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Materials Research and Education Enhancement for Aerospace

Dr. Amanda Cruchley

*S. Cruchley, H. Leach, J. Griffiths, E. Medcalf, G. Chahni, L. Medlock,
A. Nicum, A. Cruchley, M.J. Jenkins*



About Me

- Technical Specialist at Manufacturing Technology Centre in Additive Manufacturing
- Assistant Professor in Metallurgy & Materials
- Experience working on projects across nuclear, aerospace, space, motorsport and power generation industries



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Skills Gap

- Employers felt less than 50% of graduates and 25% school leavers were career ready (Institute of Student Employers, 2024)
- Identified skills gaps include self-motivation, resilience and understanding of professional behaviours (Spotted Zebra)
- 35% of employers reported feeling that graduates had the required hard and soft skills to perform well in their role (Workday, 2018)
- Only 23% of the young people felt they had any self-belief in their skills (Institute of Student Employers, 2024)
- COVID may have affected the emotional development and experiences of university students and graduates



Skills Gap

- 33% space organisations expect to need skills in materials and manufacturing in 3 years (UKSA, 2023)
- Majority of UK space employees UK nationals
- Challenges with recruiting non-UK employees (UKSA, 2023)
- Nearly every (95%) space organisation experienced skills-related challenges (UKSA, 2023)
- Average employer spending on training has decreased by 27% per trainee since 2011 (Institute for Fiscal Studies, 2023)
- Women account for less than 25% space-related employees (UKSA, 2023)
- 2% of space-related employees are black vs 4% in the census (UKSA, 2023)



Authentic
assessment

Employers
Reporting Skills Gap

Employees
Reporting Skills Gap

**Need for
Growing Space
Sector**

Reducing Training
Budgets

ED&I Challenges

Integrate industrial
mindset into the
curriculum



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Industrial Mindset

- Developing necessary industrial awareness and skills
- Assessing and developing professional behaviours
- Connecting students to industry beyond the classroom
- Discussing careers, graduate schemes, motivations



Engineering Council SPEC



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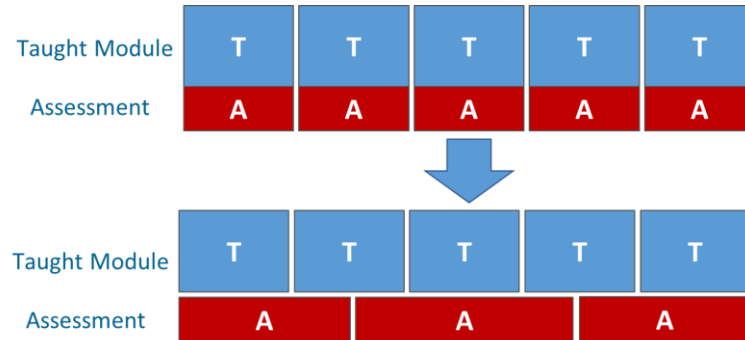
Assessment

- Traditionally, students would learn and be examined on work within a single module
- This can cause compartmentalisation of knowledge and can cause challenges when graduates have to bring a breadth of knowledge to a challenge
- IAB expressed a desire to see students engage with real-life industrial problems that involved multiple material types



Synoptic Assessment

- In response, there was a desire to develop a synoptic assessment where teaching and assessment were decoupled
- Assessment was co-created with a group of students (4-5 students) from all years of our degree programmes (UG/PhD)



Synoptic Assessment - Example

- Group project - team of 3-4 students will undertake the role of an industry research team investigating a product
- Project includes:
 - Characterisation of materials
 - Identification of manufacturing routes
 - Market positioning
 - Opportunities for improvement
 - Sustainability Considerations
 - Developing a test campaign with time and budget restrictions



Example artefact - Electric Scooter. Image from Pureelectric.com



Synoptic Assessment

Pitch and Proposal	A 10-minute project proposal to be presented to their industrial client (or manager). The aim of is to get the approval for the project by outlining and justifying the roadmap of work to be completed.
Update Presentation	A 10–15-minute group presentation will take place at the half-way point. Each group is expected to give a report on how the project is progressing.
Final technical report	A final report will be written in the form of an industrial style report which will be given to the client. It should review the work completed on the project, as well as the overall results and recommendations.
Personal Development plan	Every member must complete a personal development plan at the start of the module which will be reviewed in a personal development meeting. The student will be tasked with reflecting on this for a second submission and PDR at the end of the module.



Success

- Integrated into the UG Materials Science course following positive student feedback

“With current assessments, it’s very easy to fall into the pattern of just aiming to pass an exam so you don’t end up using that knowledge outside of the module and almost forget what you’ve learnt as soon as the exam is over. Synoptic assessment may allow better actual understanding of an area because you remember rather than just memorising for exam. This could be beneficial for applying knowledge in industry”.



Conclusions

- Current skills gap seen in graduates but noticeable improvement versus school leavers
- Desire to equip graduates with industrially relevant skills requires industry support
- Designing the curriculum to simulate real-world challenges may better equip graduates in their careers

