UK Electronics Skills Foundation

Call for evidence

UK Curriculum and Assessment Review

Response from **UK Electronics Skills Foundation**

21 November 2024

The UK Electronics Skills Foundation is the voice for skills in the Electronics Industry. We are a charity with a mission to encourage more young people to study Electronics and to pursue careers in the sector.

A chronic skills shortage threatens the UK Electronics and semiconductor industry's ability to compete on a global stage. As semiconductors become more critical to the success of UK plc, there is an increased urgency to address this skills shortage, starting at the beginning of the semiconductor skills pipeline with greater focus and more investment in secondary education.

We engage with schools, universities and industry to put in place positive interactions with Electronics that help to address the skills shortage.

We have only provided evidence to the questions relevant to the furtherance of Electronics education.

Section 1: About You

7¡.Are.you.responding.as.an.individual.or.on.behalf.of.an.organisation?

Response: Organisation

9¡.If.you.are.responding.on.behalf.of.an.organisation?which.of.the.below.best.describes.which.part.of.the.sector.your.organisation.represents?.

Response: Charity, social enterprise organisation or non-profit organisation

0¡.What.is.the.name.of.your.organisation?

Response: UK Electronics Skills Foundation

1.What.is.your.role.within.the.organisation?.

Response: Chief Executive Officer

2.What.is.your.name?.

Response: Stewart Edmondson

3.What.is.your.email.address?.

Response: stewart.edmondson@ukesf.org

4.Are.you.happy.to.be.contacted.directly.about.your.response?.

Response: Yes

5.Would.you.like.us.to.keep.your.responses.confidential?

Response: No

Section 2: General views on curriculum, assessment, and qualifications pathways

76¡.What.aspects.of.the.current.a).curriculum?.b).assessment.system.and.c).qualification. pathways.are.working.well.to.support.and.recognise.educational.progress.for.children.and. young.people?.

Response:

- **Inclusion of the physical aspects of computing in the Computer Science curriculum.** The re-design of the computer science curriculum provided greater focus on physical aspects of computing and processors, which has resulted in more students progressing to study computer science in higher education.

77¡.What.aspects.of.the.current.a).curriculum?.b).assessment.system.and.c).qualification. pathways.should.be.targeted.for.improvements.to.better.support.and.recognise.educational. progress.for.children.and.young.people?

Response:

- **There is an urgent need to make Electronics and semiconductors a more visible and explicit part of the secondary schools STEM curriculum.** Also, to ensure that an understanding of 'deep tech' is woven into wider aspects of secondary education so children, parents and teachers are aware of how semiconductors and Electronics are fundamental to the modern world. Evidence to support this need is included in the National Semiconductor Strategy 2023, which states: "Not enough people possess the right technical skills and qualifications to meet the needs of industry. Taking a holistic approach across the whole skills pipeline from STEM education, apprenticeships, industry-led learning and attracting talent is vital to meet the growing needs of the sector." Our recommendations include:
    - Including more about physical computing and computer engineering into the Computer Science curriculum at KS4 and KS5.
    - Including more about semiconductor materials and functionality in the Physics and Chemistry curricula at KS4 and KS5.
    - Re-introducing Electronics into the KS5 curriculum for AS and A-Level.
    - Increasing focus on Electronics systems in the Design & Technology curriculum at KS4.
    - Including more about electromagnetism in KS3 science (as part of teaching about 'forces').
    - Developing an education and resource pack for STEM teachers to help them understand semiconductors and with ideas for including in their teaching
- **We advocate for Electronics to be better represented as part of the Computer Science, Physics and Design and Technology Curricula in secondary Schools at GCSE**. This will provide opportunities to engage students through both academic and vocational routes and provide increased visibility in order enable more informed decision to be made about post-16 study. As an example of good practice, the Engineering Design pathway of the D&T GCSE offered by the WJEC has around 20% Electronics related topics in the specification.
- **We encourage the use of practical work as part of the teaching of Electronics subjects.** Evidence to support this includes an extract from the Science Education Tracker 2024 (Royal Academy of Engineering and Engineering UK): "Doing practical science was a key incentive to learn science for students in years 7–9, with 52%

choosing this as a motivating factor". Also, the WJEC have a 50:50 split between exam and course work assessment in their Engineering Design GCSE, which ensure students can develop the practical skills needed in Engineering, alongside their knowledge and understanding.

