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## The 'Engineering First Year': "Step Up" To Success

Nicola KNOWLES

*University of Warwick, United Kingdom, n.j.knowles@warwick.ac.uk*

Jane ANDREWS

*University of Warwick, United Kingdom, jane.andrews@warwick.ac.uk*

Gill COOKE

*University of Warwick, United Kingdom, g.cooke@warwick.ac.uk*

*See next page for additional authors*

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**Authors**

Nicola KNOWLES, Jane ANDREWS, Gill COOKE, Lauren SCHROCK, Robin CLARK, and Graeme KNOWLES

## THE ‘ENGINEERING FIRST YEAR’: “STEP UP” TO SUCCESS

Knowles, N.  
WMG, University of Warwick  
Coventry, UK.

Andrews, J.  
WMG, University of Warwick  
Coventry, UK  
ORCID: 0000-0003-0984-6267

Cooke, G.  
WMG, University of Warwick  
Coventry, UK

Schrock, L.  
WMG, University of Warwick  
Coventry, UK

Clark, R.  
WMG, University of Warwick  
Coventry, UK  
ORCID: 0000-0001-8576-9852

Knowles, G.  
WMG, University of Warwick  
Coventry

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### ABSTRACT

The nuanced nature of engineering as a profession is highlighted in a recent statement by the EPC (2023) in response to the UCAS publication ‘*The Future of Undergraduate Admissions*’ (2023). Focusing on the value of Personal Statements within the University Selection System, the EPC asks UCAS to provide more practical information to prospective students about the nature of engineering and what prerequisite qualifications are needed to study engineering. Such clarity is particularly important when considering Engineering Degree Apprentices.

Starting with the research question “*How can the gap between school and university be bridged in engineering education?*” the paper critically discusses a project currently being undertaken by a multi-disciplinary team of colleagues working together to enhance the student experience.

Located in one of the UK’s largest Engineering Education Departments, the “Step Up” Project analyses the barriers and drivers to engineering education faced by first-year Degree Apprenticeship students from three distinctive engineering and computing science disciplines. This paper represents a small part of a much larger project where

the student experience is being prioritised and high-quality learning and teaching is expected. The paper is built upon the emergent findings of a three focus groups with engineering degree apprentices. Whilst the findings are relevant to all years of study, the recommendations and conclusion highlight the importance of 'getting the first year right' and empowering students to 'step up to success' in university and in work. This evidences a demand for clearer explanations of the knowledge and skills expected of incoming students

## **1. INTRODUCTION**

Building on the corpus of knowledge relating to the first-year engineering student experience (Andrews et al., 2019; Daniels, 2022), this paper sets out to provide a unique insight into engineering degree apprenticeship students' reflections of the main issues impacting their studies as they near the end of their first year of study.

Starting with the research question "*How can the gap between school and university bridged in engineering education?*" the paper discusses the emergent findings of an ongoing pedagogical research project which examines engineering students' perspectives of studying at WMG. The primary objective of the study is to inform and influence academic practice and pedagogy, thus enhancing the student experience from the first year onwards.

## **2. STUDY APPROACH**

The part of the study referred to in this paper provides an insight into the emergent findings of three focus groups were conducted with fulltime degree apprenticeship students in the last academic year. With a sample size of 55 students, focus groups were conducted 'live' online using Miro as a research tool. The data was contemporaneously recorded onto Miro before being transferred into MS Word. Concurrently, contemporaneous notes were made. The decision was taken not to record any demographic details of the students to assure confidentiality. Once the interviews were concluded the data was analysed following phenomenological techniques whereupon it was coded and classified into six distinctive but interlinked themes: Dualistic Education – Balancing Work and Learning: Assessment & Timetabling: Pedagogy & Practice: Academic Integrity: Groupwork: Relevant Engineering Education.

The following paragraphs provide a detailed overview of the conceptual analysis of qualitative findings of the study, providing a distinctive insight into the engineering apprentice student voice. From there the findings are critically discussed before providing a brief overview of ongoing changes to how education is being provided within WMG.

