Enginuity

CHILDWISE

RESEARCH REPORT
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1   INTRODUCTION

In response to the need for many more engineers (now and in the future), Enginuity have developed *Skills Miner* – a series of interactive maps set in the hugely popular game of Minecraft. Designed to help children aged 11-14 discover their aptitude for engineering, the minigames encourage players to navigate different industries within the sector, learning more about the opportunities to change our world, the occupations on offer, and the routes to entry.

Two games have been developed so far – 'Skills Miner Aerospace' and 'Skills Miner Home Energy' – both of which have been piloted in schools. A further game (Skills Miner Vertical Farming) is now being considered, and there are concepts for other games in the pipeline too.

Enginuity have ambitious plans for the future of Skills Miner. But before they can confidently roll out the resource to a wider sample of schools, research is required to help understand the needs of STEM teachers as potential users, their initial perceptions of the resource, and any potential barriers to uptake. Research with children aged 11-14 is also needed, to help gather insights into the appeal of engineering as a career and further topics of interest for Skills Miner. CHILDWISE have been commissioned to carry out both parts of this research.

Alongside the independent research carried out by CHILDWISE, Enginuity have also conducted their own research with a sample of existing users – teachers and students. The findings from both parts of this research are detailed below in this report.

2   RESEARCH OBJECTIVES

The main objectives of this research are to identify areas of improvement, potential barriers to usage, and ways to increase the Skills Miner user base. More specifically, Enginuity wanted to explore the following:

- Perceptions of the product (and engineering in general) among potential users aged 11-14 and possible topics of interest for the future.
- Perceptions of the product (among teachers), along with their experience of game-based learning in general. Plus feedback on benchmarks and accreditations.
- The Skills Miner user experience: Is the game too easy, too hard, engaging enough, informative. Interests on other concepts.
- The overall product experience among teachers

3   RESEARCH APPROACH

3.1   Potential Users

3.1.1   Teachers

Robust data about the potential user base for Skills Miner was needed to help inform Enginuity's strategy going forward. To reach STEM teachers at secondary schools, we created an online survey, scripted and hosted by CHILDWISE. Teachers were approached via email, using addresses from our panel of schools across the UK, and via an online proprietary panel of teachers. The survey explored

how they use educational resources in general, their approach to careers education, and their reaction to the Skills Miner concept.

206 teachers specialising in STEM (specifically Science, Design and Technology, Computing and ICT, Engineering, and Mathematics) responded to the survey, with fieldwork taking place between 8th June and 6 July 2022. A breakdown of the sample is included below.

	Male			Female		
Gender	88			118		
	<26	26-34	35-44	45-54	55-64	>64
Age	6	48	71	49	31	1
	Under 2 years		3-5 years	6-10 years		10 years +
Tenure	9		25	33		139
	Science		Technology	Engineering**		Maths
Subject*	90		82	15		54
	North	Midlands	South	Wales	Scotland	N. Ireland
Location (Sch.)	45	42	74	8	27	10
	High		Moderate		Low	
Deprivation (Sch.)	40		86		80	

*Subject numbers add up to more than 206 because some teachers straddle more than one specialism
**Please note: The number of Engineering specialists is relatively small. Data relating to this subgroup is indicative only and should be interpreted with caution

3.1.2   Young People aged 11-14

In order to explore young people's thoughts on careers and to test out the skills miner concept among its intended audience, we also included eight questions on the CHILDWISE Summer Omnibus survey. 1,179 11-14 year olds answered these questions, with the survey carried out in 16 schools from the UK-wide CHILDWISE panel. Fieldwork took place between 8th June and 8th July, 2022. The sample is structured to allow analysis by age and gender – a breakdown is included below.

	Boys			Girls		
Gender	615			564		
	11-12			13-14		
Age	663			516		
	North	Midlands	South	Wales	Scotland	N. Ireland
Location	394	314	165	262	20	24
	High		Moderate		Low	
Deprivation (Sch.)	344		182		653	

3.2   Enginuity Practical Sessions

Enginuity enlisted the help of their education partners to deliver several practical Skills Miner sessions throughout June and July 2022 – involving 185 children aged 9-14, and 16 teachers. Events took place at RAF Cosford, along with classroom-based training sessions too. Participants completed a short online survey at the end of their session, with questions duplicating those used on the CHILDWISE surveys where possible. The results from these practical sessions are included below, where applicable. Please note, the sample from the teacher's survey is too small to analyse with percentages, so instead we've shown their top three responses alongside the data from the CHILDWISE survey with teachers.

A note on reporting…

*Throughout this report we refer to multiple datasets – primarily the research carried out by CHILDWISE, but also the additional research carried out by Enginuity where relevant too. For ease of understanding, data from the CHILDWISE survey with teachers is presented in **BLUE** tables, data from the CHILDWISE Omnibus survey with young people aged 11-14 is presented in **ORANGE** tables, and data from Enginuity's practical sessions is shown in **GREY.**

**The number of Engineering specialists (in the CHILDWISE survey) is relatively small (c.15). Data relating to this subgroup is indicative only and should be interpreted with caution.

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4   **EXECUTIVE SUMMARY**

4.1   Discovery and use of STEM teaching resources

More than two out of three teachers are actively navigating the stormy waters of the internet to find STEM teaching resources for their students, and more than half rely on their colleagues and associates to share inspiring resources via **word of mouth**. A third discover new content via **social media**.

Online searches are the preferred route of discovery for teachers, regardless of their subject specialism. Those who teach Technology or Engineering are marginally less inclined to rely on word of mouth, but instead focus more on sharing content via social media. Those who are more established in teaching (> 10 years) tend to be more passive in their approach, and are twice more likely to respond to content that seeks them out, such as personal e-mailers and postal mailshots.

All teachers incorporate information about possible STEM careers into their lessons on occasion, but the frequency of which they do this varies considerably. More than half say they do so **occasionally**, whilst a further three in ten find reason to do this on a more **regular** basis. The data suggests that teachers who specialise in Engineering tend to share information about STEM careers more regularly – perhaps because they're more aware than most of the current skills shortage in the industry. Long established teachers (>10 years) are also more likely to share information about STEM careers regularly, compared with those who are newer to the profession. The quality and relevance of this information remains unknown though.

Lack of time is the reason most teachers give when asked why they don't share information about STEM careers more regularly. Lack of awareness is also a concern for a significant minority – one in four say they don't know enough about STEM careers to provide this information, whilst almost as many say they don't know where to find it.

Those who specialise in Science are most likely to say they are limited by the constraints of time – both in terms of looking for information about STEM careers and implementing it in their lessons. A third of the Maths teachers who only incorporate careers information occasionally or rarely say this is because they don't know enough about it. **Teachers across the board (particularly those in high deprivation areas) are united in their uncertainty about where to find suitable information** – further reinforcing the need for greater visibility.

The vast majority of teachers say they have the freedom to teach their lessons and follow the curriculum in their own way, at least to some degree. Those who teach Science and Maths typically have less freedom to teach their lessons in the way that they want to – no doubt because these are core subjects that feature at the centre of the national curriculum. Other (Foundation) subjects are generally not explored as thoroughly, but they serve to introduce students to a wider variety of skills and knowledge – and help them to discover talents that may otherwise remain hidden. **Subject specialism is the defining factor here, with gender and length of tenure having very little impact**.

Time is once again the biggest constraint that teachers face when asked what stops them from having more freedom to teach their lessons and follow the curriculum in their own way. The need for consistency is also a big consideration, whilst a lack of money or funding is a limiting factor for some.

4.2   Careers Education

Teachers believe that one of the most effective ways to bring STEM careers into everyday learning is to **demonstrate the relationship between skills and careers**. Helping students to see how STEM education feeds into socially valuable projects in the commercial world, and where opportunities for them as individuals might exist within STEM industries. **Real life examples and practical applications are key to this**, with a strong focus on relatable role models and guest speakers, and opportunities for work experience where possible. Examples that focus on creative ingenuity and non-cognitive skills (as well as technical understanding) are also likely to help extend engagement and challenge misconceptions about the industry.

More than half of teachers are aware of the Gatsby benchmarks, which include guidance on linking curriculum learning to careers and experience of the workplace. A quarter of teachers have actively used them, but more are unaware of them altogether. Those who specialise in Technology and Engineering are most likely to have applied the Gatsby Benchmarks in their teaching, compared with those who specialise in the core STEM subjects. Awareness and application among Maths specialists is particularly low, reinforcing their apparent disconnect with careers education. Application of the Gatsby Benchmarks is higher among female teachers overall.

Far fewer teachers are aware of the Skills Builder Universal Framework overall. Just one in five teachers know about it, and just one in twenty have actively used it. Awareness is highest among Engineering specialists, yet actual application peaks among those who specialise in Technology.

When we asked the **students** themselves how they tend to learn about different career options at school, their response was mixed – with no single approach chosen by more than a third. **Talking about careers across different subject lessons is the top approach**, but it remains less than the number who say they haven't learnt about careers at all.

Despite variances in the delivery of careers education, **the majority of children feel they either know or have given some serious thought to what they want to do when they're older**. More than a third of 11-14 year olds claim to already know what they would like to do, whilst more have some idea but haven't made a firm decision yet. Numbers change relatively little across the age range or by gender. Just over a third of children aged 11-12 know what job they would like to do when they're older, rising to 40% among 13-14 year olds. This is a significant number of children, who in their minds have already made a decision about what they would like to do, possibly even before they reached secondary school. **This data reinforces the need for careers education (or certainly work-related learning) in primary schools too – broadening horizons, raising aspirations and just generally showing children the vast range of possibilities open to them from a young age.**

More than three quarters of the children surveyed during the Enginuity practical sessions said they know something about the qualifications needed and the pathways that lead to different careers, but most say they only know *a little*, rather than *a lot*.

4.3   Careers in Engineering

When teachers were asked how much they think their students know about potential **careers in engineering**, the majority of them answered with *'they know a little'*. When the same question was asked directly to children, the results reveal that marginally more of them believe they *know a lot* about careers in engineering, but that far more place themselves in the *'don't know anything at all'*

camp overall. In a 2020 report by *Engineering UK*, almost half of 11-19 year olds said they knew little or almost nothing about what engineers do, and this lack of knowledge was said to be enough to discourage them from considering a future career in engineering.

Boys are three times more likely than girls to say they know 'a lot'. They're also more likely to say they know *'a little'*, showing that gender stereotypes still prevail. By comparison, awareness shifts marginally with age.

Three in ten 11-14 year olds say they would be interested in a career in engineering, despite more than half claiming to know something about what the industry has to offer. This suggests that current sources of information are not doing enough to promote the exciting and rewarding careers available within the industry, and perhaps don't show the breadth of opportunities on offer.

When asked why they wouldn't be interested in a career in engineering, responses typically centre around it being **boring** or just not something they think they would enjoy. **Several children cite an alternative, more appealing job – which in their minds has led them to close the door on engineering as a possibility already**. Others assume engineering isn't for them because they think they're **not clever enough**, but also because they think the work is **too hard** (manual), too **dirty**, **not creative** enough, and **not well paid.**

Those who are interested in a career in engineering typically focus around the **appeal of making, fixing or building things** – plus the opportunity to **problem solve**. Minority mentions include **good pay**, and **inspiration from family members** (especially Dads) and **YouTube Influencers**.

When teachers were asked whether they would feel confident recommending careers in engineering to their students, the majority agree to some extent, but most stop short of agreeing *strongly*. Male teachers respond more confidently than their female counterparts.

