

Making it practical – a process of course change that integrates the practical and the theory

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Abstract

This paper is based on my dissertation which I submitted as part of my BA Professional Development degree at Dundee University. In this paper I reflect on the curriculum; environment; assessment methods and delivery best suited in Further Education for a National Certificate Level Six Electrical Engineering course. The intention is to use this process to support/improve student retention and achievement at West Lothian College (where I am a lecturer). An important factor in researching this topic was the existing data from the college where there has been negative student feedback and varying Key Performance Indicator (KPI) data over the previous five years.

The main methodology for the study was Action Research, where both quantitative and qualitative data was collected in a mixed method approach. A variety of data collection methods were used including surveys, interviews, and a focus group. The focus group involved staff members; current and past students; and external educational practitioners. The data collected was used to develop a thematic analysis to gain an insight into the best teaching curriculum; environment; assessment methods and delivery.

The outcome of the research that I completed agrees with existing research findings, where staff members and students suggest the course should be in a workshop to complete a practical exercise to gain 'hands on' experience. This would be combined with completing a portfolio in a classroom environment to confirm the students had gained the requisite level of knowledge and understanding of the subject.

Keywords

Further Education; Engineering; Experiential Learning; Action Research.

Introduction

Over the past few years within the engineering department at the College where I teach the National Certificate (NC) Level Six Electrical Engineering course has had poor feedback from students. The key areas of concern identified in student feedback gathered informally included: the students completing a theory-based curriculum with no practical; thus, no opportunity to develop their hand skills.

The students on this course are predominantly young males, aged between 16 to 24 years old. My experience of working with this group on similar courses has been that these students can be challenging to deal with, particularly in relation to their attitude towards the course, timekeeping, and attendance, thus the decline in this course is not unique to the engineering department. This combined with poor retention and attainment rates, with the Key Performance Indicators (KPI) figures fluctuating during the last six years. Changes to teaching and learning approaches during the Covid-19 pandemic cannot be discounted as a reason for these fluctuating KPI figures. A recent Audit Scotland report (2022) suggests that prior to the pandemic 24.7% of students failed to complete their college course, with this figure increasing to 27.7% for the academic year 2020-2021.

The decision to transform the course to a more practical based course was based on encouraging students to learn at College by replicating a real-life work-

based environment where they can use and improve their hand skills (Lave & Wenger, 1991).

Freire (1972) argues that many students have had a negative experience of school education, where the students were taught by a traditional 'banking' pedagogy in a classroom for lengthy periods of the week, and this seems to be in evidence here. The inquiry aimed to explore the potential benefits of introducing an experiential Work Based Learning (WBL) element to an existing engineering course and to generate a proposal to enhance its delivery and student outcomes.

The inquiry addressed the following research questions:

- What experiential learning opportunities might be best suited to delivering the curriculum when working with Engineering courses?
- What environment is best suited for working with a level six group in Further Education, comprised mainly of young male students aged 16-24?
- How will a change in the assessment method and delivery impact student engagement, retention, and attainment?
- What further improvements could be made to the course to increase student retention and attainment?

Literature Review

I adopted an open-minded approach, as suggested by Wallace and Wray (2016). Using this approach to literature the researcher should not be convinced of its truth nor be determined to prove it wrong. The literature has been grouped and organised under themes identified during the data analysis phase.

Curriculum

Learning is culturally and socially formed and is influenced by the emotional context in which it occurs (Avis, et al., 2015). These ideas can be used to help in the design of courses in developing the workforce for today and the future. Harrison (2009) discusses that these ideas can be useful to help guide learners in managing their own learning to achieve their own goals and the goals of other stakeholders.

Education Scotland (2022) recently published a report discussing that NC level six programmes have historically outperformed the NC level four and five programmes, with a 63.3% success rate of students completing their course (at level 6). Education Scotland also discusses that Further Education (FE) full time programmes in academic year 2020-2021 had a completion rate of 61.3%, down from 66% from the previous academic year, this however could be explained by the ongoing consequences of Covid-19.

A further educational report published by Audit Scotland (2022) outlines the fall in progression of FE students in 2019-20 with only 74.5% of the students moving onto a positive destination, a drop from the previous year. With this FE institutions now need to move forward on how they develop courses to embrace innovative technologies, including disciplines such as renewable energy and smart technology.

Environment

Part of my thinking about the (NC) Level Six Electrical Engineering course was that undertaking the course in a practical environment would assist the students in building their own self-confidence; promote student leadership; and this would lead to students interacting with one another in a community of practice, which is the embodiment of situated learning (Lave & Wenger, 1991). However, Thomas (2002) challenges this method of learning as there is limited previous

empirical studies to back up the academic claims of Lave and Wenger.

