2024

Review Report of the use of Micro:bits in Schools in Wales.

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Review Report of the use of Micro:bits in Schools in Wales

Revision 1.4

Prepared by CIOTEK Limited

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Review Report of the use of Micro:bits in Schools in Wales

Background

Technocamps is a pan-Wales schools and community outreach programme led by the Swansea University's Computer Science Department with hubs in every university across Wales.

It was first established in 2003 to provide a wide spectrum of activities aimed at identifying and addressing shortcomings in computing education and skills.

In 2018 Technocamps won a three-year £5.3 million funding under the European Social Fund (ESF) Priority Axis 3: Youth Employment and Attainment. The operation focuses on Specific Objective 3: To increase the take-up of and attainment levels in STEM subjects amongst 11-19-year-olds.

Post ESF funding Technocamps ambition remains focused on sustained interventions to increase both overall participation rates in STEM subjects at post-16 and increase the participation of girls in STEM subjects.

The Micro:bit is a pocket-sized computer designed to inspire creative thinking in children. It can be programmed in many different ways and has multiple uses.

Through the micro:bit, children are encouraged to explore ideas using real code. The device provides an authentic experience of the interaction between hardware and software and gives children practical computer knowledge. Using it, they can see how what they do with the code on-screen has a direct impact on the device they're holding in their hand.

The micro:bit hardware has been developed since it was created in 2015, with the current iteration (V2) boasting enhanced features which will play a part in a new campaign. The device contains a range of sensors, connectors, and inputs that offer multiple ways of using the device. These features include:

- An LED display that also doubles as a light sensor
- An accelerometer that detects motion and movement
- A microphone and a speaker
- Radio and Bluetooth connectivity
- Input buttons and a touch sensor
- Connecting pins that allow it to be slotted into compatible devices or wired into a circuit

The micro:bit project offered a free classroom set of 30 micro:bits to primary schools across the UK as part of the **BBC micro:bit – the next generation campaign**[1] The deadline for UK primary school teachers to sign up for a free classroom set of 30 micro:bits was Monday 18 December 2023 at 5pm. For those not registering by that date, micro:bits are available to borrow from some libraries, or they can be purchased for the school.

[1] https://www.bbc.co.uk/teach/microbit

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1. Introduction

This review report comprises the findings of an independent evaluation of the use of micro:bits in Schools in Wales following their allocation to participating schools

The micro:bit project offered a free classroom set of 30 micro:bits to primary schools across the UK as part of the **BBC micro:bit – the next generation campaign**[2] The deadline for UK primary school teachers to sign up for a free classroom set of 30 micro:bits was Monday 18 December 2023 at 5pm. For those not registering by that date, micro:bits are available to borrow from some libraries, or they can be purchased for the school.

With support from Hwb[3], regions in Wales have been encouraged to develop a Digital Schools strategy. Examples being Carmarthenshire[4] and Merthyr Tydfil[5] . These strategies have been developed in support of the new Welsh Curriculum for Schools[6].

1.1 Survey Aims and Objectives

As a part of its support for schools Technocamps undertook an inception survey in February and March 2024 to gain teacher feedback on their plans and ambitions for the use of micro:bits, and the importance of the supporting role offered by Technocamps.

The survey was completed by the participants at the conclusion of the training/support workshops and (In addition to the name of the school) comprised the following questions.

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[2] https://www.bbc.co.uk/teach/microbit

[3] https://hwb.gov.wales/

[4] https://democracy.carmarthenshire.gov.wales/documents/s57793/Digital%20Schools%20Strategy%202022%20-%202025.pdf

[5] https://democracy.merthyr.gov.uk/documents/s60907/Appendix%201.pdf

[6] https://hwb.gov.wales/curriculum-for-wales

- What best describes your role in your organisation?
- Are you personally teaching computer science/digital based topics at school currently?
- Do you currently use Hwb as your go-to digital provision within your school?
- Have you benefited from Technocamps engagement in the past?
    - If yes, briefly describe in what way?
- How important was Technocamps in getting your school to register for the BBC micro:bit campaign?
- How important was today's Technocamps Training Day in preparing you to participate in the micro:bits programme?
- Are there other organisations beside Technocamps that have supported you in the past from which you will seek support for the micro:bits programme?
    - If yes, which?
- Please rate the overall delivery of the session today.
- Following this session how likely are you to use the micro:bit when teaching?
- Following this session how likely are you to Do at least one of the playground survey activities with your class?
- *Any further comment*
- If you can think of any further professional learning or other content you would like to see us develop and deliver, please include this information below.

The details of the overall breakdown results and the regional responses (Cardiff, Swansea and Conwy) have been included in Appendix A of this report. It should be noted that this information does not show the individual responses for each school which remains confidential and not for publication.

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2. Background

Technocamps is a pan-Wales schools and community outreach programme led by the Swansea University's Computer Science Department with hubs in every university across Wales.

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In 2018 Technocamps won a three-year £5.3 million funding under the European Social Fund (ESF) Priority Axis 3: Youth Employment and Attainment. The operation focused on Specific Objective 3: To increase the take-up of and attainment levels in STEM subjects amongst 11-19-year-olds. The notable success of this programme was highlighted in the formal independent external evaluation report completed in 2019 which stated.

> *The evaluation has identified Technocamps as an exemplar programme in supporting digital upskilling across Wales through strong partnerships with Welsh universities. Specifically, it has successfully achieved an increase in young people's engagement with STEM subjects*

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[7] https://www.bbc.co.uk/teach/microbit

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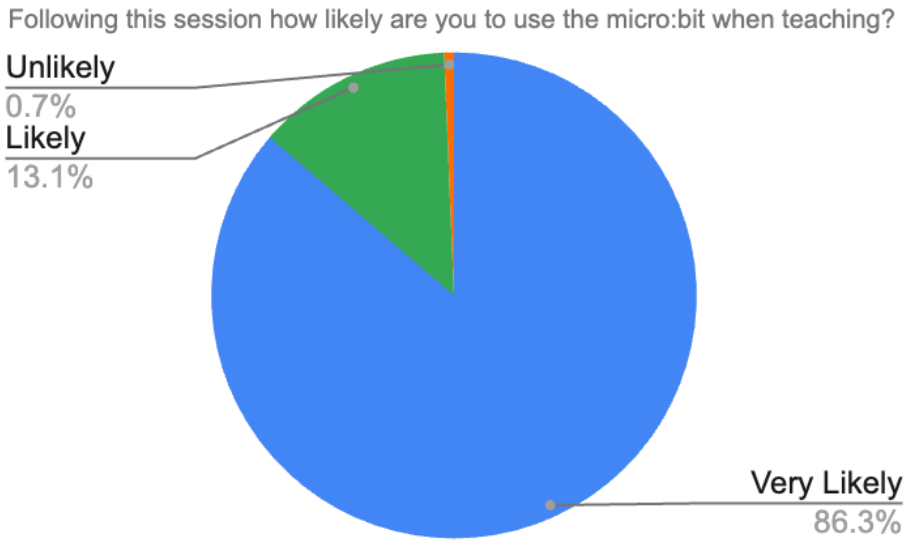
3. Findings

3.1 Initial Survey results

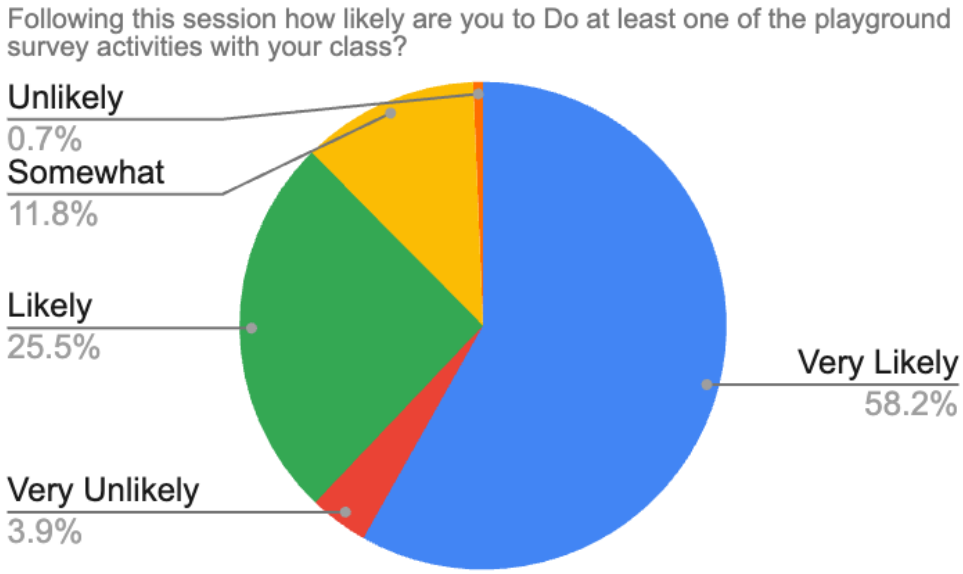
This section of the review report comprises the findings of an independent evaluation of the use of micro:bits in Schools in Wales following their allocation to participating schools

As a part of its support for schools Technocamps undertook an inception survey following the workshops in March 2024 to gain teacher feedback on their plans and ambitions for the use of micro:bits, and the importance of the supporting role offered by Technocamps.

