Employability Schemes for Young People in STEM: Enabling staff to deliver an enriching experience through research culture development

Craig Carnegie, Naomi Ogunkola

Warwick Manufacturing Group (WMG), University of Warwick, UK
Correspondence: Craig.Carnegie@warwick.ac.uk, Naomi.Ogunkola@warwick.ac.uk

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Abstract

The researchers were awarded an Enhanced Research Culture Fund to improve the Research Culture within WMG (Warwick Manufacturing Group, University of Warwick). The aim was to encourage diversity and inclusion, enable career development and provide open access resources and research to facilitate collaboration, through the creation and development of a new Work Experience strategy. The project was committed to reaffirming young people's interest in STEM (Science, Technology, Engineering & Mathematics), and hopefully inspiring them to pursue a career in the field. To begin such a programme, the researchers conducted a literature review, to highlight the importance of employability interventions that can provide young people with aspirations and role models. Conclusions of the study found that young people are prone to losing their STEM interest before they reach the age of fifteen due to negative perceptions of STEM as well as a lack of access to information, advice and guidance. Using the gaps in the research culture, the project aimed to establish and train a work experience team, with an emphasis on early-stage career staff; develop a strategy document with clear guidelines for hosting employability programmes; implement said programme. The strategy document identified three core Work experience models; Guided, Blended and Independent. The fund empowered a team of early career academics and professional staff to develop and deliver such a programme. The guide allows for better resource management and student timetabling, to enhance the overall experience.

Keywords: employability scheme; good practice; research culture; team creation; work experience

Research Culture and Employability Schemes

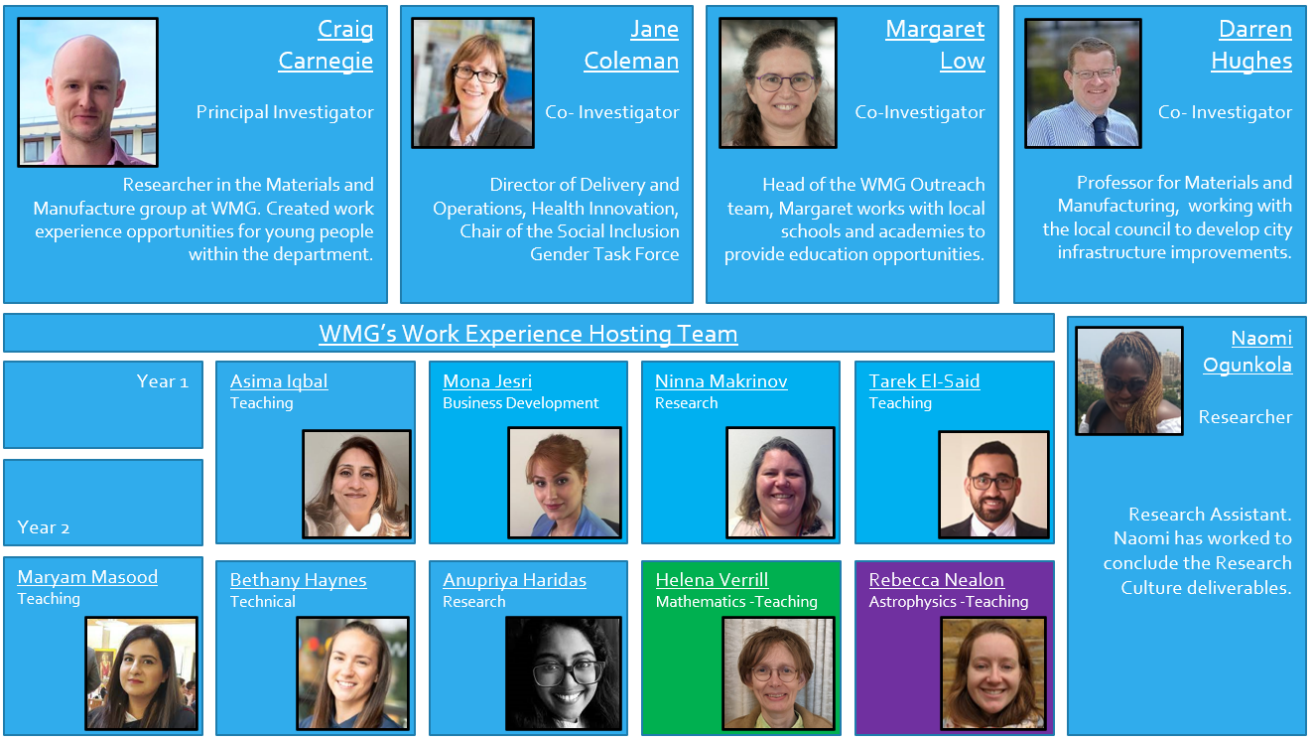
Research Culture encompasses a wide range of topics and areas that need to be addressed to create a more open and collaborative research environment. Nationally, based on an online survey of 4,267 researchers, 55% of respondents attached negative sentiment to describe research culture (**Wellcome, 2020**). Factors contributing to this sentiment include the perceived lack of job security, limited career flexibility, mental health issues, and a prevailing sense of isolation and loneliness at work. This article focusses on addressing these issues, through a departments ability to enable their staff. This includes increasing diversity and inclusion, empowering people to enhance their career paths, generating open access science and fostering a collaborative working relationship with others.