Far fewer agree that they know enough to help if they were asked for advice about this though, especially Maths and Science specialists. With this in mind, *Enginuity may want to consider targeting any media comms towards Technology and Engineering specialists in the first instance, with the potential for a separate approach to Maths and Science specialists, signposting them towards relevant careers information*.

Case studies, including interviews and videos with people already in engineering careers, are the approach that teachers would value most when trying to help their students learn more about opportunities in the industry, followed closely by an **interactive map** which would allow students to find information about all the different industries that exist within engineering and manufacturing, or a **competition** where students and / or schools could submit their innovative ideas and win a cash prize. **Engineering specialists focus on approaches that help students to unlock their hidden skills and talents, and inspire them to take more interest**. They place the most value on a series of skills and personality assessments so that students are able to understand their strengths. Technology specialists rate the case studies as potentially most useful, whilst science and maths specialists (the teachers who claim to know the least about engineering) choose the interactive map where students can find information – which is possibly a projection of their own limited knowledge.

When presented with the same list of activities, the answers from children were considerably different, with **detailed job descriptions chosen as their top choice** (this was the teacher's lowest

choice). This was followed by the **interactive map**, and the **classroom-based games.** One in five answered 'don't know'.

4.4   Using Minecraft as an Educational Tool

Teachers taking part in the CHILDWISE survey were divided in their response to the question asking how likely they would be to use Minecraft as a tool to teach their students. **More than two out of five are receptive towards the idea**, including a minority who say they would be *very likely* to do this (16%). The same number say they would be *unlikely* to do this though (47%), with more teachers expressing strong feelings about this.

Technology specialists are by far the most receptive towards using Minecraft as a tool for learning. More than half say they would be likely to do this. **Engineering specialists are likely to require a little more convincing though –** more than half say they would be *unlikely.*

Lack of knowledge (and experience) is the main reason why teachers say they would be unlikely to use Minecraft. More than half respond in this way, especially Maths and Science specialists. Lack of resources is also a concern for around a quarter of teachers, whilst around one in ten feel the game is more suited to a younger audience, or that it's simply not relevant to a career in STEM.

Training and CPD accreditation would help to overcome the knowledge barrier. Teachers would also like to see **examples of success** and a rationale to help convince their senior leadership team. Easy (and free) access to the software would also be welcomed.

4.5   First Impressions of Skills Miner

Upon seeing an example of how Minecraft can indeed be used as a teaching resource, the number of teachers who said they would consider using it increased. In fact, **two out of three were receptive towards the idea, up from two out of five prior to the Skills Miner resource being shown**. Nearly a third remained unconvinced, although they answered with less conviction this time around. Technology specialists remained the most receptive subgroup. The introduction to Skills Miner does help to shift attitudes though, particularly among the Engineering specialists.

Among those who said they would be likely (very or quite) to consider using the Skills Miner resource, the main reason given is because **it looks engaging**. A quarter of teachers who answer positively give this response, whilst others say it looks good and is **likely to help children learn about careers in STEM**. Just under one in ten like the resource because it's **interactive**. **Proven results are most likely to help increase the overall appeal of Skills Miner**. More than a quarter of teachers would like to see some **evidence of its success**, whilst others would like to see what **impact** it has in a classroom environment. One in ten teachers are keen to know how it can be used to engage **hard to reach children**, and similar numbers would like to see evidence of how it meets **curriculum requirements**.

When teachers at the Enginuity sessions were asked how well they thought the game subject area fitted within the school curriculum, they answered 7.7 out of 10 on average, with 10 being *'fits very well'*.

After the children had seen a written description of the Skills Miner resource (but without having had access to the game itself), they were **divided in their response**. Almost one in two said they would be interested on some level, but almost as many said they would not be interested, with one

in ten unsure either way. **Gender and age have a significant impact on responses to this question**. Boys are much more likely than girls to be interested at all, with those aged 11-12 responding with the most enthusiasm. Girls are much more restrained in their response, with just one in three interested at age 13-14. **Familiarity with Minecraft is the main reason why some children are more interested in Skills Miner than others.**

4.6   Using Skills Miner

As part of the Enginuity workshop sessions, children (and teachers) were given the opportunity to play the Skills Miner games. Afterwards they completed an online survey (separate to the CHILDWISE survey). '**Game 3: Making Sustainable Fuel**' was the most frequently played game. More than six in ten children said they were able to complete at least one of the games they started. Three in ten didn't manage this though, and one in ten were unsure either way.

More than two in five children said they found the game difficulty '*just right*'. A quarter said they found it too hard though, whilst a similar number said they found it easy. This is testament to the **varying levels of ability among children**. *Where possible teachers will need an adaptable approach that is suited to the individual learning needs of their students, rather than one strategy that addresses the class as a whole.*

The majority of teachers surveyed by Enginuity were unaware of whether their students were experiencing difficulties during the Skills Miner games or not (12 out of 16 answered '*don't know*'). There is likely to be an expectation among teachers that they can assess and evaluate pupil progress throughout the lesson, with regular checks required to ensure that each step is being understood.

Around half of the children were confident that they had learnt something new as a result of playing the game. One in six were unconvinced though, whilst twice as many were left feeling uncertain either way (34%).

When asked to rate the **overall Skills Miner experience** out of five stars (1 being the lowest) the response from teachers and children was closely aligned and edging towards the top of the scale. **Teachers gave the resource a score of 3.94 overall, whilst children rated it 3.88**. The extent to which the games boost children's interest in engineering careers remains unclear though. When asked to rate their interest on a scale of 1 to 10 (10 being most interested, 1 being least interested, and 5 being don't know), they gave an average score of **5.7** – implying that many of them remain unsure either way.

4.7   Skills Miner Themes

A Skills Miner game that focuses on 'The future of food' appeals most to children overall. More than half of the children surveyed by CHILDWISE said they would be interested in this to some extent. **Boys show more interest in any of the listed themes than girls**. They are twice as likely to be '*very interested'* in the themes that explore 'The future of industry', and 'The future of energy', whereas 'The future of food' generates a much more balanced and equal response.

Interest peaks among younger children rather than older children. Those aged 11-12 are more interested in any of the listed themes, with 'The future of industry' and 'The future of communities' generating the most balanced response (+/- 2%) across the age range.

The children who took part in the **Enginuity workshop sessions** also rated 'The future of food' as their top choice.

4.8   Delivering Skills Miner in Schools

The teachers surveyed by CHILDWISE were asked whether they would prefer the Skills Miner minigames to cover a 5-6 week scheme of work, or an individual lesson. **The results are not conclusive either way, but do lean towards resources that cover an individual lesson**. Science and Maths specialists are most in favour of a resource that covers an individual lesson, whilst teachers who specialise in Technology (and are generally more receptive towards the Skills Miner concept) lean more towards a 5-6 week scheme of work. Engineering specialists remain on the fence though, with a third interested in either approach.

After having read about the Skills Miner games and what they have to offer, teachers were asked how they thought the resource could be best delivered to students aged 11-14. **Most teachers felt it would be well received as part of a STEM club, whilst just over half could visualise it being delivered in regular lesson time.** When asked how they would *prefer* the resource to be delivered though (choosing one option only), teachers are most likely to say as part of a **regular lesson.**

When asked what could be done to help encourage students to complete the short survey at the end of each minigame, **teachers were overwhelmingly in favour of an approach that offers an incentive or reward of some kind** – including entry to a prize draw or competition, bonus points / badges, additional game play, levelling up opportunities, and access to exclusive content.

In terms of encouraging teachers to respond, some felt their colleagues would be more likely to complete the survey if there was an explanation about how their feedback could help with the ongoing development of the games, if there was evidence of how feedback has impacted on the game to date, and if a valid and purposeful reason was provided. Several teachers also said the pre-coded / multiple questions would be favoured over written responses

4.9   Recommending and Using Skills Miner in the Future

As part of the **Enginuity workshop sessions**, the sixteen teachers who took part were asked to sum up their experiences of using Skills Miner. The majority said they thought the implementation of Skills Miner in a school environment would be beneficial, with two thirds agreeing that this would be *'very useful'*. Three out of four teachers would consider using the resource to deliver part of their curriculum next year, and almost all would consider recommending it to a colleague.

Most teachers agreed that seeing the game in action had added to their knowledge about careers in engineering, but only a handful said the game had been very informative and had left them feeling very confident about recommending or advising their students about a career in engineering.

4.10   Conclusions

The research findings point towards teachers finding it difficult to navigate the complex landscape of STEM careers; identifying the best resources to use, ensuring these don't compromise the overall learning experience (or attainment levels) of their students, and feeling confident enough to deliver a potentially new approach to learning – all whilst trying to mitigate the ongoing pressure on their time.

Technology specialists are by far the most receptive towards using Minecraft as a tool for learning, although attitudes do shift among other STEM teachers (especially Engineering) when the Skills Miner concept is explained to them. Those who teach Science and Maths typically have less freedom to teach their lessons in the way that they want to though, and far fewer agree that they know enough to help if they were asked for advice about careers in engineering. With this in mind, Enginuity may want to consider targeting Technology and Engineering specialists in the first instance, with the potential for a separate approach to Maths and Science specialists later on – perhaps when there is more evidence of proven results and impact. Training and CPD accreditation may also help to overcome potential barriers to use, as would evidence that the resource can be adapted to suit the individual needs of students (including those who are typically harder to reach).

With the majority of 11-14 year olds claiming to know or have given some serious thought to what they want to do when they're older, the research findings also reinforce the need for careers education in primary schools too – broadening horizons, raising aspirations and just generally showing children the vast range of possibilities open to them from a young age. The appeal of Minecraft peaks among 9-10 year olds[1], so it's likely that age-appropriate minigames could be well received by this audience. The 11-14 year olds surveyed by CHILDWISE were divided in their response when asked whether they would be interested in using Skills Miner at school. Gender and age have a significant impact here (with boys aged 11-12 most keen). The potential theme of the game also plays a key role, with 'The Future of Food' appealing to girls and boys alike, whilst 'The Future of Industries' and 'The Future of Communities' generates a relatively consistent response across the age range.

In terms of delivery, students value an approach that includes detailed job descriptions (most only know a little about the pathways that lead to different careers), plus interactivity and game-based learning. Teachers also value interactivity, but lean more towards real life examples and case studies over game-play. The data suggests that current sources of information are not doing enough to promote the exciting and rewarding careers available within the engineering industry – less than three in ten 11-14 year olds are interested, despite more than half claiming to know what the industry has to offer. Teachers and children both recorded a positive experience after using Skills Miner (at the Enginuity workshops), but the extent to which the game boosts children's knowledge of engineering careers remains unclear. This is something that will need to be addressed going forward, to help boost uptake (proven results) and to help teachers ensure that learning objectives are being achieved.

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[1] 52% of 9-10 year olds have played Minecraft in the last week. *Source: CHILDWISE Monitor Report 2022*

5   RESEARCH FINDINGS

5.1   Discovery and use of STEM teaching resources

CHILDWISE TEACHER SURVEY (MULTICODE)

Q1. Where do you typically find out about Key Stage 3 (11-14) STEM teaching resources?