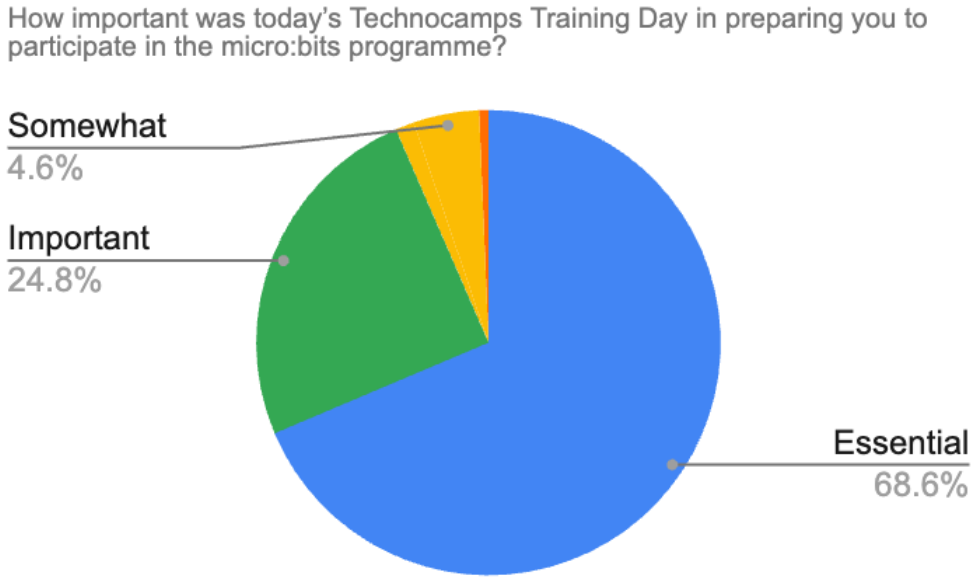
Of the 176 attendees at the workshops, feedback was obtained from 152 of the participants. The results below are based on the 152 respondents. Feedback from the workshops and training sessions, (Cardiff, Swansea and Conwy) indicated an extremely high level of enthusiasm and ambition with 86% of the respondents indicating that they were “Very Likely” to use the micro:bits when training, and a further 13% indicating “Likely”.



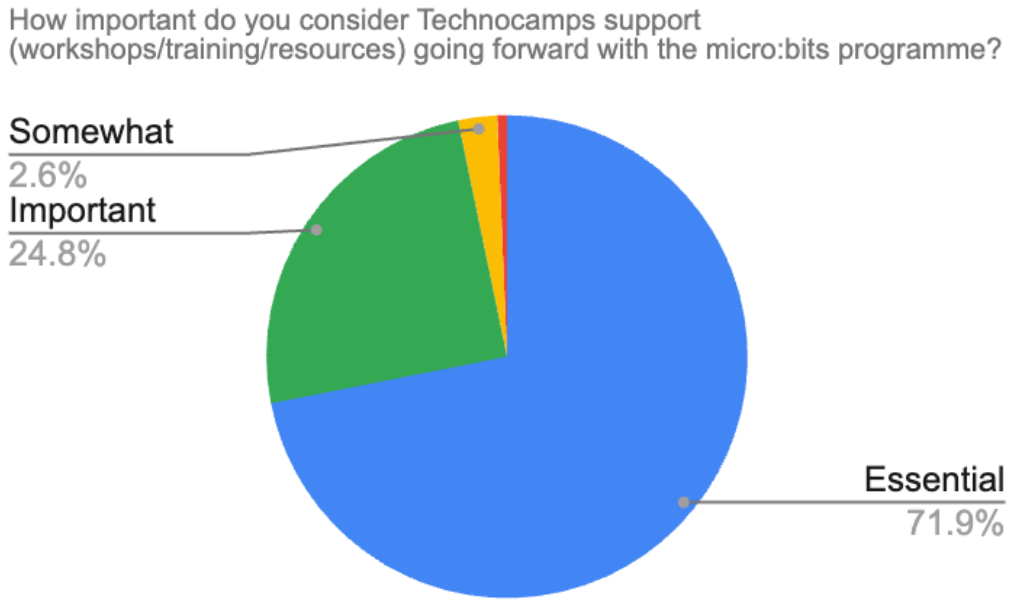
Interestingly, the is level of commitment was not carried forward to the playground survey activities with only 58% indicating that that they would “Very Likely” to do at least one of the playground survey activities with a further 25% indicating “Likely”.



In relation to the preparation of respondents for participation in the micro:bits programme, the positive responses associated with the importance of the Technocamps Training Day equated to 94% with 69% indicating the support had been “Essential” and a further 25% rating it as “Important”.



Similarly, in respect of the support from Technocamps in supporting the participants in going forward with the micro:bits training, the positive responses equated to 97%, with 72% advising that the support was “Essential” and a further 25% indicating it is “Important”.



It is important to understand here, the reasons why this support is adjudged as being so important. The delivery of computing in schools is unlike the teaching of any other subject being offered, both from the perspective of the teachers and of the students/pupils. The teaching of traditional subjects such as History, Geography, Languages, Science subjects and Mathematics may differ only marginally from year to year. A curriculum content delivered in one year may be completely relevant in the following year. Computer Science is different. The speed of development of technology, in relation to elements such as programming, Artificial Intelligence tools, physical devices, software applications and Apps, is dramatic, and a curriculum from one year may be out of date by the next. This has put a significant strain on the teaching of computer science which is struggling to keep pace with the speed of change and new and emerging technologies.

As an example, ChatGPT was launched and released in November 2022. Version 5 is expected mid-2024.

Feedback received from this survey has indicated the need for ongoing support to enable teachers of computer science to deliver effective and up to date content.

A recent report by Accenture[8] summarised 2024 technology vision in five key considerations.

- Technology is becoming human by design, and enterprises that prepare now will win in the future.
- How people access and interact with information is radically changing as human-like, AI-powered chatbots synthesise vast amounts of information and provide answers and advice.
- AI is starting to reason like us and will soon comprise entire ecosystems of AI agents who will work with one another and act for people and organisations alike.
- A new spatial computing medium is emerging, letting the digital world reflect what it means to be human and in a physical space.
- The challenge of tech not understanding us and our intent is disappearing, machines are getting much better at interacting with humans on their level.

The importance of support to teachers from Technocamps in keeping ahead of their pupils and being able to effectively deliver Computer Science in schools cannot be underestimated.

The conclusion that can be drawn from this is the importance that participants have placed on both the existing and future supports from Technocamps.

It was interesting to note that in response to the question. "*Have you benefited from Technocamps engagement in the past?",* that of the 152 respondents to the survey 93 (61%) had used Technocamps before whilst 59 (39%) had not.

The support considerations are underlined by the question *"Are there other organisations beside Technocamps that have supported you in the past from which you will seek support for the micro:bits programme?"*

Of the 125 respondents to this question, 92 (74%) indicated that they had no other organisation that would support them with the micro:bits programme. 16 (13%) indicated they had external supports, citing BBC teach, the micro:bits website and Cardiff Metropolitan University. A further 17 respondents (14%) indicated that they were unsure where they would go.

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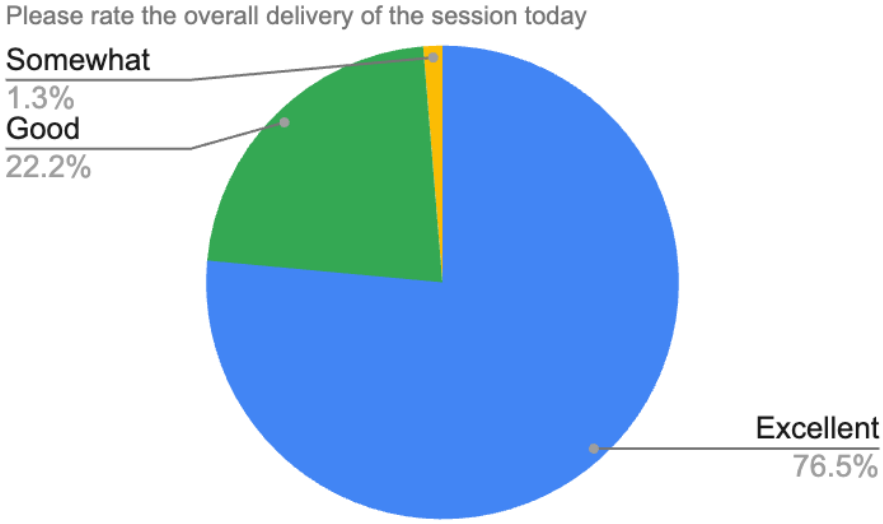
8 https://www.accenture.com/gb-en/insights/technology/technology-trends-2024?c=acn_glb_accenturetechnogoogle_14070644&n=psgs_0124&gad_source=1&gclid=EAIaIQobChMIvoWC8ezkhgMV9ZKDBx2figB7EAAYASAAEgJUovD_BwE&gclsrc=aw.ds

In relation to the workshop sessions, in the region of 98% reported a positive response to the delivery of the support session with 76% indicating it was “Excellent” and a further 22% rating it as Good.