Coffield et al (2008) cites Stanton (2004) that for a strong vocational course, to be successful the students need to be taught by highly motivated, qualified educators to the latest industry standards in their vocational field. This needs to be backed up by industry standard facilities that the institution should have in place. This should provide students with the highest quality of learning thus giving them the best opportunity to complete their studies (Gregson & Hillier, 2015).

Race (2009) discusses the importance of building relationships and collaboration among students to help them develop a sense of belonging. With the NC level 6 engineering course, there was some interaction with modern apprentices who were in an adjoining room. Kolb (1984) experiential learning cycle is also important here especially in emphasising opportunities for learners to reflect on their experiences and to identify opportunities for development and growth.

Assessment

The process of learning can be seen as a process of knowledge creation that helps the student to a better understanding of the requisite subject. Vygotsky (1978) discusses his scaffolding teaching methodology, which helps learners comprehend the course by working with the educator, an expert in the subject matter. The learners being trained in a practical setting should be taught the subject in small chunks so they can expand their understanding. When educating adult students, they are self-directed learners who are motivated by their own needs and interests. As Knowles (1978) discusses the adult learning theory of andragogy, where these students are more likely to be engaged when they can take ownership of their learning and direct it towards something that is meaningful to them.

Coffield et al (2008) argues that the student's course that they are working towards, and the assessment method are a significant factor in shaping the students learning experience. The educator also plays a major part in how the approach to the assessment is managed.

As the academic year progresses, students used self-assessment and peer-assessment to gauge their progress. Gregson and Duncan (2020) discuss that these forms of formative assessment are helpful to students in building self-belief and confidence and promote leadership if used appropriately.

Methodology

The principal approach that I used for this inquiry project was Action Research (AR). Cohen et al (2018) cite Kemmis and MacTaggart (2000) when discussing this approach, they describe it as: a straightforward method of shared self-reflective analysis; undertaken by participants in social conditions; to develop the justice and rationality of their individual circumstances. I used AR, in a cyclic process to Plan; Act; Observe; Reflect. My inquiry project focused on the first stage of AR, in subsequent phases I will implement the decisions, evaluate, review, and make any required changes over time.

During my practice inquiry project, I adopted an interpretivist philosophy, where I needed to develop empathy and a rapport with the subject of the research. With this philosophy, qualitative data is preferred as this type of data is more subjective as individuals have their own views and opinions on events. However, Merriam and Tisdell (2016) described how an interpretivist viewpoint has been criticised for the subjectivity of the researcher that will inevitably entail without the collection and analysis of numerical data.

Analysis of findings

Data was collected using both quantitative and qualitative methods as part of a mixed method approach. The aim was to examine the project from a variety of different perspectives and thus produce more reliable results. Triangulation was considered as part of this approach as highlighted by Denzin (1978) who discusses that when using a mixed methods approach, triangulation: assists and improves accuracy; it confirms the findings in terms of authenticity and accuracy.

In any research project the data collection methods should be valid and reliable. Lincoln and Guba (1985) describe validity as the trustworthiness of the findings. The first data collection method considered for this research project was an online questionnaire. The student contributors (n=12) which was a return rate of 75% were current students on the engineering course during academic year 2022- 2023 coupled with former students still in contact with their tutors. The staff contributors (n=5) were colleagues, and external practitioners involved in the delivery of this engineering course. The contributors for this were sampled in a purposive manner, as the participants of the course all have some current or past relationship with this engineering course. Denscombe (2014, p. 41) discusses that when using a purposive sample method, the participants have been 'handpicked' to gain pertinent information and knowledge from the phenomenon being investigated.

The second method of gathering data was an in person focus group. The data from the online questionnaire was collated and analysed and members of the student cohort were invited to take part in a focus group (n=5). The participants were asked probing semi structured, open-ended questions so themes could be explored in greater detail to elicit additional information which produced qualitative data. Denscombe (2014) discusses that this allows the researcher to be flexible with the order of the questions being

deliberated but more notably it allows the participants to foster their own ideas and speak freely about the questions being raised.

The third method of data collection was one-to-one interviews with members of the college senior management team (n=2). These interviews were designed to capture the manager's perspectives on experiential WBL, college strategies, and the practicalities of enhancing the electrical engineering course. The questions directed to them were semi structured and open ended.