%	TOTAL	Subject Taught				Enginuity Teacher Survey
		Science	Technology	Engineering*	Maths	
Online searches	67	67	70	60	74	*#3*
Word of mouth from other teachers	53	58	46	53	63	*#2*
Via social media	36	30	48	47	24	*#3*
On teaching websites	33	43	24	40	31	-
Promoted via TES	31	34	22	7	35	-
By personal email	30	32	30	47	19	-
From the senior leadership team	8	10	6	7	9	*#1*
Postal mailshot	7	4	7	0	9	-
Somewhere else	5	7	6	7	2	-
Don't know	2	3	0	0	2	-

Caution: Low base size

More than two out of three teachers are actively navigating the stormy waters of the internet to find STEM teaching resources for their students (67%). Gone are the days when they would rely on a handful of carefully chosen resources – instead the internet allows them to update old material and make it more relevant and engaging for their students. This doesn't come without its risks though – namely, the issue of having to evaluate many different options before choosing the right ones. It's not surprising therefore that more than half of teachers also rely on their colleagues and associates to share inspiring resources and **spread the word** (53%), and more than a third discover new content via **social media** (36%). *With this in mind, Enginuity may need to consider increasing their search engine optimisation for STEM related topics, and ensure that any promotional material is available and sharable via popular social media platforms.*

Almost one in three teachers rely on the dedicated educational resource, **TES** (originally published as The Times Educational Supplement) for new STEM related content (31%). Other teaching websites are also used by a significant minority of teachers (33%), with general mentions including *Twinkl* and *STEM Learning* (from the National STEM Learning Centre), and subject specific mentions including *Resourceaholic* (maths), *Corbett Maths, RSC* (The Royal Society of Chemistry), *NCCE* (The National Centre for Computing Education), and *IET* (Institution of Engineering and Technology). Three in ten teachers discover new STEM resources via **direct marketing e-mailers** (30%), whilst comparatively few learn about these via their **senior leadership team** or by **post** (8% and 7% respectively).

By Subgroups

Online searches are the preferred route of discovery for teachers, regardless of their subject specialism. Those who teach Technology or Engineering are marginally less inclined to rely on word of mouth, but instead focus more on sharing content via social media (48% and 47% respectively). Word of mouth is the favoured approach for those with a tenure of less than ten years though, followed by online searches and the digital TES community. Those who are more established in

teaching (> 10 years) tend to be more passive in their approach, and are twice more likely to respond to content that seeks them out e.g. personal e-mailers and postal mailshots.

CHILDWISE TEACHER SURVEY (SINGLECODE)

Q2. How often do you incorporate information about possible <u>STEM careers</u> into your lessons?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
Regularly	**30**	34	34	47	15
Occasionally	**51**	53	49	33	54
Rarely	**19**	11	17	20	31
Never	**0**	1	0	0	0
Don't know	**0**	0	0	0	0

Caution: Low base size

All teachers incorporate information about possible STEM careers into their lessons on occasion, but the frequency of which they do this varies considerably. More than half say they do so **occasionally** (51%), whilst a further three in ten find reason to do this on a more **regular** basis (30%). One in five teachers say they **rarely** incorporate information about STEM careers.

By Subgroups

The data suggests that teachers who specialise in Engineering tend to share information about STEM careers more regularly – perhaps because they're more aware than most of the current skills shortage in the industry. More than a third of those who teach Science or Technology also share careers information regularly (34%), with many more sharing it occasionally (49-53%). Fewer Maths specialists share this type of information, with just 15% choosing to do so regularly.

Long established teachers (>10 years) are more likely to share information about STEM careers regularly, compared with those who are newer to the profession (32% and 25% respectively). The quality and relevance of this information remains unknown though. Those who teach in areas with high or moderate levels of deprivation are also likely to share information more frequently than those who live in areas of low deprivation. The gender of the teacher has no real impact.

CHILDWISE TEACHER SURVEY (MULTICODE - ASKED IF Q2=Occasionally, Rarely or Never)
Q3. Why don't you incorporate more information about STEM careers into your lessons?

%	TOTAL	Subject Taught			
		Science	**Technology**	**Engineering***	**Maths**
I have no time to look for this information	**52**	61	43	38	48
I have no time to use this information in lessons	**50**	59	46	25	48
I don't know enough about it	**26**	25	22	0	33
I don't know where to find this information	**18**	14	19	13	20
This information is not relevant to my students	**4**	3	4	0	9
My students would not be interested in this information	**2**	3	2	0	4
Something else	**12**	8	13	50	11
Don't know	**2**	0	6	0	2

*Caution: Low base size

Lack of time is (unsurprisingly) the reason most teachers give when asked why they don't share information about STEM careers more regularly. More than half of those who said they only share material occasionally or rarely, say they simply **don't have enough time** to look for more information (52%), whilst a similar number say the **demands of the curriculum** leave them no time to actively use this information in lessons anyway (50%).

Lack of awareness is also a concern for a significant minority though. One in four say they **don't know enough about STEM careers** to provide this information (26%), whilst 18% say they **don't know where to find it** – reinforcing the need for more visible and accessible career resources. A handful of teachers actively decide on behalf of their students that this information is likely to be **neither relevant** (4%) **nor interesting** (2%).

More than one in ten of those who only share information occasionally or rarely provided some other reason for this (12%). In most cases it is because they don't feel it's relevant to include information about STEM careers more often than they already do, and because the information is not currently embedded within the curriculum, and therefore not a statutory requirement. A handful said this is something they plan to improve upon in the future.

By Subgroups

Those who specialise in Science are most likely to say they are limited by the constraints of time – both in terms of looking for information about STEM careers and implementing it in their lessons (61% and 59% respectively). A third of the Maths teachers who only incorporate careers information occasionally or rarely say this is because they don't know enough about it (33%). Having said that, they are also the group most likely to say the information is neither relevant nor interesting to their students though (9% and 4% respectively) – with one teacher claiming *"there are not many practical tasks connecting jobs and maths".* **Teachers across the board (particularly those in high deprivation areas) are united in their uncertainty about where to find suitable information** – further reinforcing the need for greater visibility.

Length of tenure has little bearing on the amount of time available for incorporating information about STEM careers in lessons. It does impact on the extent to which teachers know where to find the right information though, with teachers who have been serving for a shorter time (<10 years) typically less confident about doing this (22% vs 16% among longer serving teachers).

Gender plays a role here too. Female teachers tend to face more restrictions on their time outside of lessons – 59% say they have no time to look for information about STEM careers (compared with 42% of male teachers), and three in ten cite lack of knowledge as a reason for not incorporating STEM material more often (29% vs 23% of males). Male teachers are more likely to say they don't know where to find relevant information (21% vs 18%), but also much more likely to say they don't consider this information to be relevant in the first place (8% vs 1%).

CHILDWISE TEACHER SURVEY (SINGLECODE)
Q4a. How much freedom do you have to teach your (KS3) lessons and follow the curriculum in your own way?

%	TOTAL	Subject Taught				Enginuity Teacher Survey
		Science	Technology	Engineering*	Maths	
A lot – I have absolute freedom to deliver the curriculum as I see fit	**40**	30	54	60	33	-
Some – my colleagues and I collaborate to agree methods of delivery, which is then approved by my head of department / senior leadership team	**49**	58	37	27	52	#1
A little – my head of department / senior leadership team selects the delivery method and then asks for my opinion	**6**	9	5	0	7	#2
None – my head of department / senior management team tells me how to deliver each lesson	**1**	1	2	0	0	#3
Other	**3**	2	2	13	6	-
Don't know	**0**	0	0	0	2	-

Caution: Low base size

The vast majority of teachers say they have the freedom to teach their lessons and follow the curriculum in their own way, at least to some degree (95%). Two out of five have absolute freedom to deliver lessons as they see fit (40%), followed by 49% who say the collaborate with colleagues and agree the best method of delivery. This suggests that **whilst time demands, visibility, and the perceived relevance of new material are all valid considerations when introducing a new STEM resource, the extent to which teachers have the autonomy to make their own decisions and introduce new content, tends to be less of a concern.** Those surveyed as part of the **Enginuity workshops** were also most likely to say they had 'some' freedom.

One in twenty teachers surveyed by CHILDWISE said they only have little freedom when delivering KS3 lessons (6%), whilst 1% say they have none at all. Among the 3% who answered 'other' to this

question, responses generally reiterated that they have freedom to deliver content however they choose, but that the content itself is dictated by the curriculum.

By Subgroups

Those who teach Science and Maths typically have less freedom to teach their lessons in the way that they want to – no doubt because these are core subjects that feature at the centre of the national curriculum. Other (Foundation) subjects are generally not explored as thoroughly, but they serve to introduce students to a wider variety of skills and knowledge – and help them to discover talents that may otherwise remain hidden. **Subject specialism is the defining factor here, with gender and length of tenure having very little impact**.

CHILDWISE TEACHER SURVEY (OPEN – ASKED IF Q4a=SOME, A LITTLE, NONE)
Q4b. What stops you from having more freedom to teach your lessons and follow the curriculum in your own way?
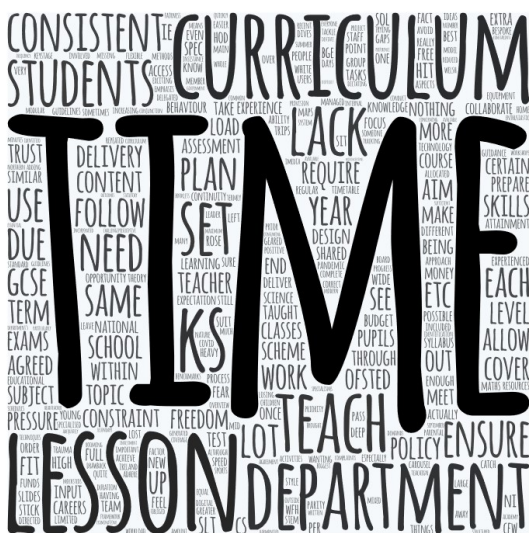
Time is once again the biggest constraint that teachers face when asked what stops them from having more freedom to teach their lessons and follow the curriculum in their own way.

The need for consistency is also a big consideration – ensuring that all students are given a similar experience, and that standards are maintained year on year.

A lack of **money** or **funding** is a limiting factor for a minority, whilst some cite centralised decision making at Trust level, or a general lack of awareness within their department.

"Time constraints. We teach KS3 on a termly carousel and there are a maximum of 16 lessons to take students through the whole design and make process. So this means losing lesson time to focus on careers would be a challenge. That being said, adding in Home Learning tasks could be an opportunity."

"Time is the biggest factor, and the nature of the examinations require certain skills be taught."

"We have set booklets that all teachers in the department use for each year group. We are able to complete other work outside of these but due to time we do not very often get to do so."

"Time, the need to ensure consistency of delivery and coverage of the National Curriculum."

"Fear of other classes missing out due to some staff being enthusiastic and involved in free exciting lessons. Parental complaints generated because of the difference in lesson delivery."

"Making sure we have some agreement as a department so that students get a consistent experience."

"Continuity across the department is important to increasing attainment and in ensuring all pupils have a positive experience."

"Having to ensure that all aspects of the new Ofsted framework are incorporated. Lack of curriculum time and funds for equipment/trips/educational workshops etc."

"I feel we have enough freedom, sometimes money or subject knowledge can be a drawback."

5.2   Careers Education

CHILDWISE TEACHER SURVEY (OPEN RESPONSE)
Q5. What do you think are the most effective ways to bring STEM careers into everyday learning?