There was marginal, but not significant, regional differences to the responses and a breakdown of the responses to each of the questions regionally may be found in Appendix A of this report.

It is interesting to reflect on the parallels reported from the ESF funded Technocamps project where it was acknowledged by the teachers that the support provided by Technocamps has been excellent and had a very positive impact. Teachers also reported that without Technocamps, STEM subjects in Welsh schools would not be as well supported and Wales would miss a significant opportunity in embedding STEM as a viable option for career progression and setting a platform for the next generation.

The 2021 evaluation report concluded that the Technocamps operation is setting a foundation in Wales which will give Welsh students a competitive edge and needs to be seen as more than a successful programme. It needs to be seen as an investment for the future of the next generations.

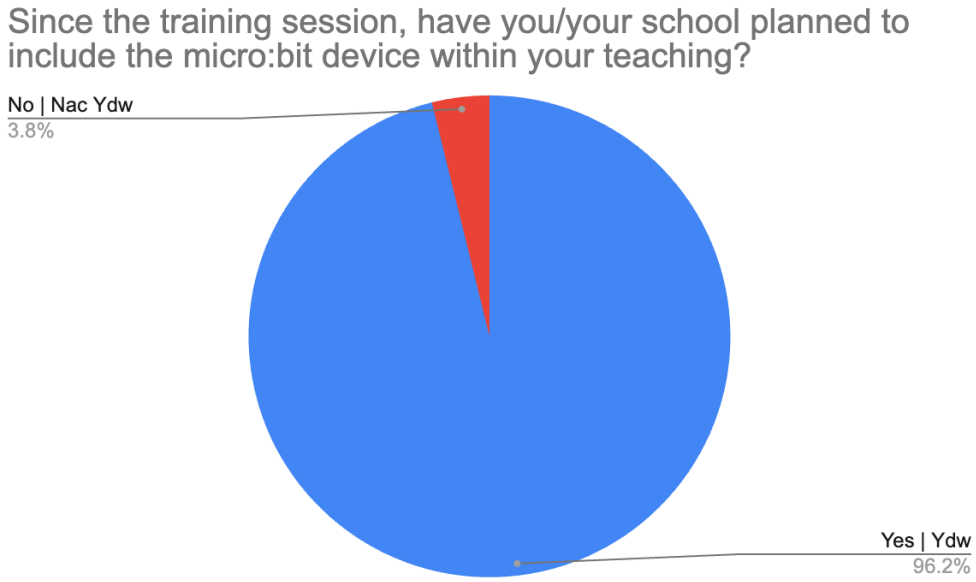
July 2022 research from the Education Policy Institute (EPI) into the impact of educational inequalities across England and Wales, funded by the Nuffield Foundation, reveals that Welsh schools suffer a wider disadvantage gap than English schools, but that both nations have made only modest progress in closing this gap during the last decade. This is the first report into educational inequalities in Wales and England over the last decade[9].

[9]https://epi.org.uk/publications-and-research/inequalities-in-gcse-results-across-england-and-wales/

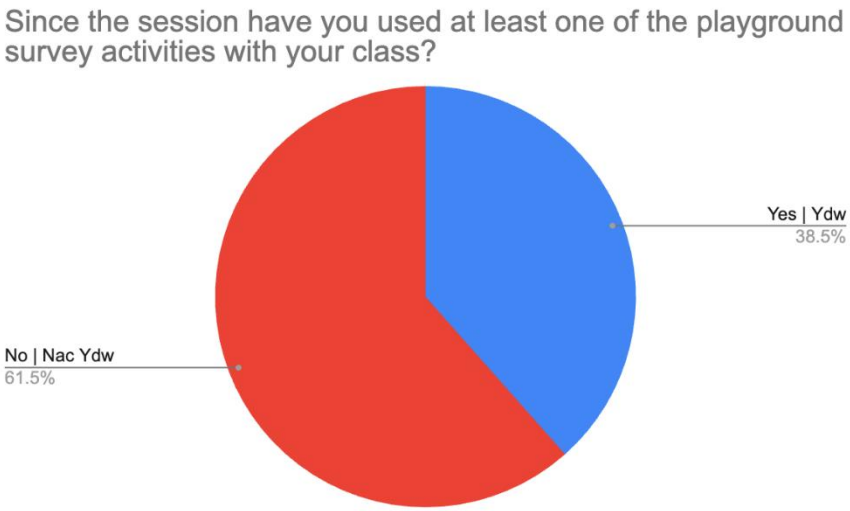
3.2 Follow-up Survey results

A follow up electronic survey was conducted in May and June 2024 to assess the level of progress since the initial training sessions.

A total of 53 individuals responded to this survey (representing 35% of the initial 152 respondents). Of these it was reported that since the training session 96% planned to use the Micro:bit device within their teaching.



It was also noted that 88% of the 53 organisations responding have actually used the micro:bit when teaching and only 38% have used the playground survey activities



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4. Conclusions and Recommendations

4.1 Conclusions

It would at this stage be easy to conclude that 88% of participants attending the initial training were now using their micro:bits in training. The reality, however, is that it likely that those that ARE using the micro:bits in training, form the majority of those that have responded to the follow up survey, and are therefore keen to confirm their progress.

It is thought unlikely that schools that have successfully embraced the use of micro:bits in training will have declined to confirm this. It is therefore considered probable that many of those not responding have not done so because they are yet to employ the micro:bits effectively in training. This cannot be verified but given the fact that participants were chased on numerous occasions but have declined to respond suggests that they have little positive to report.

The conclusion drawn from this, and the high level of dependency on Technocamps supports, suggests that, in order to ensure Wales and Welsh schools do not fall behind, ongoing support for teachers will be needed.

4.2 Recommendations

Recommendation 1 – Research the use of the Playground Activities

Seek to establish and understand why only 58% of the respondents to the first survey advised that they were “Very likely” to use the playground activities provided, yet even fewer, only 38% of those actually using the micro:bits have used the playground survey activities

Recommendation 2 – Gain further feedback

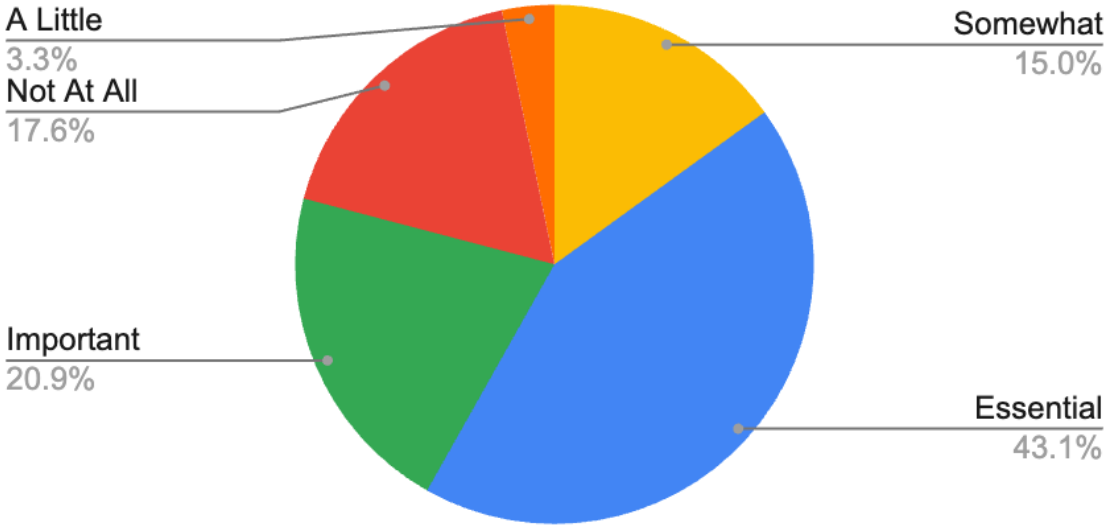
To gain a fuller and more accurate picture, it is recommended that further contacts are made to the schools to ascertain whether or not they are actually using the micro:bits provide, and if not, why not. It is recommended that this should be by a direct contact, potentially a phone call or direct email, advising that they survey is anonymous, and the survey is to ascertain if, and what further supports may be needed.

