Written evidence from UK Institute for Technical Skills and Strategy (ENB0038)

Introduction to the Institute

The UK Institute for Technical Skills and Strategy (across the higher education, research, and innovation sector) welcomes the House of Lords Science and Technology Committee's inquiry into understanding the field of engineering biology. The Institute's submission has been informed by the knowledge and expertise of the technical workforce in engineering biology. Committed as we are to making the UK a tech superpower by 2030, we are concerned about the technical workforce experiencing a lack of visibility, recognition, and career development. Career pathways and professional development can be poor, and an aging workforce means that large numbers of skilled technicians are retiring.

The government frequently discusses emerging technologies needed to drive innovation, but rarely do we consider the expert technical skills, roles and careers required to use these technologies. Technical expertise is critical to the success of UK higher education, research and innovation, and the growth of the UK economy. The UK has a shortage of technicians across all sectors, and there are significant equality, diversity and inclusion challenges impacting the current workforce. These factors pose a serious threat to the UK's innovative strength and global competitiveness.

The UK Institute for Technical Skills and Strategy are the hosts of the Gatsby-funded Technician Commitment and are building on the legacy of the TALENT Commission report (chaired by Professor Sir John Holman). We are funded by Research England; and within a broad portfolio of activities, our Institute is working on supporting technical skills and apprenticeships, essential for the growth and productivity of the country. Technical skills across the sector underpin primary activities of universities and research institutions, creating foundations for technical excellence in research, teaching, and innovation. Technical professionals enable research and innovation in our universities and institutes and build, maintain and enable the use of the UK's research infrastructure.

The Institute's Evidence

The UK has six Synthetic Biology Research Centres (SBRCs) as funded by Synthetic Biology for Growth. These are BrisSynBio (University of Bristol), Nottingham SBRC (University of Nottingham), OpenPlant initiative (University of Cambridge, John Innes Centre, Earlham Institute), UK Centre for Mammalian Synthetic Biology (University of Edinburgh),

SYNBIOCHEM (University of Manchester), and WISB (University of Warwick).

As the committee members may already know, engineering biology is an umbrella term encompassing various fields such as fermentation, synthetic biology and robots. Therefore, participants state that technicians harness essential skills that are transferrable across the various fields of engineering biology.

It is important to remember that in higher education, research and innovation, technical careers, don't necessarily mean the role holder took a traditional vocational pathway. For example, in the first research centre, two-thirds of the technical staff held doctoral degrees before embarking on their technical careers. Similarly, at the second institute, all five technicians were PhD holders. This highly specialised workforce is instrumental to the functioning of engineering biology research teams. To illustrate their contributions, consider the following tasks routinely performed by our technicians in different engineering biology specialisations:

The technician specialising in molecular biology ensures a consistent supply of consumables, is responsible for repairs and maintenance of laboratory equipment, managing prep room activities, which includes the cleaning and preparation of apparatus, and supporting spin-out companies, and offering specialised services as needed.

Another technician specialising in Fermentation/Synthetic Biology is responsible for training postgraduate students, doctoral candidates, and postdoctoral researchers in the use of fermenters, in addition to maintaining the fermentation equipment and managing related research projects.

A third technician specialises in molecular biology within a vaccine development platform. This role involves utilising engineering biology to craft pathogen analogues for vaccine creation. The technician also leads their own research project, manages laboratory operations, ensures adherence to health and safety protocols, and administers tasks such as liaison with engineering services and coordinating with the building management team.

Contributions of the technical workforce:

Contributions to Spin-out Companies and Start-ups:

Technicians actively contribute to spin-out companies and start-ups that are associated or grow out of their research centre. Their expertise is often called upon for the setup and management of equipment. Often,

they also offer practical support and technical advice, ultimately playing a pivotal role in the early-stage development of these emerging ventures.

Supporting Pilot Studies through Data Creation:

The contributions of staff technicians are crucial in the initial phases of research, particularly during pilot studies. These technicians are instrumental in generating preliminary data essential for securing research grants. However, there is a growing concern amongst technical staff that new academics in universities are not being adequately supported with technical staff.

Maintenance, Operation, and Innovation of Specialised Equipment:

Specialised laboratory equipment needs to function smoothly for research outputs to be possible. Proficiency in troubleshooting equipment issues and customising code for scripts is essential for the proper function of complex equipment such as fermenters used in engineering biology. Technical staff are also capable of creatively modifying and enhancing the functions of available equipment beyond its intended design.

Skills and Expertise Development:

Technicians play an essential role in the knowledge ecosystem as they are typically responsible for training PhD students, postdoctoral researchers, and staff/researchers of spin-out companies in the operation of specialised laboratory equipment. Although manufacturers provide basic training, it is the technicians, with their advanced skillset and specialised understanding of the equipment, who are equipped to instruct on the more complex capabilities and operations that are critical for research tasks.

Technicians pointed out the following challenges**:**

Precarious Employment of Technical Staff:

Research funding plays a vital role in research capabilities and hiring capabilities. Therefore, the stability of employment contracts in the sector, especially for technicians remains dependant on the sustainable research funding.

One technician noted the tenuous nature of their job security, stating, "In theory, we are never more than 12 weeks away from redundancy". Despite holding permanent positions at universities, these contracts are subject to underlying research funding. Long-term security for technicians can be rare, with many employed on contracts spanning only three to five years. The inherent lack of job security makes these positions less

attractive and often leads to a talent drain to the private sector which benefits from technicians trained in universities.

