply knowledge/skills to real-world settings</td>
<td>78%</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td>Locate, organize, evaluate info from multiple sources</td>
<td>72%</td>
<td>19%</td>
<td>9%</td>
</tr>
<tr>
<td>Innovation/creativity</td>
<td>71%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>Teamwork/collaboration in diverse group settings</td>
<td>67%</td>
<td>22%</td>
<td>11%</td>
</tr>
<tr>
<td>Ability to connect choices and actions to ethical decisions</td>
<td>64%</td>
<td>27%</td>
<td>9%</td>
</tr>
</tbody>
</table>
Degree Accreditation

An overview
Degree Accreditation Programme

Two distinct forms of accreditation:

**Advanced Accreditation** recognises academic excellence in the biosciences, highlighting degrees which contain a significant research element and educate the future leaders of research and development.

**Accreditation** follows an independent and rigorous assessment of degree programmes which contain a solid academic foundation in biological knowledge and key skills, and prepare graduates to address the needs of employers.
Brief History of Development

Advanced Accreditation:
• Chain of STEM reports highlighting skills gaps within the biosciences, particularly in research roles
• Two years of consultation and development (starting in 2010) with input from the community including OLS, BIS, UKCES, BBSRC, ABPI, BIA, employers, HEIs and Learned Societies
• Pilot programme completed in March 2012, focusing on biochemistry
• Government funding secured from UKCES, allowing a launch in October 2012

Accreditation:
• Six months of consultation with key stakeholders, including two large workshops with the community.
• Pilot programme run between September 2014 and December 2014
• Refinement of criteria
• Full launch in March 2015
Accreditation Criteria

1. Final year work, the “capstone experience”
   - The capstone experience will integrate and develop the skills and knowledge gained in earlier years; bring reflection and focus to the whole of the degree experience; and provide students with the opportunity to demonstrate and apply the understanding and skills that they have developed

2. Competence in the practical environment

3. Application and development of transferable skills (ICT, team working etc.)

4. A solid foundation in mathematics and physical sciences

5. Subject-specific knowledge
   - Based on the Benchmark Statements, but with extra if a subject area wants it, e.g. Biochemistry

6. Developing creativity and enterprise
Developing Creativity and Enterprise

• Enterprise education will develop students’ capabilities as “enquiring, critical thinking, future orientated thinkers”
• Students are taught to apply and evaluate original or unconventional ideas, and to tackle problem solving using techniques designed to develop individual and group creativity

A **contextualised learning experience using real-world scenarios** to gain better alignment with expected key employability skills;
The notion and value of intellectual property;
The importance of evaluating feasibility and impact through a reflective approach;
The interdisciplinary nature of enterprise;
Financial literacy in the context of developing commercial awareness

Life and Chemical Sciences (LCS) Skills and Training

Bridging the Skills Gap
Industrial Biotechnology
How does this work in the ‘real’ world?

→ Scotland is looking to further develop it’s skills base
  → Skills Development Scotland
  → Scottish Enterprise
  → Scottish Qualifications Authority
  → Education Scotland

→ All working together to understand skills shortages, and how to address them at all levels of education

→ Expressed through Skills Investment Plans (SIPS), one for each key area

→ Joint plan for Life and Chemical Sciences (LCS)

→ Owned by industry/employers, supported by education providers
Life and Chemical Science Skills Investment Plans

• Based on evidence and consultation:
  – Quantitative and qualitative research with numerous businesses
  – Carried out 20+ individual meetings to discuss action plan
  – Tested and endorsed by Skills groups
  – Launched 14th May 2018 by Jamie Hepburn MSP
476 RTD companies across the subsectors

- Pharma, Pharma Services and Contract Research: 138, 21%
- MedTech: 124, 19%
- Speciality Chemicals: 79, 12%
- Consumer Chemicals: 65, 10%
- AgriTech: 46, 7%
- Therapeutics: 39, 6%
- Other: 31, 5%
- Professional Services: 26, 4%
- Digital Health: 24, 4%
- Industrial Biotech: 21, 3%
- Commodity Chemicals: 18, 3%
- Stem Cell and Regenerative: 17, 2%
- Bioinformatics and Health Informatics: 17, 2%
- Materials: 15, 2%
Employment

• **20,300 jobs in the Life Sciences sector** and over **9,200 in the Chemical Sciences sector** in Scotland in 2017.

• **Sector Projections (Demand)**
  – Based on Oxford Economics data, around **900** new CS employees and **2,900** LS employees over the next ten years.
  – Other data from Skills Industry Partnership suggests far greater numbers: 700 to 1,000 (post)graduates and 280 to 600 technicians in combined LSCS sector **every year** for the next ten years*.

• **MedTech** and **Industrial Biotechnology** are predicted to be the fastest growing subsectors. **1,400 new jobs in IB by 2025**.
• Digital Health saw the fastest growth rate, of 23%, from 2010 to 2015.

* Assuming Scotland accounts for 7-10% of the UK workforce in LSCS.
SIP Priority Objectives

• Address specific skill shortages
• Offer a comprehensive skills and training provision across the country
• Increase exposure to, and basic understanding of, what industry does
• **Enhance basic practical lab experience and the ability to problem solve**
Address specific skill shortages

• Engineering and technical skills - maintenance, electrical, mechanical, electronic and process control positions.
• Digital skills - data, software and informatics.
• Regulatory, compliance, QA and QC expertise.
• Business, commercial, and leadership skills allied with sector knowledge.

Multi-disciplinary skills are very important.
Enhance basic practical lab experience and the ability to problem solve

• Database of institutions that provide practical lab courses.
• Establish additional courses where necessary.
• Revise and update relevant SVQs to ensure that these meet NOS and accreditation requirements of the sector.
• Adapt HEI provision to include practical classes that address specific industry needs, and where possible secure accreditation of additional degrees.
The numbers

*Scotland has 16 potential providers in the Life Sciences subject area*

<table>
<thead>
<tr>
<th>Type:</th>
<th>HEIs</th>
<th>Scotland</th>
<th>Programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accreditation</td>
<td>43</td>
<td>6</td>
<td>359/47</td>
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<tr>
<td>Advanced Accreditation</td>
<td>20</td>
<td>1</td>
<td>240/12</td>
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<tr>
<td>Masters Accreditation</td>
<td>1</td>
<td></td>
<td>5</td>
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<tr>
<td>International Accreditation</td>
<td>5</td>
<td></td>
<td>7</td>
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<tr>
<td>International Programme Review</td>
<td>1</td>
<td></td>
<td>1</td>
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<tr>
<td>Foundation Accreditation</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Doctoral Accreditation</td>
<td>2</td>
<td></td>
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Impact *(from SDS)*

“All [accredited University courses] have demonstrated substantial changes in their teaching, focusing on laboratory and skills teaching to address employer concerns over the employability of graduates. Edinburgh Napier University’s introduction of Good Laboratory Practice is now a core part of the curriculum and has had a major impact, not only on their programme, but in sharing their good practice with other Scottish universities. “

*Life and Chemical Sciences SIP 2018, Skills Development Scotland*
Impact *(a personal one...*)

**2013 (old curriculum)**
- Destination of Leavers from Higher Education – 64%

**2016 (new curriculum)**
- DHLE – 89%

League Tables

- Overall score
- Graduate Prospects
University of Dundee

World Top 250 University
Times Higher Education World University Rankings 2019

1 in World
World’s most influential research institution in pharmaceuticals
Clarivate Analytics 2017

4th in UK
for impact of scientific research
CWTS Leiden Rankings 2018

Top 10 in UK
National Student Survey 2017 and 2018