Appendix A – Charts for Feb/March 2023 survey

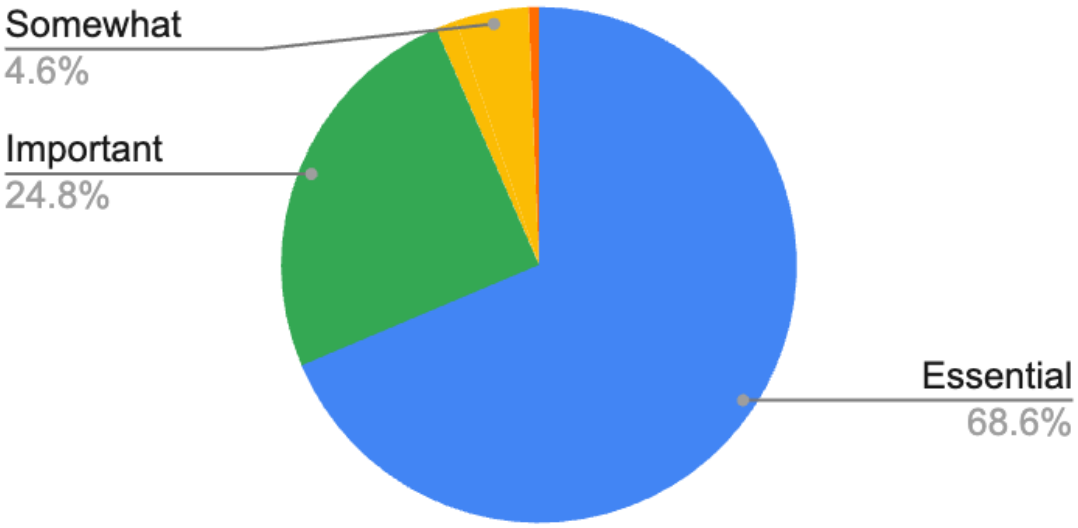
Overall

How important was Technocamps in getting your school to register for the BBC micro:bit campaign?

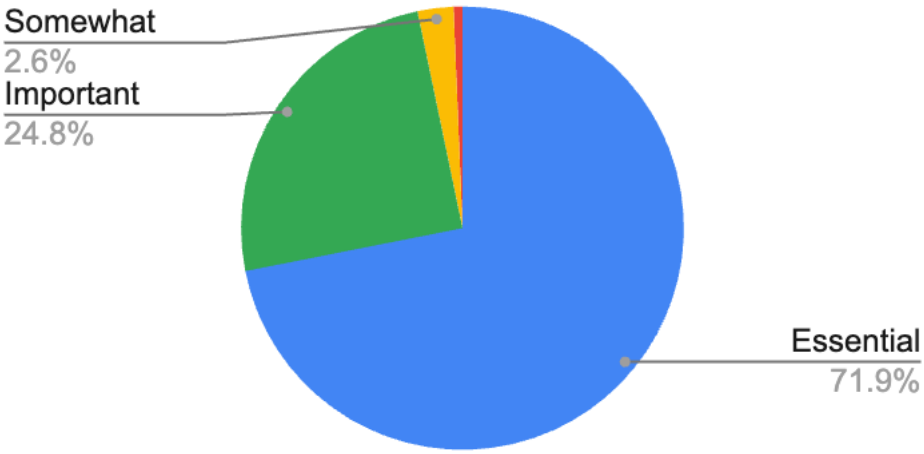
Pa mor bwysig oedd Technocamps i gael eich ysgol i gofrestru am ymgyrch micro:bit y BBC?



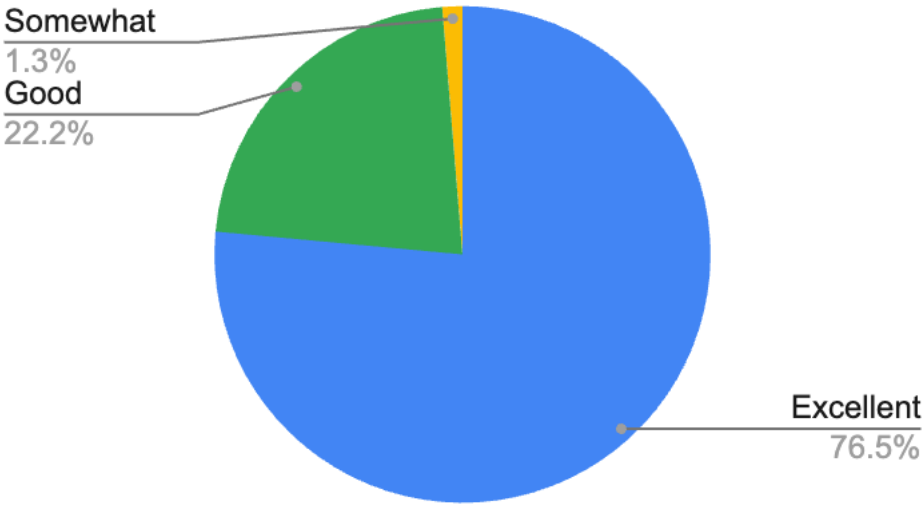
How important was today's Technocamps Training Day in preparing you to participate in the micro:bits programme?



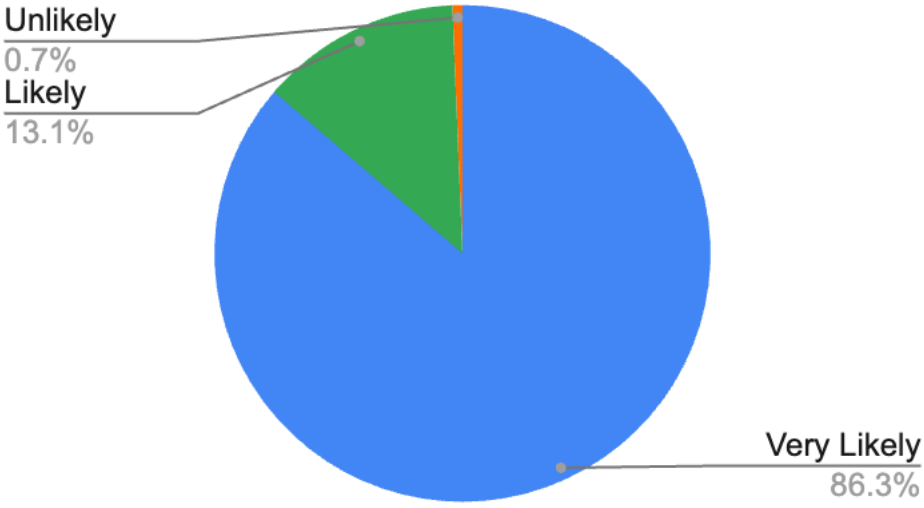
How important do you consider Technocamps support (workshops/training/resources) going forward with the micro:bits programme?

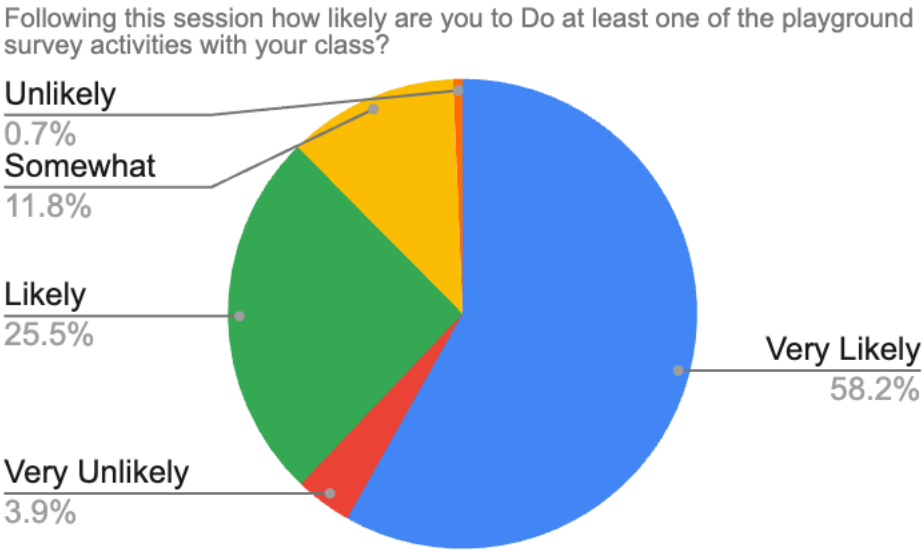


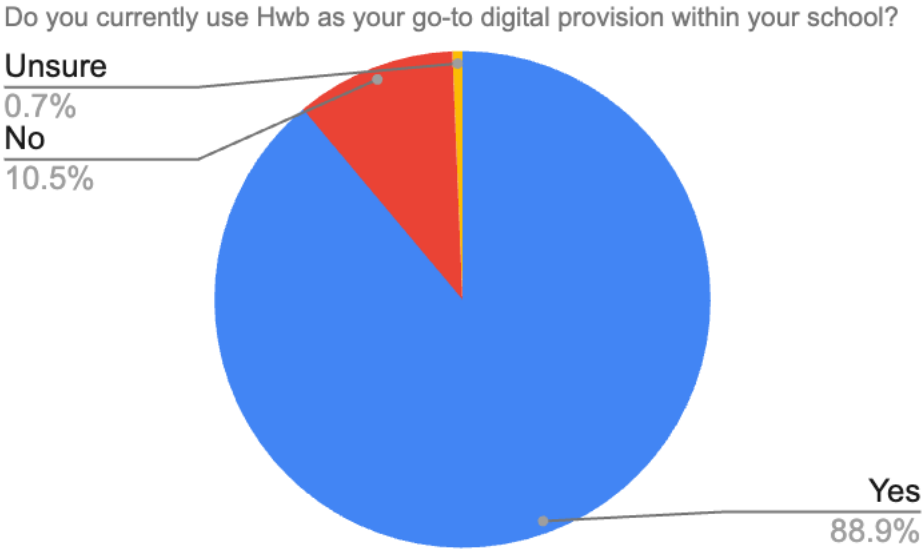
Please rate the overall delivery of the session today



Following this session how likely are you to use the micro:bit when teaching?