79¡.In.the.current.curriculum?assessment.system.and.qualification.pathways.are.there.any.barriers.to.improving.attainment?progress?access.or.participation.which.may.disproportionately.impact.pupils.based.on.other.characteristics.(e¡g¡.disability?sexual.orientation?gender?race?religion.or.belief.etc¡)

Response:

PISA (2022) scores for the UK show there is no difference in attainment between girls and boys in Science, however, just 10% (365) of students who accepted places on Electrical and Electronics Engineering degree courses in 2021 were female (UCAS). The evidence shows:

- Girls are more likely to be put off science because of factors relating to difficulty and ability (Science Education Tracker 2024, RAEng and Engineering UK).
- The STEM decision funnel (ASPIRES 2013) demonstrates how girls interest in STEM decreases significantly between the ages of 10 and 13, and at a much quicker rate between ages 10 and 16 than their male counterparts.
- When I Grow Up (Innovate Her, 2024) found that "Girls more frequently mentioned a desire to help others and make a positive impact on society" and also reported that nearly 100 students reported a barrier to careers in STEM was "A lack of technology or IT education in school".

Maths, Physics, Computer Science and Design Technology provide the foundations for Electronics:

- 37.7% of A-Level Maths entrants in 2023 were female (WISE)
- 23% of A-Level Physics entrants in 2023 were female (WISE)
- 15.1% of A-Level Computer Science entrants in 2023 were female (WISE)
- 29% of those who studied A-Level Design & Technology in 2021 were female (Design Week)

We advocate that by improving Electronics education and also by improving awareness of how semiconductors and Electronics are fundamental to the modern world, we can increase interest in Electronics and understanding that it offers a rewarding and exciting career pathway that is able to have a positive impact in society.

88¡.Are.there.particular.curriculum.or.qualifications.subjects.where¿a¡.there.is.too.much.content·.not.enough.content?or.content.is.missing·.b¡.the.content.is.out_of_date·.c¡.the.content.is.unhelpfully.sequenced.(for.example.to.support.good.curriculum.design.or.pedagogy)·.d¡.there.is.a.need.for.greater.flexibility.(for.example.to.provide.the.space.for.teachers.to.develop.and.adapt.content)?

Response:

It is important to incorporate practical work within the teaching of Electronics in secondary school Physics and Computer Science Curriculum. We know that "single greatest incentive to learning science at school among students in years 7–9 was enjoyment of practical work" (Science Education Tracker 2024, RAEng and Engineering UK). In Wales, the Engineering

pathway of the Design and Technology GCSE is an exemplar of good practice, and contains a good mix of theoretical and practical Electronics within the course. We strong advocate support for this pathway for D&T GCSE in England.

It is also important to improve understanding of the application of Electronics. Electronics is a fundamental enabler of our modern world and is vital to making advances in multiple sectors from net zero, healthcare, AI, transport, defence and communications.

8❶.In.which.ways.does.the.current.primary.curriculum.support.pupils.to.have.the.skills.and.knowledge.they.need.for.life.and.further.study.and.what.could.we.change.to.better.support.this?

Response:

- Research from NUSTEM found that attributes required by an engineer include, but are not limited to, logic, observation, open-mindedness, organisation, patience, creativity and curiosity. Teaching engineering in primary schools will support students to develop these skills that will benefit their education and development as a whole.
- A study from UCAS found "The younger that students decide higher education is for them, the more likely they are to go to a 'higher tariff' university". "Being certain about higher education by age ten or earlier means a child is 2.6 times as likely to end up at a more competitive university than someone who decided in their late teens." The survey found that 25% of those in the most advantaged areas were sure that they would go to university by the age of 10, vs 18% in the least advantaged areas. This demonstrates that giving students access to engineering and Electronics education at primary level can influence their long-term achievements.
- The UK Electronics Skills Foundation is active in the Engineering in Primary Schools (EiPS) Working Group. Convened and supported by Engineering UK, the EiPS brings together leading professionals from the STEM engagement sector, Educators and Employers to share and develop best practice, pedagogy and projects that realise our collective ambition to improving pupil access and learning in engineering education in primary schools. We strongly recommend that the review liaises with this group.