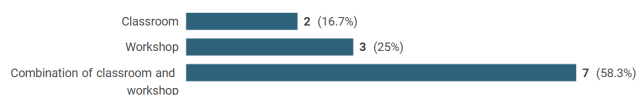
The analytical approach used to make sense of all the gathered data was thematic analysis, a method of recognising, analysing and reporting themes within data (Braun & Clarke, 2021) . The first stage of which being 'encoding,' the identification of the themes from the data generated. The three themes identified at this stage were: curriculum; environment; and assessment methods and delivery.

Curriculum

The qualitative data obtained from the student survey was that the students believe the current curriculum could be enhanced by being: *'more practical so there are hands on experience'* and *'the course being a practical course rather than in a classroom.'* Similarly, this theme was also reiterated by the staff survey when asked about their thoughts on the current curriculum with comments such as: *'The students require more practical within the course to help engage the learners more.'* and *'The course should contain more practical in some shape which encompasses some of the academic work on the course.'* By engaging students in real-world projects and challenges, instructors can help students develop practical skills, improve retention with increased motivation and experience that can be valuable in the workforce (Kolb, 1984).

Environment

When discussing the preferred learning environment, 58.3% of the students expressed that their preferred learning environment would be a combination of a classroom and workshop.



Multi answer: Percentage of respondents who selected each answer option (e.g. 100% would represent that all this question's respondents chose that option)

On the other hand, when discussing this topic for the staff survey, a common theme for current learning environment for the course was: *'Improvements are required with a dedicated area for practical activities,' 'The course should be delivered in a workshop, where they need to use the correct Personal Protective Equipment (PPE) and electrical materials to develop their knowledge.'* and

'Investment is required to improve the learning environment so the student can take ownership of their work which builds a sense of belongingness for the students. This self of belonging fosters a comfort to learn and build on the scaffolding as described by Vygotsky.'

A supportive learning environment can assist in fostering a sense of belonging and motivation among students. This can be accomplished with positive feedback, establishing an inclusive, encouraging classroom culture and promoting student collaboration and participation (Cohen & Lotan, 2014).

Assessment

When discussing the preferred assessment method, 50% of the students indicated that practical assessments would be their preferred method of assessment.



Multi answer: Percentage of respondents who selected each answer option (e.g. 100% would represent that all this question's respondents chose that option)

This view was reiterated from the staff survey for the preferred assessment method with the participants views being: *'The best assessment method for these groups would be contextualised assessments where practical would work better, with projects based with students completing portfolios.'* Boud and Falchikov (2006) discuss that the best assessment method for this type of course will depend on a range of factors, including the skills, knowledge being assessed and the preferences and needs of the students.

The findings of the focus group further indicated that the best way forward for this course to improve would be by dividing the students' time at College with 50% in a workshop and 50% in a classroom with the students completing an electrical installation in a workshop environment. The students would then complete a portfolio-type assessment to assess their competence. The size of the group was also discussed, with around fifteen students in a class being an optimum number, especially in a workshop. It was also ascertained during the focus group with one participant stating: *'that having only two key lecturers when undertaking the course is a factor in the learners' experience and enjoyment of the course'* when attending the College. Gregson and Duncan (2020, p. 135) discuss when students build a relationship and a rapport with their lecturers, they could help create a positive learning environment where students feel comfortable to engage with the learning material, ask relevant questions, and share their experiences.

The two interviews with members of senior management of the College, one respondent appreciating the need to change the course in response to the students' stated preferences:

'Some of the main pillars of what drives us are our values, we'll put students at the centre. So, by asking those questions,

what you're telling me is we need to respond to student feedback.'

It was recognised that the proposed changes would have an impact on teaching staff, with one respondent acknowledging that: *'it may put pressure on the staff members with regards to prep for this new way of teaching this group.'*

We then discussed about the need to have a workshop area to complete the practical installation, the responses where: *'We need to think creatively and practically,'* and

'It's not going to be within our gift to create new spaces. However, you're right, if we can create strategic partnerships with industry, say what you are going to get from that. Well, we'll put two of your employees through this training for nothing.'

A further topic that was discussed, was about any policies or initiatives that are coming from Scottish Government, Skills Development Scotland (SDS) and Education Scotland that could assist in helping to change the course to a practical based one. From that I got a response of:

'I think if we're talking about how work-based learning is enshrined within curriculum and the expectation that everyone will have work experience in the programme is a driver for both SDS, Education Scotland and ultimately Scottish Government.'

'This means the strategy sits within the College Net Zero Strategy (West Lothian College, 2021) and the National Strategy for Economic Transformation (NSET) (Scottish Government, 2022).'

