Transforming Laboratory Learning – Bringing WIL into the Curriculum

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Building on research evidence

Independent learning ability required for continuing...
Ability to use own initiative
A capacity for flexibility or adaptability
Time management and organisational skills
Team-working skills
Leadership skills
Ability to retrieve/locate information from a range of sources
Oral presentation and/or verbal communication skills
Report writing and/or written communication skills
Problem-solving skills
Analytical and critical thinking skills
Technical analysis
Information and communication technology (ICT) skills
Mathematical skills
Appreciation of ethical scientific behaviour
Research skills
Knowledge/appreciation/awareness of...
Ability to explain the role and relevance of science in society
Ability to apply knowledge and skills relevant to your...
Content knowledge in your disciplinary area

Building on research evidence

Knowledge, science in society, ethics.

‘Soft skills’, commercial awareness, maths & IT skills.

I find some high performing 'quantitative' students struggle with unsolvable problems (e.g. not enough data is available) or uncertain situations (e.g. what does the customer want). If possible give them some exposure to uncertain/ambiguous problems.

More focus on taking students from being students to being employees - preparing them for work.
Can we address employability in the lab?

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DS Domin, *JChemEd*, 199, **64**, 4, 543-547

There is research evidence that the approach is effective at developing a wide range of skills, such as communication, problem solving, and experimental design and that they motivate and enthuse students

Impact of WIL on students

- Improve student engagement
- Reduce drop out
- Aid transition from study to work
- Developing discipline specific, general and career skills
- Teach professional conduct, career planning
- Understanding of the perspectives of potential employers
- Develop problem solving, communication, information literacy, digital literacy, and professionalism;

Work integrated learning in STEM in Australian Universities, ACER, 2015
Our approach to new laboratory programme

- Inquiry or problem based
- Authentic assessment
- Industrial context
- Authentic, modern, engaging
Our approach

- Industrial context
- Industry partner/logo
- Student ownership
- Years 1, 2, 3
- Industry videos, pre-labs
- Reduce cognitive load
- Varied assessment
- Support skills gaps
- Manuals, TA notes, marking schemes
- TA training
Engaging industry: First Contact

- Many companies are eager to engage
- They often don’t know how to
- Do research on the company
- Use contacts at one company to reach into others
- Be clear about what you want
- Find the right people, level
- Site visit
- Have options
Mars uses vinegar in a wide range of its SuperCook products. The acetic acid concentration varies with its use. Vinegar for table use contains acetic acid at a level of 3-9%. Pickling vinegar contains acetic acid at up to 18%. Determine whether the sample of vinegar provided is suitable to be used to make salad dressing.
Example – Synthesis of acetylferrocene Year 2

MPEX manufacture a petrol additive to enable classic cars to run on leaded petrol. The additive contains ferrocene. Your company wants to explore this niche market but think that acetylferrocene could be more effective. Synthesize and purify a sample of acetylferrocene and cost it compared to ferrocene.

Write a report for the Technical Director outlining your costed synthesis with a price $/kg.
Mapping authenticity

ASSESSMENT TASKS

Professional context

Teacher centred: knowledge

Student centred: skills

Academic

T&L ACTIVITIES

Teacher centred: knowledge

Student centred: skills

Academic
Work integrated learning

T&L ACTIVITIES

Student centred: skills

Teacher centred: knowledge

ASSESSMENT TASKS

Professional context

Academic
Researching the effectiveness of TLL - Presurvey

Coded responses to survey - percent appearance

- prepare students for a research environment.
- teach students how to scientifically communicate...
- enhance students’ critical thinking skills.
- allow students to learn through means other than reading...
- prepare students for the workforce.
- give students experience working under tight time restraints.
- allow students to become comfortable working in teams.
- enable students to gain experience and confidence with lab...
- enhance safe practices.
- enhance the students’ practical skills.
- enhance theoretical understanding.

TAs  Pilot students

0  10  20  30  40  50  60  70  80

%
What skills did you develop today?
Did you enjoy today's lab?
Student feedback

*How data can be produced and used in real world scenarios.*

*I learnt how to construct a method to investigate questions that are applicable for the real world.*

*How to work in a team, investigation skills, leadership skills, chemistry techniques*

*Relating the pracs to what you would be doing in the workforce.*

*Industry experience. Seeing how a given experiment might be carried out in industry.*
Challenges

- Working across 20 units in 3 years
- Overcoming complacency
- Identifying enough industrial contexts
- Inquiry vs WIL
- Collaborating at the right level
- Authenticity – actual vs perceived
- Changing role of TAs
- Training TAs
Thank you

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- Stephen George
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