Incorporating Technicians into Research Grant Budgeting:

Currently, the decision to budget for technicians within research grants can often lie with the principal investigators, mainly academics that submit the proposals. Although there are some examples where technical staff are properly included in grant budgets, this practice is not common practice across all departments. These practices remain inconsistent across different research teams, and technicians expressed disappointment over not being budgeted on research grants. New academic staff at universities often find themselves without the support of staff technicians, who are pivotal for conducting pilot studies and gathering initial data. These pilot studies form essential components in research grant applications.

Pathways to Technical Careers and Apprenticeships:

The current structure of apprenticeships typically engages individuals from the ages of 18 to 23. However, there is a lack of opportunities and resources within technical colleges for specialised technical education, particularly concerning the field of engineering biology. This issue is further exacerbated by a lack of laboratory facilities in most schools, which leads to apprentices needing substantial guidance and training.

The commitment to adequately train young apprentices is substantial, and yet the available training programmes in engineering biology remain insufficient. Notable positive examples include Oxford's Doctoral Training Partnership in engineering biology and University College London's research focused MSc in synthetic biology. Despite these programs, there is a scarcity of introductory short courses that could serve as gateways into these specialised fields. Even with postgraduate taught programs, the duration of a 10-week research project is insufficient for comprehensive training to prepare these students for research.

Recognition and Acknowledgement

Technical staff face inconsistency in recognition practices; on occasion, technicians receive acknowledgements in academic papers as opposed to co-authorship, regardless of their significant contributions to the research. While some may be verbally acknowledged as part of the research grant team, this does not always translate into proper formal recognition in published materials.

There is a lack of consensus among academics regarding best practices for acknowledging technical contributions. Although the university provides guidance on fair attribution, enforcement is challenging, leading

to varying practices within different departments and disciplines, especially in the field of engineering biology. Technicians have noted a gradual positive change in acknowledgment of their roles, thanks to the initiatives and guidance put forth by the Technician Commitment, where many signatory institutions have introduced institution wide fair attribution policies to ensure recognition for technical contributions.

Lack of Career Development Opportunities

The technical workforce face a lack of opportunities for Continuing Professional Development, which is critical for their career progression. There is a perception that their contributions are undervalued, and this is compounded by a lack of institutional and sector wide lack of understanding about the competitive nature of technical expertise.

Additionally, there is a notable disparity in recognition and remuneration between academic and technical roles within universities. The current salary increments for technical staff are not aligned with the rising cost of living, as they fail to match inflation rates, further exacerbating the issue of underappreciation for this vital segment of the workforce. Lastly, as we acknowledge that technological advancements are transforming the landscape of work, there is a pressing need to invest in retraining and upskilling initiatives for our current technical workforce to match these developments.

Knowledge and Skills Retention

One of the most pressing challenges faced by academic institutions is the retention of highly specialised technicians. The recruitment process can be arduous, as highlighted by a technician who mentioned the hiring process for a computational biologist position required three rounds of advertising to fill. This difficulty is often due to the competitive salaries offered by industry, which are typically higher than those in academia.

Moreover, within research groups, there is an ongoing challenge in maintaining a continuity of skills and knowledge over time. Not all universities employ dedicated technicians who can manage and preserve the methodologies and institutional knowledge alongside their technical expertise. When these technicians leave, it further exacerbates this issue, as such transitions can result in the loss of valuable expertise.

Policy Recommendations:

1. We recommend that the government enhance the current funding models by transitioning from episodic funding to a more sustainable, long-term financial commitment to supporting and furthering technical skills and talent. This adjustment is crucial to providing consistent support for the development and retention of

technical skills and talent, thereby securing a sustainable future for the UK's scientific and technological workforce. For instance, skills and talent investments such as BBSRC Discovery Fellowships 2023, can be targeted towards UK's technical talent within engineering biology.

2. We appreciate that the government's 'National Vision for Engineering Biology' insightfully recognises the importance of technical expertise; however we have observed a gap in the current offerings of Institutes of Technology, particularly concerning specialised courses in engineering biology. Given the rapidly evolving, specialised, and costly equipment utilised in this field, we recommend that degree apprenticeships and T-level placements take place within higher education and research institutions, where students can gain hands-on experience with cutting-edge technologies. This approach would not only empower the next generation of technicians but also ensure that the UK remains at the forefront of innovation in engineering biology.

3. Develop institutional policies to provide more stable and secure long-term contracts for technical staff to improve job security.

4. Implement a standard practice that ensures the inclusion of technicians' salaries and development opportunities in the budgeting of research grants to acknowledge their essential role in the research process.

5. Create clear and structured career pathways for technicians, including opportunities for advancement and professional development, to reduce turnover and incentivise long-term commitment to the institution.

6. Standardise acknowledgment practices for technical staff to ensure appropriate recognition of their contributions in published research, including co-authorship where significant contributions to the work have been made.

7. Allocate resources for in-depth, ongoing training programmes for technicians to ensure continuous knowledge transfer, upskilling and retention, as well as the maintenance and advancement of technical skills within institutions. As the technological landscape in engineering biology rapidly evolves, investment in training the current technical workforce, who are also our future workforce is essential.

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