Teachers believe that one of the most effective ways to bring STEM careers into everyday learning is to **demonstrate the relationship between skills and careers**. Helping students to see how STEM education feeds into socially valuable projects in the commercial world, and where opportunities for them as individuals might exist within STEM industries. **Real life examples and practical applications are key to this**, with a strong focus on relatable role models and guest speakers, and opportunities for work experience where possible. Examples that focus on creative ingenuity and non-cognitive skills (as well as technical understanding) are also likely to help extend engagement and challenge misconceptions about the industry.

The survey findings point towards teachers finding it difficult to navigate the complex landscape of STEM careers; identifying the best resources to use, ensuring these don't compromise the overall learning experience (or attainment levels) of their students, and feeling confident enough to deliver a potentially new approach to learning – all whilst trying to mitigate the ongoing pressure on their time. *Enginuity will need to ensure that their offer stands out from the rest; that it does enough to penetrate the consciousness of teachers (and the young people they teach), and that it inspires them to change the way that they currently deliver information about STEM careers.*

"Linking learning to skills and jobs. Making sure students can see how new learning is relevant and useful to them. External speakers who talk about where they came from and how they got to where they are today. Site and local attraction visits."

"Relating concepts in class to real world applications, whether in person on trips, with guest speakers or with video clips."

"Relating the skills we teach to skills and jobs in industry."

"Recognition of everyday use within personal or professional worlds."

"Demonstrate joy of STEM, making them not boring."

"I think it works best when information is incorporated into the subject we are doing e.g. cardiologists, ecologist, geneticist, lab work. I think I could be better at this / more imaginative about how I do this and it is certainly rising up the agenda at the moment as a focus in the school."

"Activity days are good. We have good links with industry and STEM Cymru. We do have a whole half term spent looking at some careers in STEM as part of an integrated science scheme of work."

"Inviting visitors to the school to talk about particular careers. Engaging interest in students with real life problems."

"Creating time and opportunity to work with agencies that can offer something different; such as drone making and flying etc etc."

"Drop down curriculum days have worked well for us. ie Students follow a project for a day. Also making links to what they do to real life often more relevant with KS4 students."

"For us, the best opportunity seems to be extra-curricular, but we are about to start a project linked to Dyson at KS3."

"Training and CPD, free resources, making the lead of STEM a paid role with a TLR to support subject leaders."

"Teaching towards careers rather than teaching to a test. Students value their learning and how it impacts future and how they can grow."

CHILDWISE TEACHER SURVEY (SINGLECODE)
Which of these career frameworks are you aware of and which have you used?
Q11a. Gatsby Benchmarks

%	TOTAL	Subject Taught				Enginuity Teacher Survey
		Science	**Technology**	**Engineering***	**Maths**	
Aware but not used	**27**	28	27	27	24	-
Aware and used	**27**	30	34	33	17	-
Neither aware nor used	**41**	38	34	40	52	*#1*
Don't know	**5**	4	5	0	7	-

Caution: Low base size

The eight Gatsby benchmarks are a framework (first published in 2013) for good career guidance, developed to support secondary schools and colleges in providing students with the best possible careers education, information, advice, and guidance. **More than half of teachers are aware of the benchmarks** (54%), which include guidance on linking curriculum learning to careers and experience of the workplace. A quarter of teachers have actively used them (27%), but more are unaware of them altogether (41%) – despite it being adopted as part of the Government's Careers Strategy and statutory guidance for schools and colleges.

By Subgroups
Those who specialise in Technology and Engineering are most likely to have applied the Gatsby Benchmarks in their teaching (34% and 33% respectively), compared with those who specialise in the core STEM subjects. Awareness and application among Maths specialists is particularly low, further reinforcing their apparent disconnect with careers education. **Application of the framework is higher among female teachers overall** (31% vs 22% of males), and is marginally higher among those who have worked in teaching for less than 10 years (30% vs 26% > 10 years). There's no real difference by level of deprivation.

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CHILDWISE TEACHER SURVEY (SINGLECODE)
Which of these career frameworks are you aware of and which have you used?
Q11b. Skills Builder Universal Framework

%	TOTAL	Subject Taught				Enginuity Teacher Survey
		Science	Technology	Engineering*	Maths	
Aware but not used	**14**	16	17	33	7	-
Aware and used	**5**	3	9	0	2	-
Neither aware nor used	**76**	78	70	60	83	*#1*
Don't know	**4**	3	5	7	7	-

*Caution: Low base size

Far fewer teachers are aware of the Skills Builder Universal Framework overall. The overarching 'Skills Builder Partnership' has evolved over the last 10-12 years, helping schools to build essential skills into their everyday teaching by following their tried and tested principles – with a focus on lesson-time projects, challenge days and visits to employers. Their Education Associates (a network of ex-teachers) are also used to provide dedicated support sessions in school, to train teachers to get the most out of the resources provided. Awareness of their Universal Framework is low though – just one in five teachers know about it (19%), and just one in twenty have actively used it (5%). **Despite the partnership and framework offering so many of the things that teachers rate as important in STEM education, the majority are unaware that it exists** (76%) – further reinforcing how complex the landscape of STEM careers really is.

By Subgroups

Awareness of the Skills Builder Universal Framework is highest among Engineering specialists, yet actual application peaks among those who specialise in Technology (9%). Maths and Science specialists are least aware. Female teachers are more likely to have heard of the framework (23% vs 15%), but they are no more likely than their male counterparts to have actually used it.

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (MULTICODE)
Q1. Now, thinking about careers, how do you learn about career options at school?

%	TOTAL	Gender		Age	
		Boys	Girls	11-12	13-14
We talk about careers in across different subject lessons	**27**	29	25	20	34
We have a careers advisor we can talk to if we want to	**20**	20	21	6	35
We have employers come in to talk to us	**17**	20	14	10	24
We get to do work experience	**16**	19	13	9	23
We have careers evenings at school	**15**	17	14	10	21
We have specific careers lessons	**14**	17	11	9	19
Some other way	**3**	3	3	2	4
I haven't learnt about careers at school yet	**29**	26	32	41	17
Don't know	**22**	23	22	25	20

When we asked the **students** themselves how they tend to learn about different career options at school, their response was mixed – with no single approach chosen by more than a third. **Talking about careers across different subject lessons is the top approach** (27%), but it remains less than the number who say they haven't learnt about careers at all (29%). One in five students say they have access to a **dedicated careers advisor** (20%), whilst fewer can recall **employers coming in to talk** to them about careers (17%). A minority of students have benefitted from access to **work experience** (16%), **careers evenings** (15%), or **specific careers lessons** (14%). It's likely that the COVID-19 pandemic has made it more challenging for schools to arrange external careers events, especially visits from employers, work experience, and careers evenings.

By Subgroups

Access to careers education increases sharply across the age range. At the age of 11-12, just one in three children select any of the listed options (34%), with the vast majority saying they are yet to cover this (41%) or they simply 'don't know' (25%). **By the age of 13-14 things step up a gear** though, with almost two out three claiming to have had some experience of careers education (63%) – with more than third having access to a careers advisor (35%), or covering the topic of careers across different subject lessons (34%). But still, **less than a quarter of students have experienced real life examples or the practical applications of careers education (23%) – despite teachers rating these as some of the most effective ways to promote everyday learning**. More than a third of students aged 13-14 say they haven't covered careers at school yet or they simply 'don't know' how this is taught. Girls are more likely than boys to say they are yet to learn about careers at school (32% vs 26%).

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (SINGLECODE)
Q2. How much thought have you given to the sort of job you want to do when you're older?

%	TOTAL	Gender		Age		Enginuity Children's Survey
		Boys	Girls	11-12	13-14	
I know what job I want to do when I'm older	37	39	36	35	40	42
I have some ideas but I haven't decided yet	45	44	46	46	44	43
I don't know what job I want to do when I'm older	11	9	12	12	10	9
I haven't thought about this yet	7	8	6	8	6	6

Despite some variances in the delivery of careers education, **the majority of children feel they either know or have given some serious thought to what they want to do when they're older** (82%). More than a third of 11-14 year olds claim to already know what they would like to do (37%), whilst 45% have some idea but haven't made a firm decision yet. One in ten children are still uncertain what direction they would like to take (11%), whilst a small minority say they haven't given this any thought at all (7%).

By Subgroups

Numbers change relatively little across the age range or by gender. Just over a third of children aged 11-12 know what job they would like to do when they're older (35%), rising to 40% among 13-14

year olds. This is a significant number of children though, who in their minds have already made a decision about what they would like to do, possibly even before they reached secondary school. **This data reinforces the need for careers education (or certainly work-related learning) in primary schools too – broadening horizons, raising aspirations and just generally showing children the vast range of possibilities open to them from a young age.** A TES survey from 2018 showed that the majority of teachers believe children should be learning about the world of work and different jobs in their first years of primary school – suggesting that an age-appropriate careers resource is likely to be well received by this audience too.

ENGINUITY CHILDREN'S SURVEY (SINGLECODE)
Q5. How much do you know about the qualifications needed and the pathways that lead to different careers? E.g. apprenticeships, A-Levels, Degrees etc.

%	TOTAL
I know a lot	**21**
I know a little	**57**
I don't know anything at all	**12**
Don't know	**10**

More than three quarters of the children surveyed during the **Enginuity practical sessions** said they know something about the qualifications needed and the pathways that lead to different careers (78%), but most say they only know *a little* (57%), rather than *a lot* (21%). More than one in ten say they *don't know anything at all* (12%), whilst a similar number are unsure either way (10%).

ENGINUITY CHILDREN'S SURVEY (SINGLECODE)
Q8. How often do you use computers or iPads in lessons at school?

%	TOTAL
Daily	8
More than once a week	18
Every week	27
Once every couple of weeks	32
Less often than this	9
Don't know	6

More than half of the 9-14 years olds surveyed by **Enginuity** said they use computers or iPads at school on a weekly basis (53%), including 26% who use them more than once a week. Frequency of usage is likely to increase once children reach secondary school, as this type of equipment tends to become more widely available.

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5.3   Careers in Engineering

CHILDWISE TEACHER SURVEY (SINGLECODE)
Q6. How much do you think the 11-14 year olds you teach are aware of the potential careers available in Engineering?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
They know a lot	**5**	3	7	20	6
They know a little	**76**	76	76	67	74
They don't know anything at all	**18**	20	17	13	20
Don't know	**0**	1	0	0	0

Caution: Low base size

When teachers were asked how much they think their students know about potential careers in engineering, the majority of them answered with *'they know a little'* (76%). One in twenty said '*they know a lot*' (5%), whilst more than three times as many said '*they don't know anything at all*' (18%).

By Subgroups

Unsurprisingly, Engineering specialists are most confident in their response to this question. One in five think their students know *a lot* (20%), but the majority still think they only know *a little* about careers in the industry (67%). Female teachers are more likely to think their students know *a lot* about careers in engineering (8% vs 1%), whilst male teachers are more likely to think they know *a little* (83% vs 71%).

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (SINGLECODE)
Q3c. How much do you know about careers in engineering?

%	TOTAL	Gender		Age	
		Boys	Girls	11-12	13-14
I know a lot	**8**	12	4	7	9
I know a little	**46**	52	40	44	48
I don't know anything at all	**36**	29	44	38	34
Don't know	**10**	7	12	11	8

The same question was asked directly to children. The results reveal that marginally more of them believe they *know a lot* about careers in engineering (8%, compared with 5% among teachers), but that far more place themselves in the *'don't know anything at all'* camp overall (36%, compared with 18% among teachers). In a 2020 report by *Engineering UK*, almost half of 11-19 year olds said they knew little or almost nothing about what engineers do, and this lack of knowledge was said to be enough to discourage them from considering a future career in engineering.