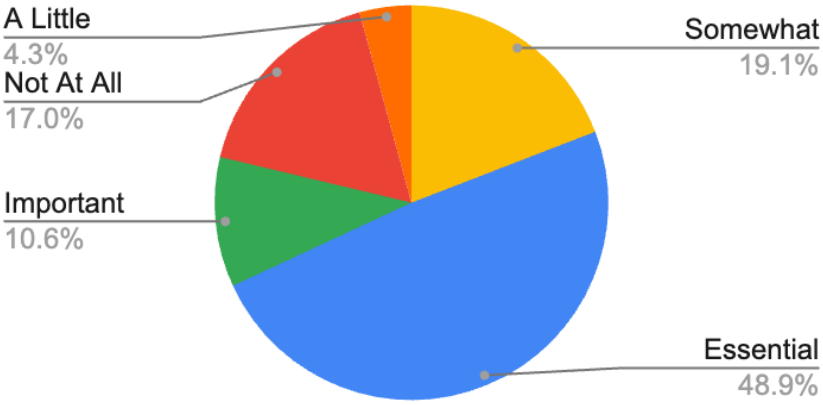



Following this session how likely are you to Do at least one of the playground survey activities with your class?
Unlikely
0.7%
Somewhat
11.8%
Likely
25.5%
Very Likely
58.2%
Very Unlikely
3.9%


Do you currently use Hwb as your go-to digital provision within your school?
Unsure
0.7%
No
10.5%
Yes
88.9%

Swansea

How important was Technocamps in getting your school to register for the BBC micro:bit campaign?



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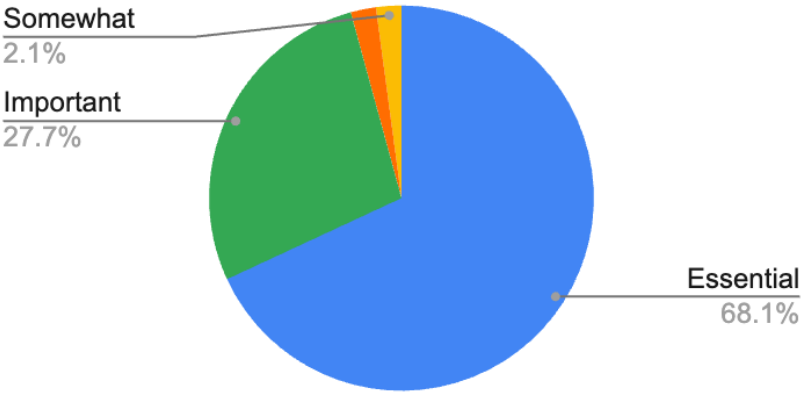

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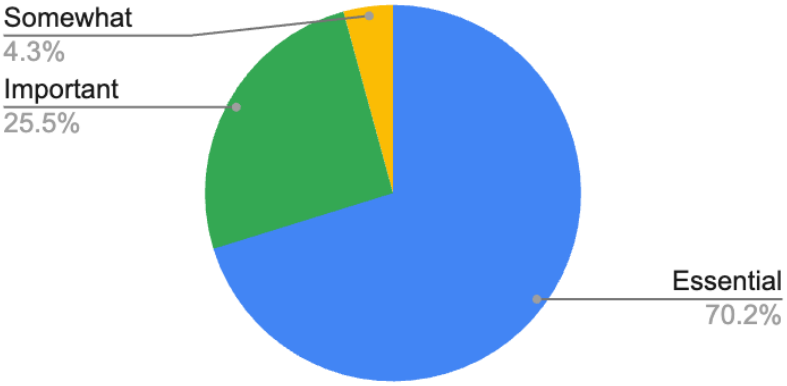
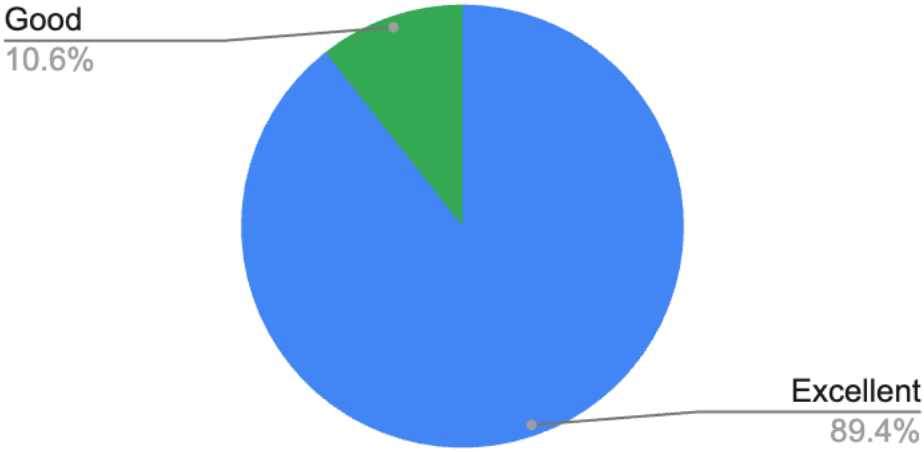
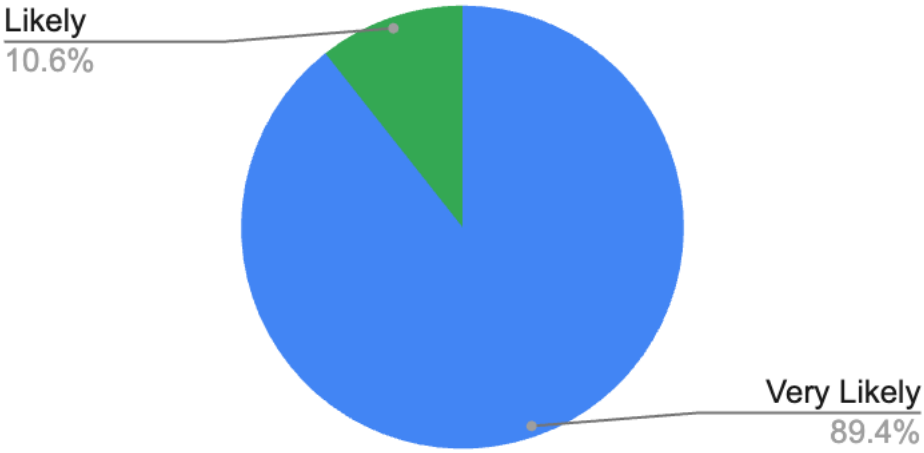


Please rate the overall delivery of the session today

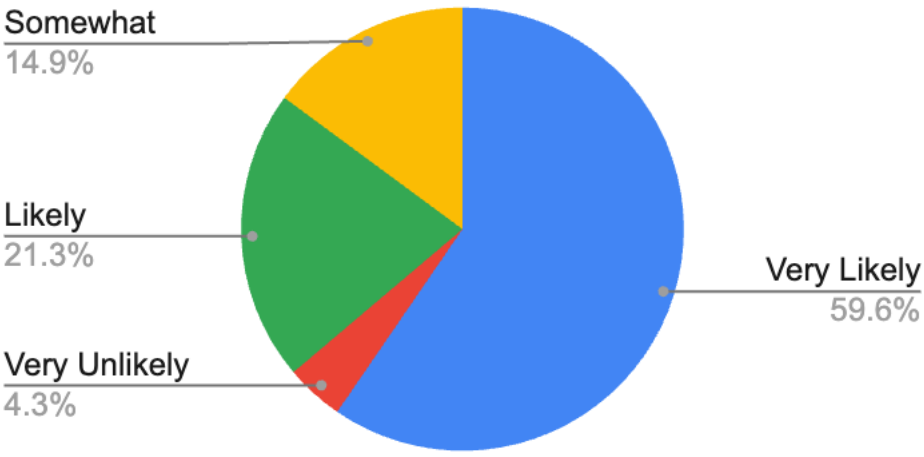
Rhowch sgôr i gyflwyniad cyffredinol y sesiwn heddiw



Following this session how likely are you to use the micro:bit when teaching?
Yn dilyn y sesiwn hon pa mor debygol ydych chi o ddefnyddio'r micro:bit wrth addysgu?