Conclusion and recommendations

Overall, it is obvious and clear that the NC Level Six Electrical Engineering staff and students would like the course to be one that has more activities that are practical in nature. The research that I undertook was completed before the end of the

academic year, so any future findings, KPI's and results will be unknown, which may lead to further research being necessary. From the research data gained the four questions that were raised at the start of the paper could now be answered:

- What experiential learning opportunities might be best suited to delivering the curriculum when working with Engineering courses?
- What environment is best suited for working with a level six group in Further Education, comprised mainly of young male students aged 16-24?
- How will a change in the assessment method and delivery impact student engagement, retention, and attainment?
- What further improvements could be made to the course to increase student retention and attainment?

Curriculum

From the analysis of the data that was collected, I could now conclude that a practical-based learning including introducing renewable energy units and initiating a portfolio to underpin the student's learning would give them the best possible experience. This would positively impact the attainment and retention of the students, which could be accomplished as a standalone vocational course or with the backing of the SQA, or other equivalent awarding bodies.

Environment

The analysis of responses from both students and staff emphasised the importance of a learning environment that reflected important aspects of the work environment that students would encounter within their employment. Analysis of the responses from students also highlighted how students appreciated the importance of

the theoretical aspects of their course and the need for a classroom setting to focus on these aspects of the course. However, from the analysed data collected from the students, they would like the course to be based in both a workshop, while completing practical exercises and in a classroom where they can complete their theory coursework by way of a portfolio.

Assessment

From the analysis of the data gained, it supported my belief about the importance of having a holistic/integrated approach to assessment. This could be completed by considering evidence from the practical based units with the core essential skill units being fulfilled in a contextualised manner by the completion of a portfolio.

Further improvements

In the future, if it is possible to redesign the course in light of the findings from my inquiry project, the students will spend half their time in a workshop space. This purpose-built space does not currently exist within the faculty and so securing sufficient funding is a challenge. It might be possible to approach local employers and other stakeholder groups to cover some of the development costs. In conclusion, the significance of experiential learning was discussed by Kolb (1984) where he argues the importance of student-led learning. He believed that education should be an experience that empowers individuals to shape their own lives and communities. I believe with the practice inquiry that I completed that I could put forward a credible case to the senior management of the institution for this course to be a more practical based one for future academic years.

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KPI Figures

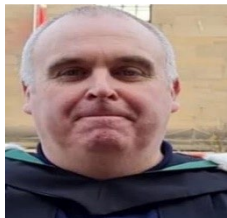
| YEAR | NUMBER OF STUDENTS | EARLY WITHDRAWAL | EARLY WITHDRAWAL PERCENTAGE | LATE WITHDRAWAL | LATE WITHDRAWAL PERCENTAGE | PARTIAL SUCCESS | PARTIAL SUCCESS PERCENTAGE | SUCCESS | PERCENTAGE SUCCESS |
|-------------|---------------------------|-------------------------|------------------------------------|------------------------|-----------------------------------|------------------------|-----------------------------------|----------------|---------------------------|
| 17/18 | 28 | 1 | 3.75% | 1 | 3.75% | 2 | 7.50% | 24 | 85% |
| 18/19 | 12 | 1 | 8.33% | 2 | 16.67% | 2 | 16.67% | 7 | 58.33% |
| 19/20 | 16 | 1 | 6.25% | 4 | 25% | 7 | 43.75% | 4 | 25% |
| 20/21 | 15 | 0 | 0% | 4 | 26.67% | 0 | 0% | 11 | 73.33% |
| 21/22 | 15 | 1 | 6.67% | 4 | 26.67% | 2 | 13.33% | 8 | 53.33% |
| 22/23 | 15 | 1 | 6.67% | 0 | 0% | 4 | 26.67% | 10 | 66.67% |
| *23/24 | 16 | 0 | 0% | 3 | 18.75% | 0 | 0% | 13 | 81.25% |

** These are predicted results for this academic year which is the first year of the new pedagogical approach to this course.*

All data was supplied by the Management Information System department of the organisation under discussion.

Author Biography

I am a learning champion and lecturer in electrical engineering at West Lothian college. As my role of lecturer, I am involved with teaching electrical apprentices at all stages of their learning journey. As part of my learning champion role, I assist and mentor fellow lecturing staff across the



college. One of my duties is to undertake lesson observations and have professional discussions with fellow lecturing staff so they can maintain their GTCS status. I previously worked in the electrical industry for many years including owning my own electrical contracting business before moving into education in 2015. I completed my TQFE through University of Stirling in 2020- 2021. I then gained my BA in Leadership and Management at University of Dundee in 2023.

The College Action Inquiry Research Network (CAIRN) Journal aims to be an important voice in the scholarship of the Scottish college sector.

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