The opportunity to use funding to facilitate activities capable of supporting research culture and access to STEM (Science, Technology, Engineering & Mathematics) allowed us to take our initial idea of proving employability schemes for young people and grow it into a self-sufficient team within the department of WMG (Warwick Manufacturing Group) at the University of Warwick. Funding has been secured two years running, with four key project aims as follows:

1. Identify the gaps in research culture surrounding employability schemes, through a preliminary literature search. The identified gaps that need addressing are:
    a. Researchers' negative sentiment attached to research culture.
    b. Young people's lack of interest in STEM study and career paths.
    c. Absence of clear guidelines for employability programmes.
2. Establish and train a core employability team and network, to enhance research culture at the university, with an emphasis on supporting opportunities for early-stage career researchers.
3. Develop a strategy document, along with clear guidelines for developing and hosting an employability programme, while making this resource readily available online.
4. Demonstrate the ability to implement said programme and review its effectiveness.

Now in the second year of development, the team has grown and evolved. Figure 1 shows the involvement of fourteen members of staff, with a range of skills and backgrounds and collaborating with multiple STEM departments (Blue – WMG, Green – Mathematics, Purple – Astrophysics).

Figure 1: Profiles of the Work Experience team, as of early 2024.



Towards the end of 2023, we used the platform of the International Research Culture Conference 2023 to provide a live talk on the work completed. It was well received and provided a means to disseminate the work internationally, something we hope to continue doing.

Team building

To address the necessary changes in the culture, each member of this team was offered one-on-one training sessions with a personal development coach, provided safeguarding training and a DBS (Disclosure and Barring Service) check. It is important for employers to carry out a background check on an individual that will be working with young, vulnerable people through a DBS. It involves looking for criminal records and it is important to renew the check every few years. Additionally, the wider research community at WMG was invited to participate in a series of workshops throughout the 2022/23 academic year. These workshops covered topics such as the promotion process, creating a diverse and inclusive work environment and how to be strategic and political in academia.

It has always been our intention that such an approach would provide opportunities for each team member to boost their own career development, and to begin to specialise within the field of employability schemes. For example, one team member has demonstrated a keen interest in providing opportunities for refugees that now live within the Midlands, at a time where language and cultural barriers are making their

studies and early career journeys difficult. To address this, we focussed on offering the chance to gain real world experience within a Higher Education department that has close ties to industry. This not only enhances their CVs, but ultimately their self-belief and confidence in the long run.

Hosting a work experience

Historically, work experience programmes are initiated by *the approach*. This would come in the form of colleagues or friends that require their own child or family friend to attend a week at a local company or organisation. This ad hoc request can then be pushed from one member of staff to another, until someone is able provide a weeks' worth of experience, often this will be *work shadowing* with some mock work that mimics the typical work of the host.

The resulting experience can be very isolating for both the host and the young person attending the experience, with the odd favour being requested of other members of staff for talks and demonstrations to break up the days. Within a university environment, this opportunity often falls to a young person who is likely from an advantaged background, often due to having connections with a friend of the family working on campus. In contrast, those without connections have very few chances to participate in such a programme.