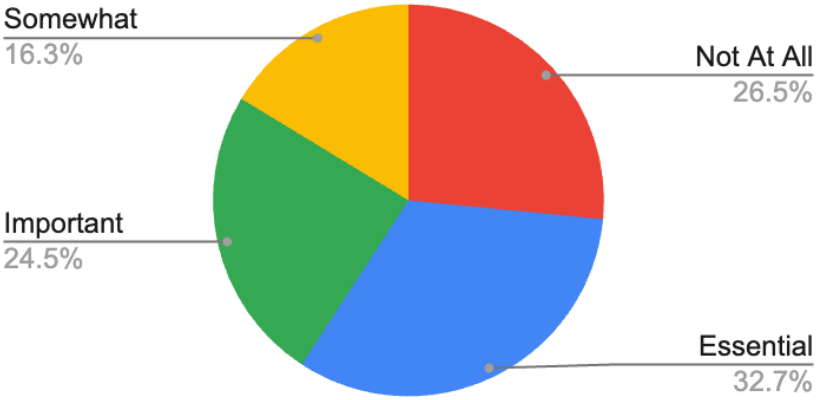


Following this session how likely are you to Do at least one of the playground survey activities with your class?



Cardiff

How important was Technocamps in getting your school to register for the BBC micro:bit campaign?



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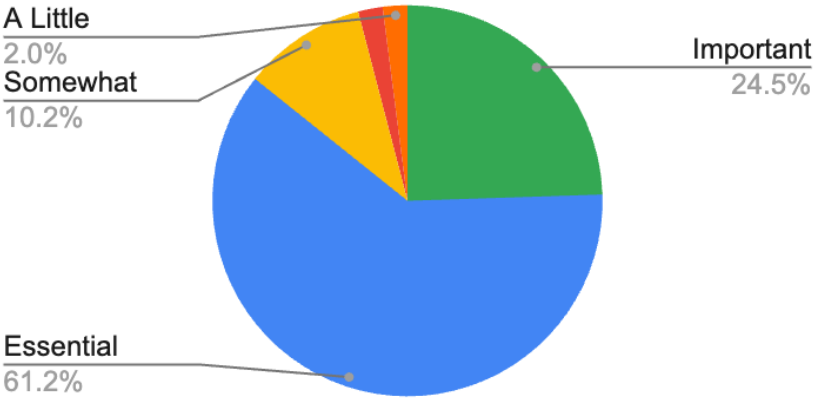

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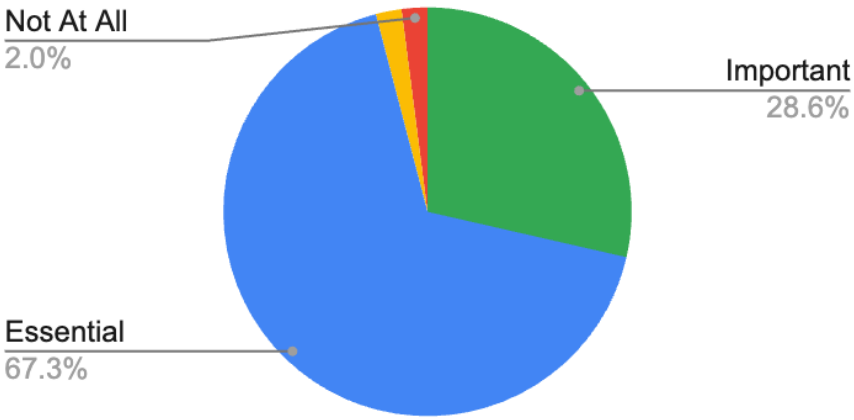
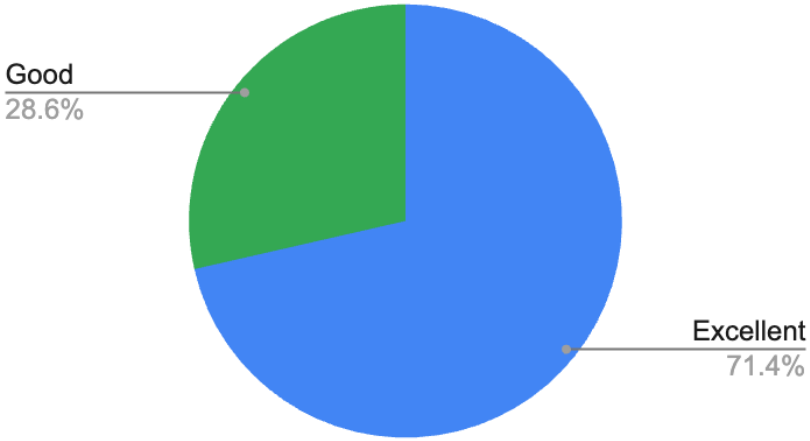


Please rate the overall delivery of the session today



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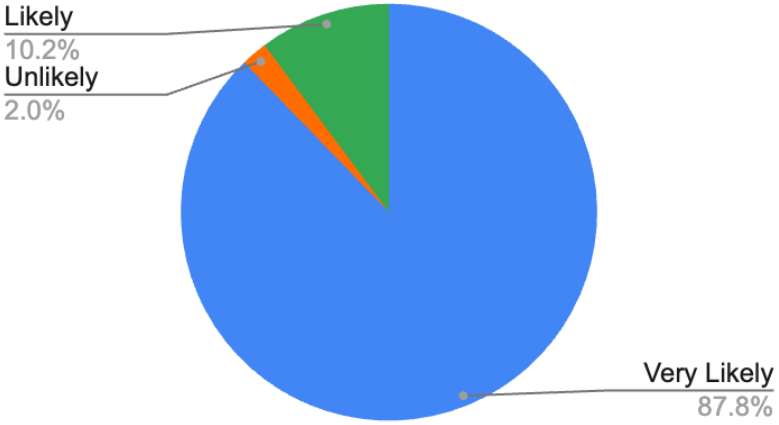

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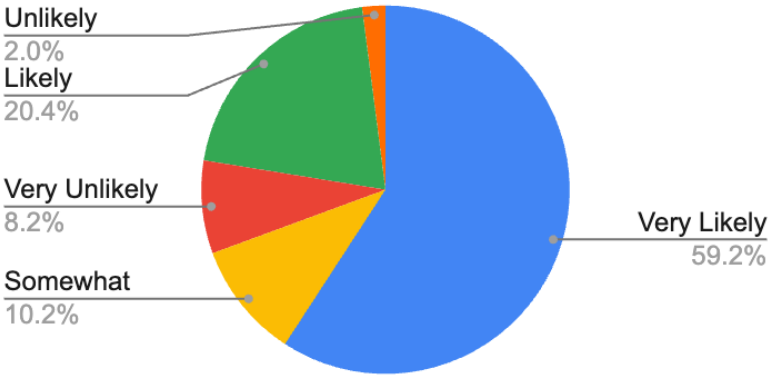
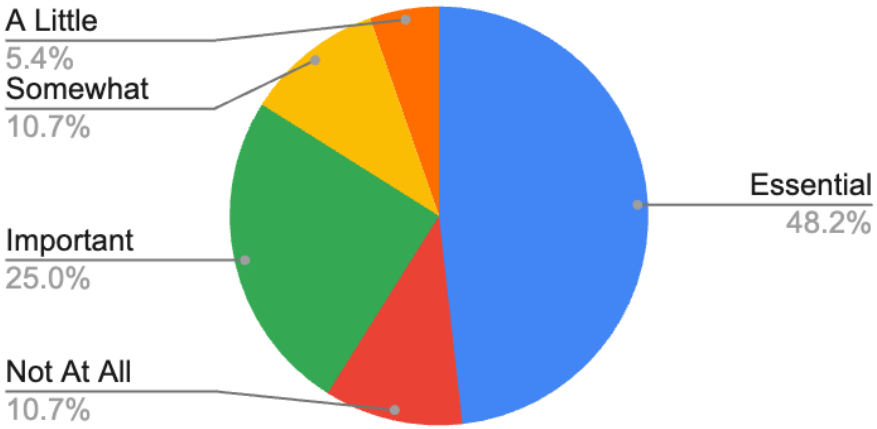
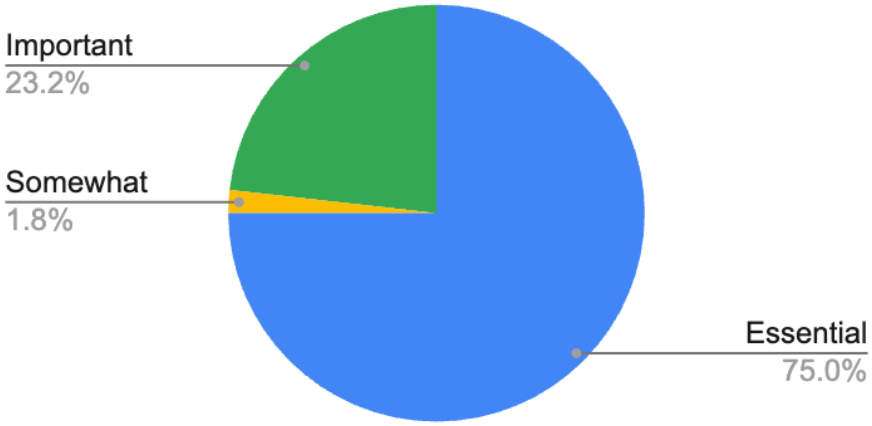


