Experiential Learning Vignette 2: Living the engineer life – integrated engineering through experiential learning

This vignette is derived from interviews with Prof Gary C Wood and Peter Metcalfe at NMITE, Hereford. It forms part of a Collaborative Enhancement Project funded by the QAA.

Background

NMITE – the New Model Institute for Technology & Engineering – is an innovator in the UK Higher Education landscape that co-designed and co-implemented a new approach to engineering education with industry and potential students. Their approach is to nurture engineers through a highly experiential learning model to be primed to know how they want to make an impact as a graduate. Their model focuses on:

- **Integrated engineering**: solutions require many disciplines working together, particularly for 'wicked' (open-ended, complex) problems. NMITE develops engineers capable of inter-disciplinary working through nurturing appropriate technical knowledge and professional skills.
- **A challenge-based approach**: students learn in teams through tackling real and diverse challenges that come from industry and community partners; these teams change for each new challenge. Industry and community partners are involved throughout the challenge.
- **Block, studio-based learning**: challenges last 8-weeks to encourage multi-disciplinary working and solutions. Student teams have their own project room and work from 9-5, Monday to Friday. This ability to focus on one project at a time enriches the learning experience for students.

At the heart of this model is **authenticity**. Students are learning by being engineers that tackle problems and working together in a team format in a learning environment that mirrors the workplace.

Experiential learning for everyone

Students/budding engineers: through tackling and learning from different challenges from a range of diverse industry sectors and communities, NMITE's budding engineers develop through professional practice. These varied experiences and opportunity to take on different team roles equip students *as engineers,* and how to use their knowledge and skills to work to make a difference. They gain feedback on competences from one block that they can feed into the next block, so a continuous cycle of formal, informal and non-formal learning takes place. In the words of one NMITE budding engineer – "*I forgot I was a student*." Whilst new, all NMITE graduates have found roles, and ones aligned to their professional identity.

You say student, we say engineer

The aim of NMITE is to nurture engineers, not just engineering graduates. Engineers that can make an impact in the workplace and on society through a balance of depth and breadth of technical knowledge, a lived-experience of designing a range of diverse solutions by pulling on different disciplines, as well as agency in their learning and a bank of demonstrable transversal skills (such as communicating to a range of stakeholder and problem solving). Consequently, the learning experience has been built around this – both in physical space as well as in teaching, learning and assessment.

- **Studio Spaces**: teams of 5 are based in these spaces through the 8-week challenge – this is their professional working and learning space.
- **Learning**: real challenges are given to teams to solve. So, learning helps students unpack the challenge, with this scaffolding reducing as students progress. Also learning is responsive to needs of students and what they have self-identified as important; there are no lectures.
  Also, there are many formative learning experiences.
- **Assessment**: a project portfolio is produced, e.g. at MEng level then this is a Policy Brief, Feasibility Study, Specification and Test Plan.

So, at NMITE students behave like engineers from Day 1.

How can we all experience it?

Experiential learning sits at the heart of the NMITE model. Learning for students, for partners and for staff. This learning does not happen by chance.

Who are your Babel Fish? Integrating challenges into education bridges different organisational cultures, languages and ways of working, as well as potentially competing priorities. It is vital to have a Babel Fish (connector) that can bridge between these organisations.

The sum of the parts …
The integrated (connected) nature of the education model builds an extended Community of Practice. Recognising that community members are at different stages is vital, so a scaffolded approach is required – for students, for educators and for partners. Success comes from recognising that no matter how good the original design was, a culture of learning, creating mutual value and building relationships is what makes this work.

The NMITE approach highlights the vital role of a **human-centred approach** – we succeed together or not all.

Educator professionals: educators at NMITE come from a range of professional backgrounds so model the integrated engineering concept. They too learn through experiences: as they have to tackle each challenge, so they learn with each new challenge, and have to contextualise their materials to new challenges and partners. Moreover, there is ongoing action research and learning, as learning from one block feeds into future cycles, so the pace of organisational learning is accelerated.

Partners: a lot of effort goes into finding partners with relevant challenges and these discussions enrich educators and partners. Staff from partner organisations learn from these experiences: at a personal level – about budding engineers and their capabilities and potential, and about themselves as they support learning and assessment; at a challenge level through the fresh perspectives on problems and having assumptions challenged; and at an organisational level as the relations deepen as shared value comes from active engagement.

What to consider from the NMITE approach

1) **Design for authenticity:** "*without failure there is no experiential learning*." Create authentic opportunities for student to learn, including through failure, by engaging in tasks and with responsibilities of a practising engineer or professional.

2) **Explore Block Learning:** this reduces the cognitive load for students and allows time for them to grasp concepts at their own pace, to (self-)explore concepts more deeply and to see connections. Also, for staff, the appropriate block length brings opportunity to facilitate integrated (multi-/inter-disciplinary) learning.

3) **Get Day 1 right:** making sure that learning starts off well is vital. To achieve this takes a lot of up-front planning, around the specific challenge and aligning this to learning outcomes and level, but also around partners knowing the educational model and what is expected of them.

4) **Invest in partner relationships:** fruitful and rewarding partnerships don't happen without time and effort. NMITE work with partners to ensure that they understand the approach, e.g. through seeing students working on other challenges. Also, NMITE assign the same challenge to different groups so partners gain value through multiple solutions. This model brings rewarding experiences and opportunities for partners to contribute more deeply with time.

5) **Consider your blank canvas:** You don't have to start a new university, but seize opportunities in programme design to start afresh. Experiential learning as an ethos has to be designed in at the programme level and inform decision making about curriculum.