By Subgroups

Boys are three times more likely than girls to say they know '*a lot*' about careers in engineering (12% vs 4%). They're also more likely to say they know *'a little'* (52% vs 40%), showing that gender stereotypes still prevail. Almost half of girls say they '*don't know anything at all*' (44%), whilst a further 12% are unsure either way. Awareness shifts marginally with age, with those who know something about the industry increasing by 6% between the ages of 11-12 and 13-14.

Q3a. How interested are you in a career in engineering?

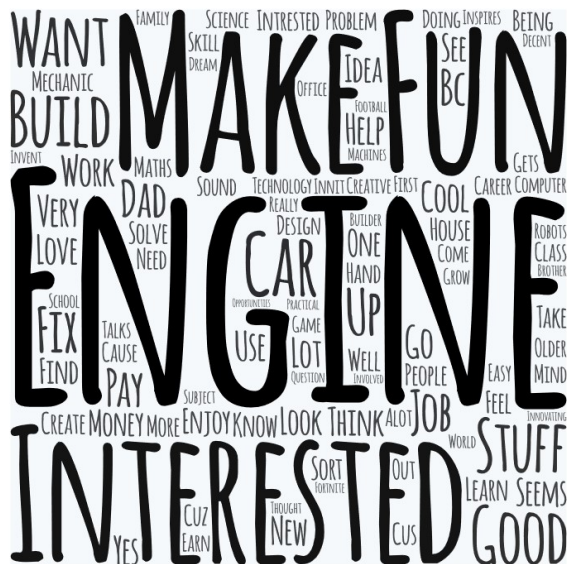| %	TOTAL	Gender		Age	
		Boys	**Girls**	**11-12**	**13-14**
Very interested	**10**	17	3	6	13
Quite interested	**19**	30	8	18	20
Not very interested	**29**	24	33	32	26
Not at all interested	**34**	21	48	34	35
Don't know	**8**	8	8	10	6

Three in ten 11-14 year olds say they would be interested in a career in engineering (29%), despite more than half claiming to know something about what the industry has to offer (54%). This suggests that current sources of information are not doing enough to promote the exciting and rewarding careers available within the industry, and perhaps don't show the breadth of opportunities on offer. Nearly two out of three children say they would not be interested in a career in the engineering industry (63%).

By Subgroups

Boys are four times more likely to be interested in a career in engineering than girls (47% vs 11%). **Age has far less impact**, but a positive shift does occur between the ages of 11-12 and 13-14, rising from 24% being interested, up to 33%.

Q3b. Why do you say that?

When asked why they would be interested in a career in engineering, responses typically focus around the **appeal of making, fixing or building things** – plus the opportunity to **problem solve**. Some children specifically mention cars too. Minority mentions include **good pay**, and **inspiration from family members** (especially Dads) and **YouTube Influencers**.

"As I'm good with my hands and enjoy making stuff"

"As my father is an engineer, he is a software engineer so he talks about his job and it is very interesting"

"Because engineering pays a lot"

"Because I like fixing and building and making things"

"Because it can be related to cars"

"Engineering was one of my options but i really want to be a star rugby player for England"

"I enjoy solving problems and i want to work with machines"

"I feel like it would challenge my artistic design skills and problem solving skills"

"Working with f1 cars"

"I like mathematics and science. Also I learnt a lot from Fortnite entertains videos about how to successfully build bridges and other tall building"

"I like to watch the Hacksmith on YouTube"

"Mark Rober's YouTube channel"

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (OPEN – ASKED IF Q3a=NOT VERY INTERESTED, NOT AT ALL INTERESTED)
Q3b. Why do you say that?
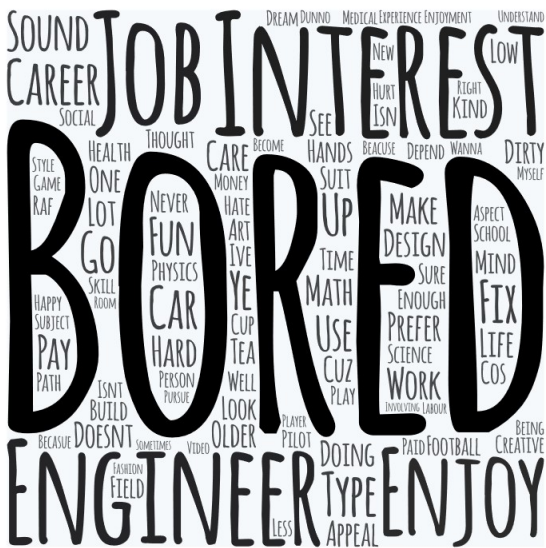
When asked why they would not be interested in a career in engineering, responses typically centre around it being **boring** or just not something they think they would enjoy. **Several children cite an alternative, more appealing job – which in their minds has led them to close the door on engineering as a possibility already**. The examples here are endless, but include footballer / rugby player, police officer, actor, pilot, marine biologist, baker, radiologist, forensic scientist and vet. Some children assume engineering isn't for them because they think they're **not clever enough**, but also because they think the work is **too hard** (manual), too **dirty**, **not creative** enough, and **not well paid**.

"bc I JUST DONT..... AND ITS NOT ME AND ITS DOESNT MAKE ME HAPPY"

"Because engineering isn't fun or enjoyable for me and I wouldn't want to be an engineer"

"Because I feel that engineering won't get you a lot of money in your life but what I want to do is get money so I can live healthier and my children can too"

"Because i mean all you do is use wrenches and stuff"

"Because it doesn't look fun and it looks extremely hard but I don't know how much it pays either"

"Because of low salary and you don't get famous in this job i want to do a job in which i am very super famous"

"I am a female and it's just NOT for me"

"I don't like engineering. I'm not the best with my fine motor skills as my hands are sometimes a bit jittery."

"I don't have the skills needed and it's not something i would enjoy"

"I want a higher paid job where I don't have to use my hands"

"I want to be a forensic scientist"

"It sounds boring and I would want a more creative job"

"Because I'm not smart enough and it's boring"

"As I am more of a person who would be on the designing aspect and less hands down and muddy"

Q7a. I would feel confident recommending careers in Engineering to my students.

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
Agree strongly	**20**	19	23	53	22
Agree	**49**	49	48	33	46
Disagree	**21**	26	18	7	20
Disagree Strongly	**6**	3	9	0	7
Don't know	**3**	3	2	7	4

Caution: Low base size

When teachers were asked whether they would feel confident recommending careers in engineering to their students, the majority agree to some extent (69%), although most stop short of agreeing *strongly*. More than a quarter disagree (27%), and a handful are unsure either way (3%).

By Subgroups

Again, **Engineering specialists are most confident in their response to this question** – the majority say they would happily recommend careers in engineering to their students (86%). In second place are Technology teachers (71% would confidently recommend), with Maths and Science specialists close behind (both 68%). More than a quarter of Science, Technology and Maths teachers don't feel confident enough to recommend a career in engineering to their students though. There's also a noticeable **difference in responses from male and female teachers** here too, with male teachers far more confident than their female counterparts (79% would recommend, vs 62%).

CHILDWISE TEACHER SURVEY (SINGLECODE)

How much do you agree with the following statements?

Q7b. I feel I know enough to help my students if they asked me for advice about a career in Engineering.

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
Agree strongly	**17**	17	24	53	13
Agree	**39**	38	35	40	35
Disagree	**32**	34	29	7	37
Disagree Strongly	**9**	9	9	0	7
Don't know	**4**	2	2	0	7

Caution: Low base size

Although most teachers feel confident enough to recommend a career in engineering to their students (69% agree), far fewer agree that they know enough to help if they were asked for advice about this. Just over half agree (56%), including 17% who strongly agree. More than two in five teachers feel they don't know enough (41%).

By Subgroups

Maths and Science specialists are most likely to say they wouldn't know enough to help their students if they were asked about a career in engineering. They are also the subgroup least likely to be aware of career frameworks, and they have less freedom generally to teach their lessons in their

own way. With this in mind, *Enginuity may want to consider targeting any media comms towards Technology and Engineering specialists in the first instance, with the potential for a separate approach to Maths and Science specialists, signposting them towards relevant careers information*. Male teachers are more likely to say they know enough to help their students if they wanted advice about careers in engineering, along with those who have been in the profession for more than 10 years.

CHILDWISE TEACHER SURVEY (MULTICODE – TOP THREE)

Q14. What would be most helpful to you when helping students to learn about Engineering opportunities?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
Case studies, interviews and videos about people who are in engineering careers	**50**	47	55	40	41
An interactive map where students could find information about all the different industries that exist within engineering and manufacturing	**48**	53	41	40	46
A competition where students and/or schools could submit their innovative ideas and win a cash prize to build a working prototype of their invention	**44**	42	51	47	39
A series of skills and personality assessments so students are able to understand their strengths and how to channel those into certain careers	**35**	37	30	53	39
Skills Miner days or camps where Enginuity would host a STEM event where students could play games and speak to experts from industry	**35**	40	30	20	41
More certified Skills Miner games and resources to teach in the classroom or via a training provider	**28**	20	35	33	30
Detailed Job descriptions that describe the skills required for all roles in engineering and manufacturing	**24**	21	24	33	28
Something else	**2**	2	2	0	2
None of these	**0**	0	1	0	0
Don't know	**2**	3	0	0	2

*Caution: Low base size

Case studies, including interviews and videos with people already in engineering careers, are the approach that teachers would value most when trying to help their students learn more about opportunities in the industry. One in two teachers place this in their top three (50%), followed

closely by an **interactive map** which would allow students to find information about all the different industries that exist within engineering and manufacturing (48%). A **competition** where students and / or schools could submit their innovative ideas and win a cash prize, completes their top three (44%).

By Subgroups

Engineering specialists focus on approaches that help students to unlock their hidden skills and talents, and inspire them to take more interest. They place the most value on a series of skills and personality assessments so that students are able to understand their strengths, followed by a competition to submit innovative ideas and win a cash prize. Technology specialists rate the case studies as potentially most useful, whilst science and maths specialists (the teachers who claim to know the least about engineering) choose the interactive map where students can find information – which is possibly a projection of their own limited knowledge.

Longer established teachers place more value on case studies as a potential source of engagement (55%, compared with 40%), whilst those who have been teaching for less than 10 years, choose the competition (51%, compared with 40%). Female teachers choose more options overall, and are more likely to favour the competition (48%), hosted STEM events (42%), and the personality assessments (40%). Male teachers are more likely to choose the structured, standalone approaches – the case studies (52%), the interactive map (50%), and detailed job descriptions (31%).