## **3. THE STUDY FINDINGS**

### **3.1 Dualistic Education: Balancing Work & Learning**

One of the key issues to arise out of the study is unique to the 'apprenticeship' programme in that some of the students felt the training received in the workplace did not adequately equip them with the level of knowledge and skills needed to succeed in the classroom:

*The WMG course [faculty] assume our line managers / teams will deliver on the technical development ... . When this isn't the case, it leaves students in an awkward predicament of having to try and force a move to a team that suits their career aspirations*

*From the university perspective the course has been fine. However, from [an employment] perspective the process of ensuring students have enough technical development has not been fully delivered*

The resultant misalignment of skills and knowledge between work and study impacted the students in a range of different ways. For many, it resulted in a level of anxiety, something that became evident during the assessments:

*[One technical] assignment was very stressful for someone that doesn't have enough experience to create a whole web app. Considering the difficulty of the task the deadline was way too short*

*The assignment on web development, with little experience was highly stressful. It was covered in the lectures but again expected prior experience at work...*

On a more positive note, some students suggested that the gap between work and university was covered by the interdisciplinary nature of the learning and training received:

*Modules contain useful information; whilst they do not directly relate to [the type of engineering I am studying], they are useful in a business context.*

*The course is good as it is a mixture of different engineering skills, IT, and business.*

The mixture of 'harder' engineering skills, 'transferable' professional abilities, and 'softer' business competencies is not unique to apprenticeship training. However, the intertwined manner in which each of these is embedded as part of apprenticeship courses, with a mix of different influences, priorities and a need to meet employer expectations means that first year engineering apprentices have to quickly adapt to their dualistic role. The impact on learning that being caught in the middle of work and university has on apprenticeship students is not yet fully understood. One of the areas which the first years in this small study did discuss was, however, assessment – where the delicate balance between what is taught in the classroom and what is learned in the workplace was again identified as an issue.

### **3.2 Assessment & Timetabling**

Assessment was mentioned by all of the students. For some of the first-year students the main issues related to the timing of the assignments and what was taught in the module. Perhaps a causal symptom of low levels of independent learning skills possessed by students as they enter university, the first years perceived assignment briefs to lack clarity; something which they identified as causing undue stress:

*Unclear assignment briefs with a lack of clarity get in the way.*

*Particularly when things are changed close to the deadlines*

*Assignment briefs and ambiguous briefs make the assignments more stressful than they need to be*

It is not unusual for first year students to bemoan the fact that they are not taught all of the course content in the classroom. Although for apprenticeship students the issue isn't simply about a lack of independent learning skills, but instead relates back to the first theme discussed in this paper, differing expectations of faculty and students and a misalignment between what is taught in the classroom and learned in the workplace.

### **3.3 Pedagogical Approaches in Engineering Education**

The study took place after the pandemic whereby the majority of students interviewed had spent at least 18 months in lockdown learning at home and online. When the interviews took place students were divided more or less equally when it came to whether they preferred online or face-to-face teaching. Some students asked for a choice in whether they should attend a lecture in person or not:

*It should be a choice as to go on site for face-to-face lectures or not. We should be told what the lecture is about in advance so we can make an informed decision*

*I'd like the option to study at home rather than have to be in person*

### **3.4 Academic Integrity**

Like the majority of first-year students many of the apprentices struggled with referencing and academic writing, particularly at the beginning of their course. One student mentioned the penalties associated with poor academic practice:

*I have been marked down for incorrect referencing, despite having my referencing checked by someone qualified and being told it was correct.*

Others' indicated that they felt it was their lecturers responsibility to provide them with a list of academic sources, which suggests a lack of preparedness for independent study:

*The reference list at the end of the slides is often wrong. They're the same in every session in the module [ ]. Sometimes the references don't relate to the content of the slides*

*Adding a citation on every slide would be super useful. Often, we need to use information from the slides in our assignments and a topic can be too generic to google.*

### **3.5 Groupwork**

Like the majority of students, engineering apprentices report negative experiences around working in a group:

*Group projects don't tend to work as there will always be 50% of the group who won't work and who will get away with this. There's no way to rectify this. The fix is individual assignments.*

*Randomised groups for some coursework where the lectures decide the groups. This causes problems when people have different work ethics.*

*Group projects are more irritating than beneficial, they lead to conflict and greatly affect wellbeing as people think they can get away without working. This is something that has greatly impacted my opinion of the course.*

The most concerning remark about groupwork came from a student who questioned the academic validity of this type of assessment:

*Group projects seem to be giving lecturers less to mark – doesn't benefit us as students really especially when they are randomised - being with people who don't work as hard is so frustrating when you care about your grades*

Conversely, two students suggested that for them, group working was a positive experience: ‘

*Groups allocated by the lecturer are useful and give everybody a fair chance (i.e., no higher chance of being with a 'better' group)*

*Group projects keep me going when I've been in a group with people who want to get the same grade as me*

### **3.6 Relevant Engineering Education**

As they neared the end of their first year, the students commented about the gap between university and work with one student indicated that the issue was with who, from the employer, contributed to the design of the curriculum:

*The course is clearly designed by / with [the employers] – but it seems to be designed by high level managers, not the low-level managers who actually, interface without roles. It would be useful to ask their opinion of what we need to know and for modules to contain what we need to be taught. Low level managers actually know what our job is.*

## **4. DISCUSSION**

This paper has briefly looked at the experiences and perceptions of three cohorts of students studying on one of a number of engineering degree apprenticeships at WMG, University of Warwick. For first year students one of the key issues related to differences in what faculty members believe they are trained to do in the workplace and the knowledge and skills they actually have when they arrive in the classroom for a period of block learning. Previous studies in this area are difficult to find although there exists some literature around a perceived ‘knowledge and skills expectations gap’ in Biological Sciences which found a gap in student knowledge and lecturer

expectations indicative of discipline-specific knowledge and knowhow (Jones et.al., 2018) although this study related to general students and pre-university knowledge.

In considering the 'expectations and reality' gap raised in this study, it may be postulated that such inconsistencies may be indicative of differing entry requirements for students enrolled on apprenticeship as opposed to traditional undergraduate programmes (Sole et al., 2021). In many universities, apprenticeship students do not have traditional entry qualifications, although in the case of the cohorts sampled, on the whole this is not the case. The entrance standards are similar for apprentices and traditional students within the university, although in some cases apprentices are required to possess higher grades. This means that disparities in *a priori knowledge* on admission to university should have been dealt with early in the course (Scott & Willison, 2021), meaning that problems were more likely to be indicative of different expectations of learning in the workplace

Student dissatisfaction with assessment is recorded in the literature and engineering is no exception (Oti et al., 2021); hence, it is not surprising that many students commented about how they are assessed. What is different for degree apprenticeship students is that they can be assessed on what is learned at university and in the workplace. This in itself may be problematic, apprentices on the same course may be from different employers; indeed, even those from the larger companies do not necessarily receive the same training as others working in their organisation. For this group of students, the need for carefully design assessment is of paramount importance. However, whilst the need for anonymous marking is generally accepted to be vital in promoting an equitable and fair learning environment (Giray, 2021) this may not be the case when dealing with apprenticeship students. What is needed instead is an approach to assessment and marking that is carefully designed and managed to ensure a lack of bias and high levels of integrity.

The need to nurture a culture of independent learning across the undergraduate student body, particularly in the first year of study, is recognised in the literature. This is particularly important when considering first year apprenticeship students. Research in this area is particularly spartan, with little or no previous papers considering how today's apprentices become independent learners whilst gaining a new identity at work.

That the student participants had mostly negative views about working in groups is not unusual. Problems with groupwork amongst the traditional student body have been long discussed, although again literature pertaining to the engineering apprentice student experience is rare. Moreover, whilst moves towards blended and hybrid pedagogic approaches came to the fore during the pandemic (Petchemé et al., 2021) the impact of these approaches on first year degree apprentices remains unknown.