An ad hoc approach results in a short period of time for programme development, therefore it misses the preparation of documentation and readiness. There is also not the foresight to think long term, collecting student feedback to enhance and develop the scheme in the future.

Currently, there are no clear guidelines for hosting employability programmes, and this includes defined training and learning materials. Hosting a young person, especially those from disadvantaged backgrounds, requires safeguarding and the ability to identify and discuss circumstances that may go beyond the walls of the university. This means taking on a responsibility of care.

Hosts need to evaluate three things; who is the intended audience and what are their ability levels, what is your availability to host such a programme, and what are the available resources to you. Resources include space, facilities, colleague support and finances.

Ultimately, our aim is to provide an opportunity for young people coming from low socioeconomic backgrounds to gain experience through an employability programme. This includes time on a university campus, in a department that works both in research and teaching. As well as working

closely with industrial partners to demonstrate the abundance of career paths that are open to them in their future.

Identifying the Cultural Issues

To pursue a future in higher education and take a career path in a scientific field, there are ever increasing barriers to entry, which is equivalent to a lack of access. Factors that can increase these barriers include gender, ethnicity and socioeconomic circumstances. Between 2015 and 2019, interest for science dropped by 10% amongst children as young as nine years old (**Sims et al., 2019**). Young people will make a choice to leave the pursuit of a STEM career as early as fifteen years old (**Microsoft, 2018**), often when they are required to make their first subject choices at school. This can be exacerbated where financial concerns are greater, for example, the cost of going to university, or the requirement to contribute to the household financially as soon as possible.

To increase opportunities and access, the University's staff hosting the employability scheme, require training and coaching to become inspirational figures to young people. A role model or schoolteacher being supportive and showing encouragement was shown to boost the chance of girls pursing a STEM pathway by 25% (**Popovich, 2023**). Studies have highlighted that extracurricular experiences (**VanMeter-Adams et al., 2017**) and project-based learning (**Beier et al., 2018**) are both inspirations for young people to continue pursuing STEM careers. A work experience placement can incorporate both items, being away from school and often outside of schooling hours. The approach our model has taken is to assign a project and theme to the experience, where the learning and development is based around a deliverable that the student progresses and then presents.

Another research culture area that needs addressing is the reduced opportunities for staff in the early stages of their career, which includes the chance to take on leadership roles. Within a university setting, departments are split into groups, often headed by a single Professor, of whom is supported by one or two Associates. However, the proportion is then larger when it comes to Assistants, Fellows and Postgrads. Not all early-stage career staff have a direct path to the top two positions, therefore it becomes very competitive to make the next steps, and demonstrating leadership is a great way of standing out.

The structure of departments also lends to the issues of collaboration and sharing good practice. Each group wants to keep a hold of their intellectual property, and then within that, each individual needs to hold onto their own expertise. Such a structure therefore fosters an isolated culture and tends to discourage team growth.

Finally, a product of this is the lack of open access research, and the practice of uploading original datasets to public repositories. Publications are typically hidden behind a payment, and then original data is difficult to see or trace. However, whilst the adoption of open access publications is becoming more common, it is still seen as a lower quality route to sharing material.

Modifying the Culture and Embedding Good Practice

Through hosting a work experience programme aimed at young people between the ages of fifteen and eighteen, specifically from widening participation groups, the team hopes to inspire and secure young people's ambitions of a STEM future. We want to make sure that the opportunity is there to experience working life at a higher education facility, and to help foster connections and networks that will create further opportunities in the future. The work experience demonstrates a range of job roles and career paths across the university campus, including technical routes, with discussions from technicians, apprenticeships and technical service staff. It has been discussed that the UK is very good at providing academic teaching, but less so when it comes to technical education (**Yates, 2019**), leading to a skill gap. Being able to show the connection between the two is often a surprise for the visitors.

The creation of a work experience team within the department has also generated new responsibilities and career opportunities for staff. They have gained training and development that can now be used to enhance their CVs and demonstrate teaching, leadership and impact. The roles they have taken on include a large amount of public engagement, which incorporates outreach and working with local schools. This is a key performance indicator that is evaluated when applying for promotion within the university.