Conwy

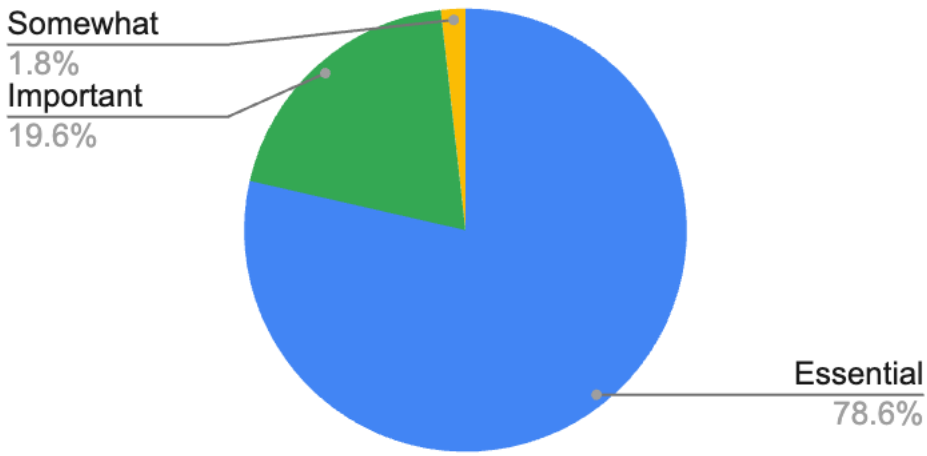
How important was Technocamps in getting your school to register for the BBC micro:bit campaign?



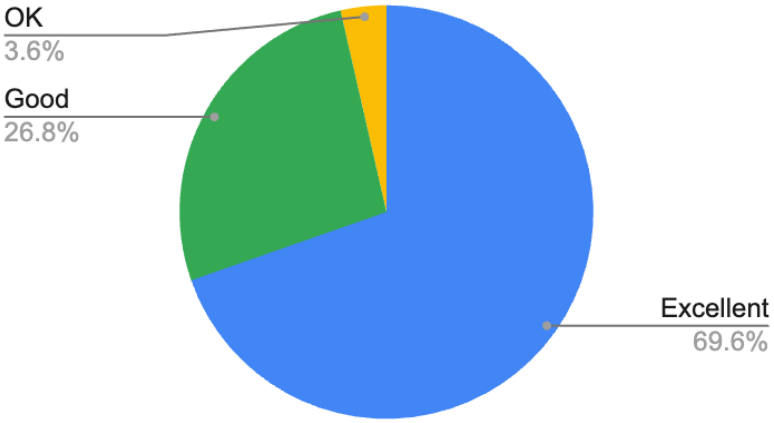
How important was today's Technocamps Training Day in preparing you to participate in the micro:bits programme?



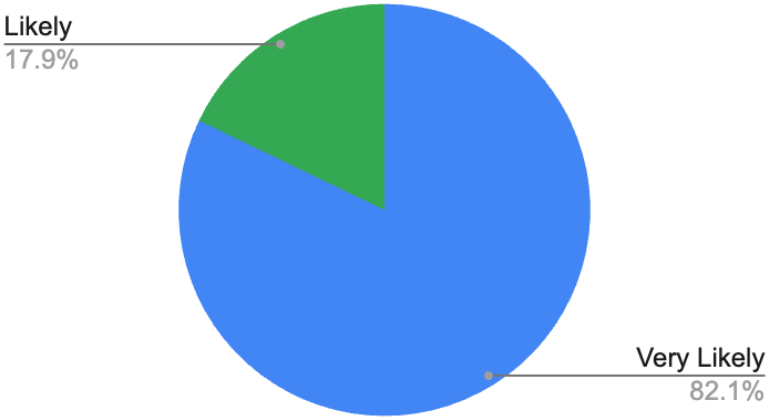
How important do you consider Technocamps support (workshops/training/resources) going forward with the micro:bits programme?



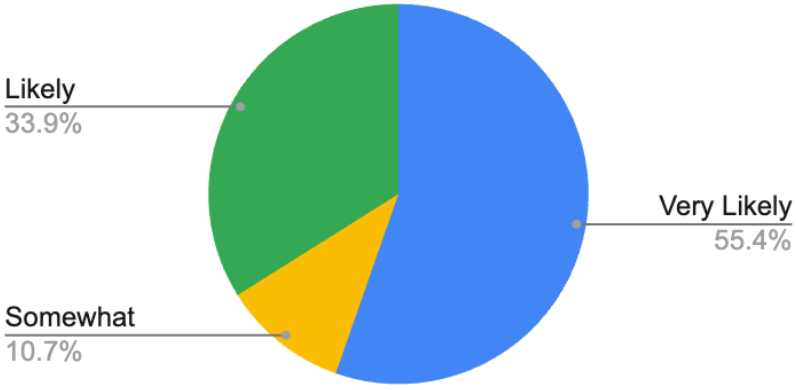
Please rate the overall delivery of the session today



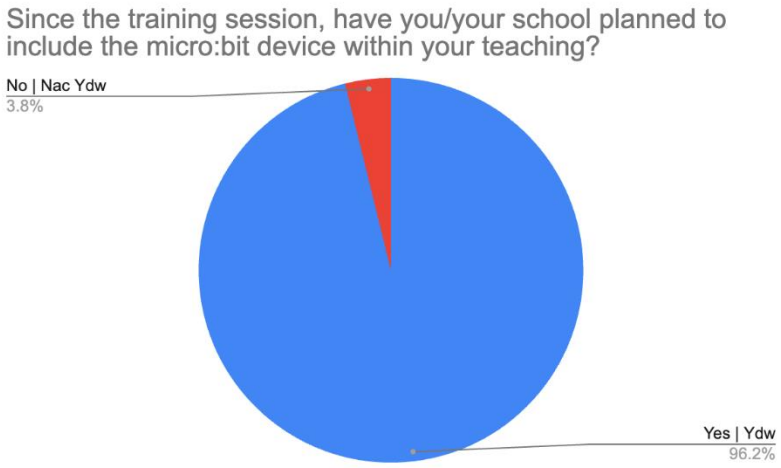
Following this session how likely are you to use the micro:bit when teaching?

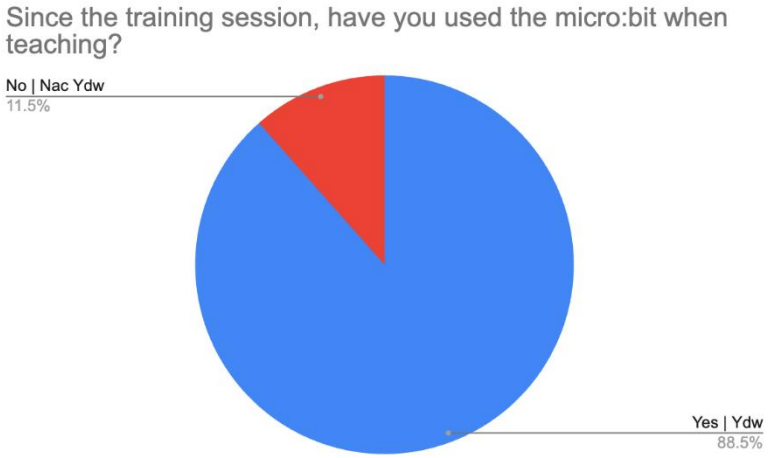


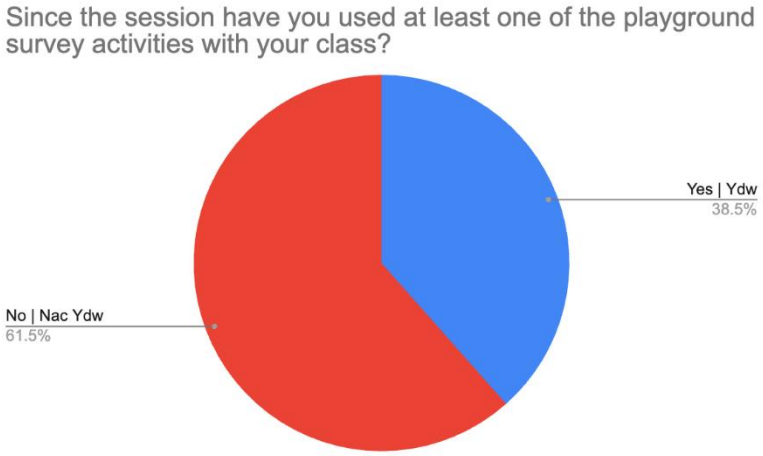
Following this session how likely are you to Do at least one of the playground survey activities with your class?