Q6. What would be most helpful to you when learning about different careers in Engineering?
Click up to three answers

%	TOTAL	Gender		Age	
		Boys	**Girls**	**11-12**	**13-14**
Detailed Job descriptions that describe the skills required for all roles in engineering and manufacturing	**38**	39	36	31	44
An interactive map of a city where you could find information about all the different industries that exist within engineering and manufacturing	**31**	28	41	27	34
More Skills Miner games and resources to use in the classroom complete with certificates for proven skills	**26**	27	20	30	23
A series of skills and personality assessments so you are able to understand your strengths and how to channel those into certain careers	**25**	28	14	31	21
Case studies, interviews and videos about people who are already in engineering careers	**24**	22	29	24	23
Skills Miner days or camps where you could play games and speak to experts from industry	**21**	23	13	24	19
A competition where students and/or schools could submit their innovative ideas and win a cash prize to build a working prototype of their invention	**19**	19	21	15	22
Something else	**2**	2	1	2	2
None of these	**5**	5	7	4	6
Don't know	**21**	21	21	22	21

We presented students with the same list of activities and asked them which they felt they would find most helpful. Their answers varied quite considerably to the teachers, with **detailed job descriptions chosen as their top choice** (this was the teacher's lowest choice). Nearly two in five children chose this (38%), followed by the **interactive map** (31%), and the **classroom-based games** (26%). One in five answered 'don't know' though (21%), resulting in far few options being chosen overall (compared to the teachers).

By Subgroups

Girls favoured the interactive map overall (41%), whilst boys leant more towards the detailed job descriptions (39%). In second place these choices were reversed, with girls choosing the case studies as their third choice (29%) and boys choosing the personality assessments (28%).

The number of children answering 'don't know' changes little with age, but detailed job descriptions, the interactive map, and the competition all become more appealing, whilst the other approaches drop back.

5.4　　Using Minecraft as an Educational Tool

CHILDWISE TEACHER SURVEY (SINGLECODE)
Q8a. How likely would you (or your STEM colleagues) be to consider using Minecraft as a tool to teach your students aged 11-14 about STEM careers e.g. by navigating an interactive world to find out more about the skills needed to work in STEM.

%	TOTAL	Subject Taught				Enginuity Teacher Survey
		Science	Technology	Engineering*	Maths	
Very likely	**16**	10	24	0	9	#1
Quite likely	**30**	30	33	27	30	#1
Quite unlikely	**18**	21	18	20	15	-
Very unlikely	**29**	33	17	40	37	-
Don't know	**7**	6	7	13	9	-

Caution: Low base size

Teachers taking part in the CHILDWISE survey were divided in their response to this question. **More than two out of five are receptive towards using Minecraft as a tool to teach their students about STEM careers** (46%), including a minority who say they would be *very likely* to do this (16%). The same number say they would be *unlikely* to do this though (47%), with more teachers expressing strong feelings about this – 29% say they would be *very unlikely* to use Minecraft as a tool for learning. Less than one in ten say they are unsure either way (7%). **Teachers surveyed by Enginuity (who had already been exposed to the Skills Miner games) were fairly unanimous in their agreement that they would consider using Minecraft as a tool to teach their students**.

By Subgroups

Technology specialists are by far the most receptive towards using Minecraft as a tool for learning. More than half (57%) say they would be likely to do this, with a quarter saying they would be *very likely* (24%). Other subject teachers remain open minded about the idea too though – two in four Science and Maths specialists would consider using Minecraft as a learning (40% and 39% respectively), whilst **Engineering specialists are likely to require a little more convincing** (60% say they would be *unlikely).*

Those who have been teaching for less than 10 years are more likely to give this some consideration than those who are more established in the profession (55% vs 41%). Female teachers are also marginally more likely to give it some thought (48% vs 43%).

CHILDWISE TEACHER SURVEY (OPEN – ASKED IF Q8a=QUITE UNLIKELY, VERY UNLIKELY)

Q8b. Can you tell us why you would be unlikely to consider using Minecraft as a tool to teach your students about STEM careers?

Lack of knowledge (and experience) is the main reason why teachers say they would be unlikely to use Minecraft as a tool for teaching. More than half respond in this way, especially Maths and Science specialists.

Lack of resources is also a concern for around a quarter of teachers, whilst around one in ten feel the game is **more suited to a younger audience**, or that it's simply **not relevant to a career in STEM**.

A minority of teachers feel that using Minecraft as a teaching resource would be too '**gimmicky**' or a passing 'fad', or that students would not engage properly and would be more likely to mess around.

"I am not familiar with Minecraft. I know what it is and how popular it is but I have never used it"

"I would love to use it as I think it would be fantastic however I have never used it before and don't know enough about it."

"I don't have enough information on how to use it - would need training as to how it was relevant & a good teaching resource"

"I don't know enough about Minecraft and organising ICT facilities to look at Minecraft with classes would be difficult"

"Never personally used Minecraft so couldn't recommend how it would be used in careers. Feel as though students wouldn't take on the links to careers and would focus on it as a game."

"It's not something I had ever considered. I also think their attention would wander too much!"

"I'm not entirely sure how it would teach them about STEM let alone STEM careers. I would look for teaching resources that involve practical actions rather than abstract simulated ones. I wouldn't expect the military to use Call of Duty to train soldiers or use SIM 4 Pet expansion to teach students about horse riding."

"Lack of ICT resources for that many students. Lack of knowledge of minecraft. Lack of time for an extended project like this."

"Maybe as an afterschool club but not in lesson"

"Minecraft would be a distraction from the actual task - seems like a gimmick."

Enginuity

CHILDWISE

Q8c. Is there anything that could be done to help you overcome this?

Training and CPD accreditation would help to overcome the knowledge barrier. Teachers would also like to see **examples of success** and a rationale to help convince their senior leadership team. Easy (and free) access to the software would also be welcomed.

"CPD on how to focus pupils on the links to careers not the game"

"Explain how it would help rather than just be a gimmick?"

"Free training and support material"

"Training and more information about what's available"

"Aim for a younger audience 14 year olds may be trying to be more sophisticated."

"Information from somewhere 'prestigious' (for want of a better term) to show parents that this is a valid approach and not their child messing about."

"Yes… enforce practical technical rooms in schools and value technical teaching… not everyone will be an artist but a high proportion of students taught more practical work will have a better chance at a better future"

Enginuity

5.5   First Impressions of Skills Miner

Part way through the CHILDWISE survey, teachers were shown a short, written description of the *Skills Miner* game (below), along with some screen captures taken from the game. Children were also shown a similar (but shorter) description.

Skills Miner is a series of interactive maps set in the hugely popular game of Minecraft. Designed to help players aged 11-14 discover their aptitude for engineering, the minigames encourage young people to navigate different industries within the sector, including Aerospace and Energy – learning more about the opportunities to change our world, the occupations on offer and the routes to entry.

When the first Skills Miner game launched in 2020, players were tasked with building bridges and handling complex circuitry. On completion, 20% of the participants went on to discover more about engineering careers, giving Enginuity (the game developer) the confidence to create more.

The most recent game focuses on Energy. Young people are tasked with entering a residential property with a set budget and retrofitting the home with an array of new, clean technology solutions, thus improving the energy performance and green credentials of the home. At all times, the skills needed to work with these technologies, the career pathways to pursue, and the sense of pride felt by the NPCs (non-player characters) are highlighted to the participants.

Each Skills Miner game is aligned to the curriculum and accompanied by a lesson plan for teachers – and, using their unique position within the industry, Enginuity are able to bring in experts from leading businesses to provide an authentic and engaging experience. The games are also mapped to the 'Skills Builder Universal Framework', helping young people to identify the skills they need for success.

CHILDWISE TEACHER SURVEY (SINGLECODE)

Q9a. Having seen an example of how Minecraft can be used to teach students aged 11-14 about STEM careers, how likely do you think you (or your STEM colleagues) would be to consider using the Skills Miner resource?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
Very likely	**18**	17	22	13	13
Quite likely	**48**	46	49	47	52
Quite unlikely	**22**	27	18	27	19
Very unlikely	**9**	9	9	13	9
Don't know	**3**	2	2	0	7

Caution: Low base size

Having seen an example of how Minecraft can indeed be used as a teaching resource, the number of teachers who said they would consider using it increased. In fact, **two out of three were receptive towards the idea (66%), up from 46% prior to the resource being shown**. Nearly a third remained unconvinced (31%), although they answered with less conviction this time around – just 9% said they would be *very unlikely* to use the resource, compared with 29% previously.

By Subgroups

Technology specialists remain the subgroup most receptive towards using Minecraft as a teaching resource. **The introduction to Skills Miner does help to shift attitudes though, particularly among the Engineering specialists** (+33% are likely to use), followed by Maths (+26%) and then Science (+23%).

Exposure to the Skills Miner concept also helps to boost the appeal of using Minecraft among teachers who are more established in the profession, resulting in there being little difference between them and those who have been teaching for less time (67% and 65% likely to use, respectively). More than seven in ten female teachers would consider using the Skills Miner resource (72% likely, up from 48%), compared with just over half of male teachers (56%, up from 43%).

CHILDWISE TEACHER SURVEY (OPEN)

Q9b. Why do you feel this way?

Among the 66% of teachers who said they would be likely (very or quite) to consider using the Skills Miner resource, the main reason given is because **it looks engaging**, followed by it **looks good** or **useful**, and is something that is likely to help children learn about careers in STEM. A minority also like the resource because it's **interactive.**

"Seems relevant and engaging for that age group."

"It would be an ideal vehicle for engaging students in wider thinking of use of STEM subjects in later life."

"Looks engaging and easier to administrate than I thought."

"They look really good and I think students would enjoy the experience without realising that it is totally educational."

"It looked good and made sense."

"I love interactive activities and games. These appeal to learners and pupils can work through these at their own speed."

The main reason given among the 31% who say they would be unlikely (very or quite) to consider using the Skills Miner resource, is their **limited access to IT resources**, followed closely by a general **lack of time**. A minority of teachers are concerned about how it would affect their existing commitments to the **curriculum**, and instead believe it has more potential as part of an **after-school club** or as **homework provision**. A small number of teachers think the resource is more suited to **younger children**.

"The technology is not available in our school to regularly use this."

"Lack of access to computers needed."

"Lack of time - curriculum time is very tight and we don't have flexibility to do anything else."

"Not in lesson to take over content delivery time, but potential after school or Science week activities."

CHILDWISE TEACHER SURVEY (OPEN)
Q9c. Is there anything that could make it more appealing to you? e.g. proven results, impact, reaching hard to reach children etc.

Proven results are most likely to increase the overall appeal of Skills Miner. More than a quarter of teachers would like to see some **evidence of its success** (27%), whilst a further 22% would like to see what **impact** it has in a classroom environment.

One in ten teachers are keen to know how it can be used to engage **hard to reach children** (9%), and similar numbers would like to see evidence of how it meets **curriculum requirements**, including detailed lesson plans (9%).

A minority of teachers say they would require better access to IT equipment (4%) or simply more time (3%).

When teachers at the **Enginuity sessions** were asked how well they thought the game subject area fit within the school curriculum, they answered 7.7 out of 10 on average, with 10 being *'fits very well'*.

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (SINGLECODE)
Q4a. Now that you have learnt about Skills Miner, how interested would you be to give this a go in your lessons at school?

%	TOTAL	Gender		Age	
		Boys	**Girls**	**11-12**	**13-14**
Very interested	**27**	37	18	31	24
Quite interested	**21**	22	20	23	20
Not very interested	**20**	17	23	20	20
Not at all interested	**22**	17	26	20	24
Don't know	**10**	7	12	7	12

After the children saw a written description of the Skills Miner resource (but without having had access to the game itself), they were **divided in their response** when asked whether they would be interested in giving it a go in their lessons at school. Almost one in two said they would be interested on some level (48%), including 27% who said they would be *very interested.* Almost as many said they would not be interested though (42%), with one in ten unsure either way (10%).

By Subgroups
Gender and age have a significant impact on responses to this question. Boys are much more likely than girls to be interested at all (59% vs 38%), with boys aged 11-12 responding with the most enthusiasm (64% were interested at all, including 42% who were very interested). Girls are much more restrained in their response, with just one in three interested at age 13-14 (33%).