The team are working together, collaboratively to develop the most enriching work experience that we can, documenting the process and making it clear to others what is possible. This year has shown the possibility to reach other departments and work with them to host cross-department programmes.

The information we gather and develop into guides will not be hidden, instead being made available online and the team is happy to discuss with those that reach out, any questions they may have. Documenting and recording our approach has been crucial in embedding the process and reaching as large an audience as possible with our work. Therefore, the delivery of online documentation was always the aim for such a project. Document 1: *Hosting a Work Experience Programme at the University of Warwick* is readily available at www.warwick.ac.uk/wmgworkexperience.

This work experience strategy conceptualises the process of dissecting research culture, generating a work experience programme, delivering said programme and processing an end of project review.

The use of internal funding has allowed the team to grow from a single host requesting favours from members of staff, into a dedicated fourteen-member team that can now host as a group or independently, if required. Finances to support the second year of our work experience programme came from the Research Impact & Services group at the University of Warwick, through applying for an Enhanced Research Culture Fund. The Research England funding was for ten months, and helped to pay for staff time, external consultancy and training fees, and consumables to support the final delivery of the experience. In 2023 the group was able to host a work experience for fourteen young people.

Observed Outcomes

The experience of setting up an employability scheme and delivering it to a range of young people has provided us with a large collection of learning materials, that we are now sharing with the wider community. Through the *STEM Faculty Work Experience Working Group* we are supporting others with timetables, templates, and course creation.

Three work experience models

The variety of programmes hosted at WMG has allowed us to dissect the best type of work experience for each individual student, allowing new hosts to create a programme that will be more enriching for their audience. To do this, we have identified three core work experience models; Guided, Blended and Independent, as shown in Figure 2. Each model consists of a collection of activities for the young people, but weighted based on the student's ability, the availability of the host to provide one to one teaching and the access to resources within the department/office.

A young person that does not have a lot of experience with the topic or has not demonstrated the ability or desire to do self-learning and research will be better suited to a *Guided* experience. This includes less independent work, and more time attending lectures or taking tours of the facilities. In contrast, a student that shows a real interest in exploring the topic and has the ability to do research could be placed on an *Independent* experience, where the focus is on answering a core question or theme, with intermittent practical, tours and a single lecture to break up the days.

Figure 2: Activities distribution across the three core work experience models; Guided, Blended and Independent.

Work Experience Model					
Guided		Blended		Independent	
Independent	20%	Independent	45%	Independent	60%
Practical	20%	Practical	20%	Practical	10%
Tours	20%	Tours	20%	Tours	15%
Lecture	20%	Lecture	15%	Lecture	5%
Floating	20%	Floating	0%	Floating	10%

Existing models have been written with a single week in mind, however they have been shown to run just as well across two weeks, with plenty of scope to be expanded further. The theme was seen to be very important for creating and running the work experience. For example, 'How do we build a car?', sets the week's objectives clearly for the student and allows the host to break that down into hour long exercises that come together to answer that question. This all culminates in a presentation or discussion at the end of the week that showcases their learning and understanding.

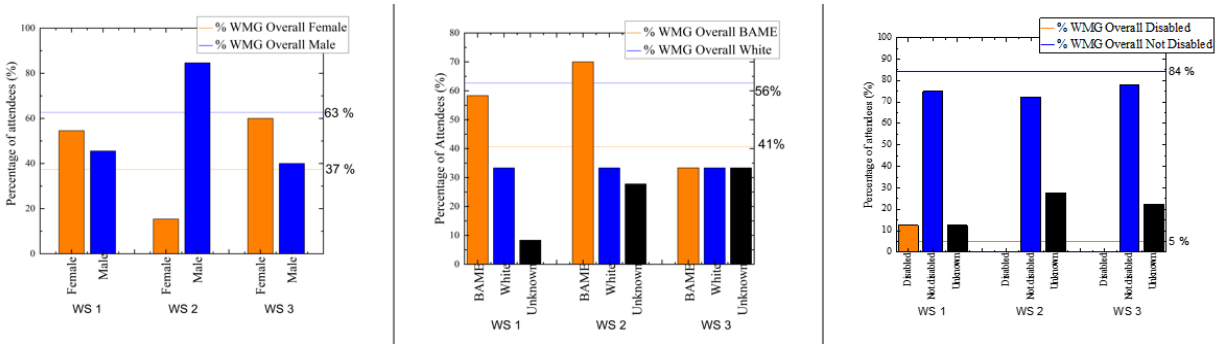
Participants of the models were asked for their feedback pre and post work experience, with very positive responses, exemplified by the following quote.