Appendix B. Follow-up Survey Results







Appendix C – Technocamps Context

Technocamps is aligned to the Government and industry priorities in Wales with a clear focus on the implementation of the new curriculum[10], upskilling of pupils and teachers, and increase of females in STEM subjects. The new curriculum aims to achieve an integrated approach to learning and teaching. The six key areas (Expressive Arts; Health and Well-being; Humanities; Languages, Literacy, and Communication; Mathematics and Numeracy; Science and Technology) encourage strong and meaningful links across the disciplines. Technocamps provide an integrated approach to teaching with hands-on activities and examples of real-world applications. Technocamps CPD training also aligns with this curriculum through the upskilling of teachers who will be able to apply these skills to teach the new curriculum. This is particularly important as the number of registered computing teachers in Welsh secondary schools decreased by 12.1% from 762 in 2013 to 670 in 2017. Only 40% of these teachers were also trained in computing[11]. This data is concerning as it has been established that the development of computing skills is vital to keep up with future technological advancements, and the promotion of prosperous individuals successful in a rapidly adapting economy.

The 'Digital Schools Strategy[12]' outlines the importance of and dependence on ICT provisions in recent years has increased significantly and the transition from face-to-face to online learning has been swift. This strategy highlights the importance of reducing digital exclusion and improving access to digital resources. Technocamps can aid in this vision by supporting the development of digital skills and equal access to all resources for pupils across Wales.

The Welsh Government also recognises the importance of encouraging more females to undertake STEM related subjects. The Welsh Minister for Economy suggested that "Wales needs more young girls to follow careers in STEM if the country is to realise its full economic potential, and to realise its ambition of becoming a truly globally responsible nation[13]". Technocamps has a particular focus on the encouragement of females in STEM and promotes these opportunities by providing equal opportunities for all, showcasing the achievements and careers of female role models, and working to normalise women in STEM. The

[10] https://gov.wales/curriculum-for-wales

[11] https://royalsociety.org/-/media/policy/Publications/2019/21-08-19-policy-briefing-on-teachers-of-computing.pdf

[12] https://democracy.carmarthenshire.gov.wales/documents/s58123/Schools%20Strategy%202022%20-%202025.pdf

[13] https://media.service.gov.wales/news/wales-encourages-more-girls-to-become-the-next-generation-of-scientists-and-engineers

Technocamps operation has also remained directly aligned with the ESF Priority Axis 3: Youth Employment and Attainment, Special Objective 3: *To increase the take-up of and attainment levels in STEM subjects amongst 11-19-year-olds*[14].

In 2014, it was pledged by Kenneth Skates that Wales would have a science teacher in every high school in Wales able to offer coding[15]. Ten years on, in 2024, this ambition has still not been achieved, and with the absence of these suitably qualified teachers, schools are not able to deliver digital skills without support.

Technocamps has the expertise, knowledge, and training and has been supporting schools, teachers, and pupils in achieving the upskilling and education of people across Wales.

"In 2016, the report "Talented Women for a Successful Wales" found that only 20% of women science graduates pursued careers in STEM subject areas compared to 44% of men.[16]

In 2018 minister, Eluned Williams warned that

> "*Wales is struggling to get pupils to study science, technology, engineering and maths*[17]*. Ms Morgan warned Wales could become relatively poorer than many Eastern European countries unless more women and girls take up opportunities to study STEM. She quoted figures from European Commission statistics service Eurostat showing only 12% of women study STEM subjects in Welsh universities while the number of women involved in technology in Bulgaria stands at 27% closely followed by Latvia, Finland, Estonia and Lithuania"*

In 2019, Welsh Education Minister, Kirsty Williams stated

> "*One of my key priorities has always been to ensure that our learners have an equal opportunity to reach the highest standards in science, technology, and maths. Science and technology are a huge part of the curriculum, and one that is essential to many learners' careers and further learning prospects*.[18]"

This ambition aligns directly with the aims and objectives of Technocamps in their pursuit of supporting STEM subject development and promoting equal opportunities for engagement in STEM subjects.

[14] https://gweddill.gov.wales/docs/wefo/publications/1604040-indicators-esf-priority3.pdf
[15] https://business.senedd.wales/documents/s28553/12%20June%202014.pdf
[16]https://www.walesonline.co.uk/business/business-news/lack-engineering-science-graduates-holding-2020293
[17] https://www.walesonline.co.uk/news/education/wales-struggling-pupils-study-science-14524976
[18] https://edtechnology.co.uk/latest-news/interview-kirsty-williams-am-welsh-education-minister/

UK Context

New research from the Education Policy Institute (EPI) dated July 2022 into the impact of educational inequalities across England and Wales, funded by the Nuffield Foundation, reveals that Welsh schools suffer a wider disadvantage gap than English schools, but that both nations have made only modest progress in closing this gap during the last decade. This is the first report into educational inequalities in Wales and England over the last decade[19].

The following are extracts from this report which underline the need for investment in education in Wales.

EPI research finds that whilst Wales suffers a greater disadvantage gap in GCSE results than England, progress in narrowing disadvantage gaps has been modest for each nation over the last decade.

Figures on the impact of educational inequality for 2019 reveal Wales' disadvantage gap to stand at 22 - 23 months, with England's narrower at 18 months. Disappointingly, corresponding figures from 2011 show slow progress in narrowing these gaps, with figures only down from disadvantage gaps of 24 months in Wales and 20 months in England in 2011.

With little sign of these persistent disadvantage gaps closing, alongside an expectation of a growing number of pupils in this category, improving educational outcomes for the persistently disadvantaged should be prioritised by policymakers.

While it's clear that Welsh schools in deprived areas suffer greater disadvantage gaps than their English counterparts, the report finds no evidence of this difference being a result of policy divergences between the two nations over the last decade.

To improve social mobility across each nation, EPI encourages a renewed focus to be targeted at narrowing disadvantage gaps within schools.

In Wales, the disadvantage gap is highest (25-28 months) in Wrexham, Merthyr Tydfil, Blaenau Gwent, Rhondda Cynon Taf, Torfaen, Pembrokeshire and Neath Port Talbot. These disadvantage gaps are larger than that seen across all local authorities in England.

Welsh local authorities with the lowest disadvantage gaps tend to be rural local authorities, Anglesey, Powys, Gwynedd and Ceredigion, or large cities, Cardiff and Swansea. However, with disadvantage gaps of about 17-20 months, this only matches the ***average*** *picture in England.*

[19] https://epi.org.uk/wp-content/uploads/2022/07/Inequalities-in-Wales-and-England.pdf

The following recommendations for policymakers were made by the EPI:

- Local authorities in Wales need to learn more from deprived areas of England with similar demographics, and which have managed to achieve smaller disadvantage gaps over time.
- Targeted extra funding at more deprived schools has been shown to be effective at narrowing the disadvantage gap. More funding should be specifically targeted at pupils experiencing persistent disadvantage in both nations.
- A high focus on teacher quality is crucial, through policies designed to improve recruitment and retention of high-quality teachers in more deprived areas, such as salary supplements, and access to high-quality professional development.
- One-to-one and small group tutoring has been shown to be highly effective

Digital Education Action Plan – Action 7[20] - Common guidelines for teachers and educators to foster digital literacy and tackle disinformation through education and training

> Digital literacy has never been as important as in today's increasingly digitalised world. The rapidly changing media and information landscape, together with the great number of online media platforms and sources of information, requires that people are not only confident, but also knowledgeable and critical in the digital world.

Digital Education Action Plan – Action 10[21] - Improving the provision of digital skills in education and training

> Technological progress has raised exponentially the need for digital skills and competences at all levels across the economy and society. Yet, levels of digital skills remain insufficient.

Digital Education Action Plan – Action 13[22] - Women's participation in STEM studies and careers

> Fewer women are interested in participating in the digital sector, be it in the field of higher education, jobs or entrepreneurship. The Commission study 'She Figures' (2021) confirms this trend.

[20] https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-7
[21] https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-10
[22] https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-13

According to the study, women represent only 20% of Information and Communications Technology (ICT) graduates and only 17% hold tech sector jobs. Women also represent only 24% of self-employed professionals in technical professions, such as science, engineering or ICT.

Young girls and boys are almost equally able to expect to work in a science-related field, but with age and at higher levels of education, girls tend to steer away from Science Technology Engineering Mathematics (STEM) and ICT subjects. Available data ('Women in the digital age', 2018) shows that only one in three STEM graduates is a woman.

The pace of change is not promising – the share of women in ICT jobs in the European Union (EU) increased by only 0.5 % between 2012 and 2016 (Source: European Institute for Gender Equality: Women and men in ICT: a chance for better work-life balance, 2018).