Q4b. Why do you say that?

Familiarity with Minecraft is the main reason why some children are more interested in Skills Miner than others. It's recognised (by boys especially) as being fun and creative, but also as a good source of learning.

"Because Minecraft is fun and people can relate to it"

"It would allow me to interact in a fun environment and see what is happening"

"Because Minecraft is a fun game and it is very creative"

"Because Minecraft is a good game, and it seems like a fun way on how to learn about engineering."

"Better than lessons we do now"

"Because it adds a fun twist to lessons"

"It would be an interesting to learn by using a game i used to enjoy a lot"

Q4b. Why do you say that?

By contrast, **unfamiliarity with Minecraft is the main reason why children would not be interested in using Skills Miner in a school environment.** Several also say this is a game they have outgrown and no longer play, or simply that they would find it boring.

"I don't play Minecraft and I don't like it"

"Because its awkward, and its roleplaying school technically.... I'm sure some pupils would like to but the majority would agree with me that it is boring and not interesting"

"I've not played it in years and I don't really enjoy it anymore"

"It's a kids game"

"It's a dead game"

"Minecraft is too straining on my eyes"

"Minecraft is cool and all but I would rather enjoy games like Minecraft in my own free time rather than it feeling like I have to use it."

"I would learn lessons in Minecraft but not engineering"

5.6   Using Skills Miner

As part of the **Enginuity workshop sessions**, children (and teachers) were given the opportunity to play the Skills Miner games. Afterwards they completed an online survey (separate to the CHILDWISE survey), with a summary of their feedback included below.

ENGINUITY CHILDREN'S SURVEY (SINGLECODE)
Q3. Which game did you play?

%	TOTAL
Game 1: Constructing an Aeroplane	5
Game 2: Coding the Flight Deck	2
Game 3 Making Sustainable Fuel	26
Game 4: Creating Future Aircraft	-
Game 5: COP 26	-

Not all the children completed this question, but among those who did '**Game 3: Making Sustainable Fuel**' was the most frequently played game. Half of the teachers observed Game 1, whilst a quarter said they watched Game 3. A minority said they observed Game 4.

ENGINUITY CHILDREN'S SURVEY (SINGLECODE)
Q11. Did you manage to complete any of the games that you started to play?

%	TOTAL
Yes	61
No	29
Don't know	10

More than six in ten children said they were able to complete at least one of the games they started (61%). Three in ten didn't manage this though, and one in ten were unsure either way (10%).

ENGINUITY CHILDREN'S SURVEY (SINGLECODE)
Q12. Did you find the games easy or difficult?

%	TOTAL
Too difficult / Difficult	4 / 22
Just right	43
Too easy / Easy	11 / 12
Don't know	8

More than two in five children said they found the game difficulty '*just right*' (43%). A quarter said they found it too hard though (26%), whilst 23% said they found it easy. This is testament to the **varying levels of ability among children**. *Where possible teachers will need an adaptable approach that is suited to the individual learning needs of their students, rather than one strategy that addresses the class as a whole.* The majority of teachers surveyed by Enginuity were unaware of whether their students were experiencing difficulties during the Skills Miner games or not (12 out of

16 answered '*don't know*'). There will be an expectation among teachers that they can assess and evaluate pupil progress throughout the lesson, with regular checks required to ensure that each step is being understood.

Q10. Did you learn anything new from the games?

%	TOTAL
Yes	48
No	17
Maybe	22
Not Sure	12

Around half of the children were confident that they had learnt something new as a result of playing the game (48%). One in six were unconvinced though (17%), whilst twice as many were left feeling uncertain either way (34%).

More than half of the children also said they were unfamiliar with the **Skills Builder Essential Skills Badges** (55%), which is unsurprising given that most of the teachers surveyed said they were unaware of the Universal Framework.

When asked to rate the **overall Skills Miner experience** out of five stars (1 being the lowest) the response from teachers and children was closely aligned and edging towards the top of the scale. **Teachers gave the resource a score of 3.94 overall, whilst children rated it 3.88**.

The extent to which the games boost children's interest in engineering careers remains unclear though. When asked to rate their interest on a scale of 1 to 10 (10 being most interested, 1 being least interested, and 5 being don't know), they gave an average score of **5.7** – implying that many of them remain unsure either way.

5.7 Skills Miner Themes

To help facilitate a better understanding of which Skills Miner themes might appeal most to children, we showed them a list of five choices and asked them to rate their interest. Below is a summary of their feedback.

CHILDWISE OMNIBUS SURVEY WITH 11-14 YEAR OLDS (SINGLECODE)
Q5. How interested would you be in new Skills Miner games that focus around the following themes?

% very interested / quite interested	TOTAL	Gender		Age		Interested in Skills Miner
		Boys	**Girls**	**11-12**	**13-14**	
The future of food e.g. zero hunger, clean water, new and innovative farming methods	26/31	30/29	22/33	29/34	22/29	39/35
The future of industry e.g. innovation and modernisation, how we travel, clean fuels	24/27	33/26	16/28	27/26	22/29	39/32
The future of energy e.g. affordable and clean energy, using more renewable energy	23/27	30/27	16/27	25/30	21/25	35/34
The future of communities e.g. sustainable cities with zero waste, rural communities, environment, flood defences	21/29	25/28	16/30	22/28	19/30	32/36
The future of waste e.g. zero waste, recycling, responsible production	19/28	24/26	15/30	21/28	17/28	30/34

A Skills Miner game that focuses on 'The future of food' appeals most to children overall. More than half of the children surveyed by CHILDWISE said they would be interested in this to some extent (57%), including 26% who would be '*very interested*'. A theme that explores '**The future of industry**' follows close behind (51%), as does '**The future of energy**' (50%) and '**The future of communities**' (50%). Just under half of children aged 11-14 would be interested a game that explores '**The future of waste**' (47%).

By Subgroups

Boys show more interest in any of the listed themes than girls. They are twice as likely to be '*very interested*' in the themes that explore 'The future of industry' (33% vs 16%), and 'The future of energy' (30% vs 16%), whereas 'The future of food' generates a much more balanced and equal response.

Interest peaks among younger children rather than older children. Those aged 11-12 are more interested in any of the listed themes, with 'The future of industry' and 'The future of communities' generating the most balanced response (+/- 2%) across the age range.

Those who are expressed an interest in playing the Skills Miner games earlier on were generally more interested in any of the themes overall, with the order of interest remaining unchanged.

The children who took part in the **Enginuity workshop sessions** also rated 'The future of food' as their top choice (31%), followed by 'The future of energy' (23%), and 'The future of automation, robotics and artificial intelligence (22%). This last option was a late addition to the list for the workshop sessions, and wasn't included on the CHILDWISE survey in schools.

5.8   Delivering Skills Miner in Schools

CHILDWISE TEACHER SURVEY (SINGLECODE)

Q10. In the future, the plan is that the Skills Miner games will go further than mapping to the curriculum, and will be part of a scheme of work over a 5-6 week period (half term). Would a 5-6 week scheme of work that was relevant to your subject appeal to you, or would you prefer resources that cover individual lessons?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
I would prefer resources for individual lessons	**34**	40	24	27	39
I would be interested in both approaches	**32**	28	29	33	37
A 5-6 week scheme of work would be of interest to me	**26**	22	39	27	20
I would not be interested in either approach	**6**	8	7	7	2
Don't know	**1**	2	0	7	2

Caution: Low base size

The teachers surveyed by CHILDWISE were asked whether they would prefer the Skills Miner minigames to cover a 5-6 week scheme of work, or an individual lesson. **The results are not conclusive either way, but lean towards resources that cover an individual lesson**. One in three teachers said they would be interested in this approach (34%), whilst a further 32% said they would consider either. One in four teachers said a 5-6 week scheme of work would be of interest to them. **The split in opinion reinforces the need for an adaptable approach that can meet the individual needs and requirements of different subject specialists**.

By Subgroups

Science and Maths specialists are most in favour of a resource that covers an individual lesson (40% and 39% respectively), whilst teachers who specialise in Technology (and are generally more receptive towards the Skills Miner concept) lean more towards a 5-6 week scheme of work (39%). Engineering specialists remain on the fence though, with 33% interested in either approach.

CHILDWISE TEACHER SURVEY (MULTICODE)

Q13a. In which of the following ways do you think Skills Miner could be delivered to students aged 11-14?

%	TOTAL	Subject Taught			
		Science	Technology	Engineering*	Maths
As part of a STEM club	**81**	87	78	67	80
During regular lesson time	**58**	54	60	60	63
Delivered by an external expert on the school's behalf	**45**	44	45	27	46
As part of a Skills Miner weekend camp	**19**	26	16	7	20
Some other way	**11**	7	12	33	15
Don't know	**2**	2	4	0	0

Caution: Low base size

After having read about the Skills Miner games and what they have to offer, teachers were asked how they thought the resource could be best delivered to students aged 11-14. **Most teachers felt it would be well received as part of a STEM club (81%), whilst just over half could visualise it being delivered in regular lesson time (58%).** Just under half would like the reassurance of having an **external expert** deliver the resource on the school's behalf (45%), whilst less that one in five thought it would work as part if a **Skills Miner weekend camp** (19%).

When asked how they would *prefer* the resource to be delivered though (choosing one option only), teachers are most likely to say as part of a **regular lesson** (35%), followed by as part of a **STEM club** (32%).

By Subgroups
Subject teachers are in agreement that the Skills Miner games could be delivered well as part of a STEM club, especially those who teach the core subjects of science and maths. Maths teachers are most receptive towards the idea of Skills Miner being delivered as part of regular lesson time though (63%), with Technology and Engineering teachers following closely behind (60%).

When asked what their preference would be, all except the science teachers say they would most like the resource to be delivered as part of a regular lesson (33-40%). Female teachers are much more likely to say they would like the resource delivered by an external expert (31% vs 11%)

The teachers who took part in the Enginuity workshop sessions (and were able to observe the game in action), felt it could be best delivered in regular lesson time – highlighting just how important live demonstrations can be. They also placed value on delivering the resource as part of a STEM club, or having it delivered by external experts.

CHILDWISE TEACHER SURVEY (SINGLECODE)
Q12. Enginuity will also map the games to the UN Sustainability Goals. These goals were adopted by the UN in 2015 as a universal call to action to end poverty, protect the planet, and ensure by 2030 that all people enjoy peace and prosperity. How useful would this be in your opinion?

%	TOTAL	Subject Taught				Receptive to using SM
		Science	**Technology**	**Engineering***	**Maths**	
Very useful	**33**	39	39	60	24	*41*
Quite useful	**48**	46	40	13	57	*51*
Not very useful	**7**	7	10	7	6	*3*
Not at all useful	**4**	3	5	7	2	*1*
Don't know	**7**	6	6	13	11	*4*

Caution: Low base size

The majority of teachers feel it would be useful if the Skills Miner games were mapped to the UN sustainability goals (81%). A third of teachers would consider this to be '*very useful*' (33%), whilst the remainder think it could be '*quite useful*' (48%). Just one in ten see no purpose to this (11%), whilst a further 7% are unsure either way.

By Subgroups

Teachers who specialise in Engineering value this addition most – 60% say they would find this *'very useful'* compared with 39% of science and technology specialists. Male teachers are more likely than female teachers to say this would not be very useful feature of the resource (17% vs 7% respectively).