> *I am so glad to have had that opportunity to expand my knowledge and inspiration within the engineering field, via WMG.* (**Young Person from our 2022 Cohort**)

Workshops for staff development

The funding allowed us to bring in an external development consultant to deliver workshops specifically tailored to research culture and staff growth. The workshops were open to a larger audience than just the work experience team, and we managed to provide them to thirty-three staff members, representing a wide range of backgrounds and job roles, as shown in Figure 3. The highest attendance was for workshop one: 'Mapping your achievements to UoW's promotions criteria', where staff began to assign their achievements to the four key promotions criteria of research, teaching, impact and collegiality.

Figure 3: Demographics of staff reached through the leadership workshops (WS). Showing gender, ethnicity and disability representation.



Collecting feedback from the workshops was key to making sure that they met the expectations, and that modifications could be made in the future, where required. The feedback included:

> *Thank you very much for organizing the event. I hope as many people in WMG as possible attend it because it would give participants a chance to chart out their roadmap for the future even if they are not considering promotions.*
>
> *This workshop [1] has directly influenced my approach to the promotions process since following the exercise I have created a strategic plan for increasing my engagement with research activities.*
>
> *I greatly enjoyed the opportunity to reflect on my professional development in a positive, supportive environment. In particular, the chance to network with teaching- and research-focussed colleagues across the department in the shared interest of academic progression is appreciated to generate opportunities for collaboration.* (**Various Workship Participants**)

Next Steps

The development of an employability scheme is continually evolving, especially as we begin to embed the process within the department and highlight the depth and vigour required to establish and maintain a safe and enriching work experience process for everyone involved. The emphasis for this year's funding is on expanding our knowledge, development, opportunities and resources to other departments within the University. This includes recruiting Mathematics and Physics to the work experience team and working with both departments to create a cross disciplinary work experience for the young people.

The group is also a part of the *STEM Faculty Work Experience Working Group*, a forum with representation from all STEM departments. We continue to work alongside the forum and come together to share good practice and provide guidance to those that may not have previously hosted such programmes.

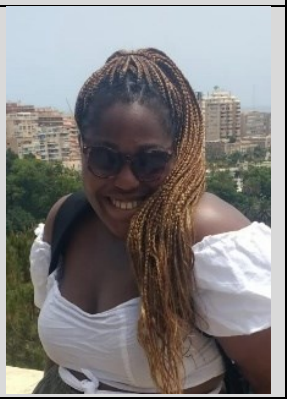
Finally, due to the success of the project to date, next steps also aim to expand the work to the wider University, including more faculties. With a real ambition of taking the efforts nationally to other Universities across the UK.

Acknowledgements

The project 'Addressing social mobility issues in STEM' was funded by the Enhancing Research Culture Fund through Research England.

Dr Craig Carnegie leads WMGs mechanical and adhesive joining capabilities, possessing skills in experimental analysis of joints. He was recently awarded an EPSRC proposal as CO-I and was the CO-I on an Innovate SMART Grant. Craig continues to look for new opportunities for collaboration and hopes to open up access to the joining capabilities to other academics. He is currently leading a Research England development fund for employability schemes and is the chair of the Warwick STEM Work Experience Working Group. He has established the departments Work Experience Team for traditional employability schemes, aimed at young people from disadvantaged socioeconomic upbringings.

Miss Naomi Ogunkola is a final year student, completing her undergraduate course in Astrophysics. She was employed as a Research Assistant on the Research England development fund, assisting on the production and development of the Work Experience Guidance document. She has a keen interest in social mobility projects and has applied for an internship with WMG, looking at opportunities to unify research outputs and public engagement.



List of Figures

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