## **5. SCHOLARSHIP IN ACTION: THE DEVELOPMENT & INTRODUCTION OF EVIDENCE BASED CHANGE**

This paper can necessarily only begin to touch upon the change occurring within WMG as senior management strive to induce a co-created academic and scholarly environment where student experience is prioritised and high quality learning a 'given'.



The six themes highlighted in the findings are now briefly contextualised within the change occurring in learning and teaching.

### **5.1 Dualistic Education – Balancing Work and Learning:**

One of the most important findings to emerge out of the study thus far relates to how little is known about the experiences of degree apprentices in general and engineering apprentices in particular. Whilst the study begins to address this gap, there is much to learn, perhaps the most important of which relates to differing expectations of what role universities and employers play in educating apprentices. The emergent findings indicate there is a clear need for continued and continual discussion between all stakeholders involved in providing apprenticeship training. Such discussion is now forming part of, and informing, transformational change; with apprentice tutors playing a key role in bridging the employer-university gap.

### **5.2 Assessment & Timetabling:**

The main finding relating to assessment reflected problems engineering degree apprentices seem to have in developing as independent learners. To support this WMG is putting into place a 'Student Hub'. This will be a 'safe space' where all aspects of the student experience can come together and students are provided with individual support and guidance in areas such as academic writing, time management as well as wellbeing support.

### **5.3 Pedagogy & Practice:**

Reflective of ongoing advances in technology, unprecedented numbers of people now work from home. Engineering degree apprentice students find themselves in a 'brave new world' following the Covid19 Pandemic, it is therefore unsurprising that views about whether learning should be online, or in-person vary so much. Yet it is clear from this study is that students want autonomy to choose whether they work from home or at the campus. WMG has put in place significant measures to make hybrid learning a reality. Lectures are recorded, or pre-recorded and use of technology proactive designed into the curriculum. There are many opportunities emerging as technology advances in the field of learning and teaching, hence there is much work to do in this area, but, in actively listening to the student voice, advances are being made.

### **5.4 Academic Integrity:**

First-year students seem to traditionally struggle with academic practice and integrity. To address this a cohort-wide module of study, professional and analytical skills has been developed specifically for the undergraduate student body. Students are able to individually access help, guidance and support in any multiple areas of academic practice in a flexible and blended manner.

### **5.5 Groupwork**

Groupwork is part of university life. To promote group cohesion amongst undergraduates, a number of actions have been taken including providing proactive compulsory training compulsory for one cohort of students. In future, 'working in teams' will be covered in the student induction. Other pedagogic actions include providing training in the area of course and programme design.

Colleagues are actively encouraged to adopt constructive alignment, and quality assurance checks in place to make sure that when groupwork is used it has a solid academic grounding and justification.

### **5.6 Relevant Engineering Education**

Student confusion in respect of the relevance of their education to their apprentice role has resulted in a more open approach to curriculum design. Students and employers both have a voice and whilst employers co-construct the degree apprenticeship programmes, plans are underway to include students in future design activities. First year students are given plenty of opportunity to ask questions about the curriculum content and context, not only during Induction but as the course unfolds. Likewise, apprentice tutors work hard with individual students to make sure that linkages between learning and work are made irrespective of whether the student is sponsored by a Small-Medium-Enterprise or multi-national engineering company.

## **6. CONCLUSION**

This short paper represents a small part of a large, ongoing scholarship project aimed at enhancing the engineering student experience. The appointment of a Director for Student Experience and a dedicated 'Student Experience Budget' shows the commitment of the Department to enhancing the student learning journey. The ongoing change is beginning to pay dividends and efforts to promote a sense of belonging and identity amongst our students and staff have resulted in the emergence of a proactive and cohesive learning community. There is much work to do, but with a committed team of staff and students, working together, advances are being and will continue to be made. In conclusion, whilst the findings of this study are relevant across all undergraduate and postgraduate cohorts, the need to 'get the first year right' is of particular importance when it comes to engineering degree apprentices. WMG is currently undergoing a period of significant change. The team who've contributed to this paper are an important part of this change, working together to empower students to enable them to 'step up to success' both in the classroom and in the workplace.

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