8❷.In.which.ways.do.the.current.secondary.curriculum.and.qualification.pathways.support.pupils.to.have.the.skills.and.knowledge.they.need.for.future.study?life.and.work.and.what.could.we.change.to.better.support.this?

Response:

We advocate for three priorities in secondary education (Creating a Skills Pipeline for UK Semiconductors, UKESF):

- Curriculum change
- More engagement with the Electronics industry
- Improved careers advice.

Beyond the curriculum, there is a need to provide engaging enrichment activities and more extracurricular opportunities for pupils to deepen their interest in Electronics and semiconductors. Evidence to support this need is included in "Implementing co-ordinated STEM engagement in schools" (Tomorrows Engineers), which shows that multiple and sustained

engagements are needed to ensure a positive, long-term, impact on students' aspirations towards STEM careers. We have seen this approach be successful with 'coding'. Therefore, there is a need to support those organisations who can:

- Provide external support (resources, advice and industry ambassadors) to teachers to help them deliver enrichment activities in Electronics across KS3-5.
- Supply schools with 'hands on' projects to introduce Electronic engineering and microcontroller concepts to pupils and allow them to explore creative applications and uses.
- Encourage participation through external recognition (e.g. through CREST Awards).
- Deliver online resources to help augment classroom-based engagement activities.

8❸.In.which.ways.do.the.current.qualification.pathways.and.content.at.7❷_7❸support.pupils.to.have.the.skills.and.knowledge.they.need.for.future.study?life.and.work.and.what.could.we.change.to.better.support.this?

Response:

As noted by OfSTED, it is clear that "there remains considerable work to do to improve the quality and effectiveness of T-level courses, to make sure that they fulfil their potential and can be offered at scale." From our perspective, there needs to be greater focus on developing relevant skills needed by industry with the vocational pathways for 16-19 year olds. For instance, Electronics circuit fault finding. There is a case to explore how concepts such as 'skills bootcamps' and short additional skills-focussed interventions can augment the current provision.

Section 6: A board and balanced curriculum

KS3 Technical Awards

99¡.To.what.extent.and.how.do.pupils.benefit.from.being.able.to.take.vocational.or.applied.qualifications.in.secondary.schools.alongside.more.academically.focused.GCSEs?.

Response:

We believe that vocational routes are important to help tackle the shortage of Electronics Engineers and provide routes for young people into rewarding careers. However, we advocate for greater hands-on, practical, content and learning and for more course work assessment within GCSEs, rather than for separate vocational qualifications and pathways pre-16. We believe that GCSEs should be common bedrock of secondary education. The Engineering Design pathway in the WJEC's GCSE in D&T is a good example of how the balance between academic and practical can be achieved. However, to supplement formal education, there is a case to explore how concepts such as 'skills bootcamps' could be adapted for KS3 pupils to provide enrichment and insights into future vocational occupations, including Electronics.

90¡.To.what.extent.does.the.current.pre_7❷vocational.offer.equip.pupils.with.the.necessary.knowledge.and.skills.and.prepare.them.for.further.study.options?including.7❷_7❸technical.pathways.and~~-~~or.A.levels?.Could.the.pre_7❷vocational.offer.be.improved?

Response:

We advocate for GCSEs to continue to be the bedrock for pre-16 education, albeit with greater focus on course work in the more practical oriented subjects, such as D&T.

Alongside numeracy and literacy, digital and data skills will increasingly be fundamental to post-16 technical pathways and future employment (see Warwick Institute of Employment report). Therefore, there needs to be greater focus on developing these skills in secondary education.