CHILDWISE TEACHER SURVEY (OPEN)

Q15. Each minigame has a short survey at the end to help measure the impact of the game and the extent to which it has met its learning objective. Student completion levels are very low though. What could Enginuity do to help encourage more students (and teachers) to complete the reflection survey at the end of the game?

When asked what could be done to help encourage students to complete the short survey at the end of each mini game, **teachers were overwhelmingly in favour of an approach that offers an incentive or reward of some kind** – including entry to a **prize draw** or **competition**, **bonus points / badges**, **additional game play**, **levelling up opportunities**, and **access to exclusive content**. Other suggestions included **embedding questions throughout the game**, making sure the questions are **simple and short**, linking completion with a **school league table** of some kind, **withholding important information** until it's completed, and offering **alternative collection methods** e.g. audio recording, images and writing etc.

In terms of encouraging teachers to respond, some felt their colleagues would be more likely to complete the survey if there was an **explanation about how their feedback could help with the ongoing development of the games**, if there was evidence of how feedback has impacted on the game to date, and if a **valid and purposeful reason** was provided. Several teachers also said the **pre-coded / multiple questions** would be favoured over written responses.

"Give rewards for this such as unlocking another level or benefits that will help them within the game."

"You could make it reward based... a prize or something. Or they could be given a random character or item and description... they find that fun. Or a funny animation at the end"

"A leader-board? A reward? or maybe a thanks email sent to the school or head of year for their cooperation?"

"Build it into the game, students could drop items into a chest to vote for example."

"Easy to answer, not too many questions. Written feedback should be optional."

"Withhold a piece of information until after it has been completed - perhaps a statistic or details of a profile that might be suitable given the choices made in game."

"What is the benefit to the students/staff? If there is a clear reason to complete the survey, I have found that students will usually do it."

"Importance being highlighted to teachers."

5.9   Recommending and Using Skills Miner in the Future

As part of the **Enginuity workshop sessions**, the sixteen teachers who took part were asked to sum up their experiences of using Skills Miner. A summary of their feedback is included below.

The majority of teachers said they thought the implementation of Skills Miner in a school environment would be beneficial (15 out of 16), with two thirds agreeing that this would be *'very useful'* (11 out of 16). Three out of four teachers would consider using the resource to deliver part of their curriculum next year (12 out of 16), and almost all would consider recommending it to a colleague (4 extremely likely, 11 likely).

Most teachers agreed that seeing the game in action had added to their knowledge about careers in engineering (9 out of 16), but only a handful said the game had been very informative and had left them feeling very confident about recommending or advising their students about a career in engineering (4 out of 16). Just one teacher said they felt the same as before, whilst two were unsure either way.

6   CONCLUSION

The research findings point towards teachers finding it difficult to navigate the complex landscape of STEM careers; identifying the best resources to use, ensuring these don't compromise the overall learning experience (or attainment levels) of their students, and feeling confident enough to deliver a potentially new approach to learning – all whilst trying to mitigate the ongoing pressure on their time.

Technology specialists are by far the most receptive towards using Minecraft as a tool for learning, although attitudes do shift among other STEM teachers (especially Engineering) when the Skills Miner concept is explained to them. Those who teach Science and Maths typically have less freedom to teach their lessons in the way that they want to though, and far fewer agree that they know enough to help if they were asked for advice about careers in engineering. With this in mind, Enginuity may want to consider targeting Technology and Engineering specialists in the first instance, with the potential for a separate approach to Maths and Science specialists later on – perhaps when there is more evidence of proven results and impact. Training and CPD accreditation may also help to overcome potential barriers to use, as would evidence that the resource can be adapted to suit the individual needs of students (including those who are typically harder to reach).

With the majority of 11-14 year olds claiming to know or have given some serious thought to what they want to do when they're older, the research findings also reinforce the need for careers education in primary schools too – broadening horizons, raising aspirations and just generally showing children the vast range of possibilities open to them from a young age. The appeal of Minecraft peaks among 9-10 year olds[2], so it's likely that age-appropriate minigames could be well received by this audience. The 11-14 year olds surveyed by CHILDWISE were divided in their response when asked whether they would be interested in using Skills Miner at school. Gender and age have a significant impact here (with boys aged 11-12 most keen). The potential theme of the

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[2] 52% of 9-10 year olds have played Minecraft in the last week. *Source: CHILDWISE Monitor Report 2022*

game also plays a key role, with 'The Future of Food' appealing to girls and boys alike, whilst 'The Future of Industries' and 'The Future of Communities' generates a relatively consistent response across the age range.

In terms of delivery, students value an approach that includes detailed job descriptions (most only know a little about the pathways that lead to different careers), plus interactivity and game-based learning. Teachers also value interactivity, but lean more towards real life examples and case studies over game-play. The data suggests that current sources of information are not doing enough to promote the exciting and rewarding careers available within the engineering industry – less than three in ten 11-14 year olds are interested, despite more than half claiming to know what the industry has to offer. Teachers and children both recorded a positive experience after using Skills Miner (at the Enginuity workshops), but the extent to which the game boosts children's knowledge of engineering careers remains unclear. This is something that will need to be addressed going forward, to help boost uptake (proven results) and to help teachers ensure that learning objectives are being achieved.

7   APPENDIX

7.1   CHILDWISE Survey with Teachers

SECTION 1: ABOUT YOU AND YOUR SCHOOL

SINGLECODE
P1.   Where is your school? *Select one only*
- a) North West
- b) North East
- c) Yorkshire & the Humber
- d) West Midlands
- e) East Midlands
- f) Eastern England
- g) London
- h) South West
- i) South East
- j) Scotland
- k) Wales
- l) Northern Ireland

OPEN RESPONSE
P2a.   What is the name of your school? *Type in below*
This will help us to identify key profile information (such as the type of area, number of pupils etc) – all information is held in the strictest confidence and all responses are analysed and reported anonymously.

OPEN RESPONSE
P2b.   What is the postcode of your school? *Type in below*
This will be used for geographical analysis only, and will be deleted from the final data file – all information is held in the strictest confidence and all responses are analysed and reported anonymously.

SINGLECODE
P3.   Which of the following best describes your role at the school? *Select one only*
- a) Subject teacher
- b) Head of Subject / Subject Coordinator
- c) Assistant Head / Deputy Head
- d) Headteacher
- e) Something else? (WRITE IN)

SINGLECODE
P4.   How long have you been in teaching / education? *Select one only*
- a) Under a year
- b) 1-2 years
- c) 3-5 years
- d) 6-10 years
- e) More than 10 years

MULTICODE
P5.   Which of the following subjects do you teach? *Select all that apply*
- a) General Science
- b) Biology
- c) Chemistry
- d) Physics
- e) Mathematics

f) Engineering
g) Computing / ICT
h) Design and Technology
i) Something else? (WRITE IN)

SINGLECODE
P6. **Are you…** *Select one only*
a) Male
b) Female
c) Other

SINGLECODE
P7. **How old are you…** *Select one only*
a) Up to 25
b) 26 to 34
c) 35 to 44
d) 45 to 54
e) 55 to 64
f) 65 plus

SECTION 2: PROMOTING STEM CAREERS

MULTICODE
Q1. **Where do you typically find out about Key Stage 3 (11-14) STEM teaching resources?** *Select all that apply*
a) From the senior leadership team
b) By personal email
c) Postal mailshot
d) Promoted via TES
e) Word of mouth from other teachers
f) Via social media
g) Online searches
h) On teaching websites (WHICH ONES – WRITE IN)
i) Somewhere else? (WRITE IN)
j) Don't know

SINGLECODE
Q2. **How often do you incorporate information about possible <u>STEM careers</u> into your lessons?**
a) Regularly
b) Occasionally
c) Rarely
d) Never
e) Don't know

ASK IF Q2=(b to d)
MULTICODE
Q3. **Why don't you incorporate more information about STEM careers into your lessons?**
Select all that apply
a) I don't know enough about it
b) I don't know where to find this information
c) I have no time to look for this information
d) I have no time to use this information in lessons
e) This information is not relevant to my students
f) My students would not be interested in this information
g) Something else? (WRITE IN)
h) Don't know

Q4a. **How much freedom do you have to teach your (KS3) lessons and follow the curriculum in your own way?**
- a) A lot – I have absolute freedom to deliver the curriculum as I see fit
- b) Some – my colleagues and I collaborate to agree methods of delivery, which is then approved by my head of department / senior leadership team
- c) A little – my head of department / senior leadership team selects the delivery method and then asks for my opinion
- d) None – my head of department / senior management team tells me how to deliver each lesson
- e) Other – write in
- f) Don't know

Q4b. **What stops you from having more freedom to teach your lessons and follow the curriculum in your own way?**

Q5. **What do you think are the most effective ways to bring STEM careers into everyday learning?**

SECTION 3: ENGINEERING

Q6. **How much do you think the 11-14 year olds you teach are aware of the potential careers available in Engineering?**
- a) They know a lot
- b) They know a little
- c) They don't know anything at all
- d) Don't know

Q7. **How much do you agree with the following statements?**
- a) I would feel confident recommending careers in Engineering to my students
- **b)** I feel I know enough to help my students if they asked me for advice about a career in Engineering

SECTION 4: INTRODUCING SKILLS MINER

Q8a. **How likely would you (or your STEM colleagues) be to consider using Minecraft as a tool to teach your students aged 11-14 about STEM careers e.g. by navigating an interactive world to find out more about the skills needed to work in STEM?**
- a) Very likely
- b) Quite likely
- c) Quite unlikely
- d) Very unlikely
- e) Don't know

Q8b. **Can you tell us why you would be unlikely to consider using Minecraft as a tool to teach your students about STEM careers?**

Q8c. **Is there anything that could be done to help you overcome this?**

INTRODUCTION TO SKILLS MINER

Skills Miner is a series of interactive maps set in the hugely popular game of Minecraft. Designed to help players aged 11-14 discover their aptitude for engineering, the minigames encourage young people to navigate different industries within the sector, including Aerospace and Energy – learning more about the opportunities to change our world, the occupations on offer and the routes to entry.

When the first Skills Miner game launched in 2020, players were tasked with building bridges and handling complex circuitry. On completion, 20% of the participants went on to discover more about engineering careers, giving Enginuity (the game developer) the confidence to create more.

NEXT PAGE

The most recent game focuses on Energy. Young people are tasked with entering a residential property with a set budget and retrofitting the home with an array of new, clean technology solutions, thus improving the energy performance and green credentials of the home. At all times, the skills needed to work with these technologies, the career pathways to pursue, and the sense of pride felt by the NPCs (non-player characters) are highlighted to the participants.

Each Skills Miner game is aligned to the curriculum and accompanied by a lesson plan for teachers – and, using their unique position within the industry, Enginuity are able to bring in experts from leading businesses to provide an authentic and engaging experience. The games are also mapped to the 'Skills Builder Universal Framework', helping young people to identify the skills they need for success.

SINGLECODE

Q9a. **Having seen an example of how Minecraft can be used to teach students aged 11-14 about STEM careers, how likely do you think you (or your STEM colleagues) would be to consider using the Skills Miner resource?**
- a) Very likely
- b) Quite likely
- c) Quite unlikely
- d) Very unlikely
- e) Don't know

OPEN RESPONSE (ASK ALL)

Q9b. **Why do you feel this way?**

OPEN RESPONSE (ASK ALL)

Q9c. **Is there anything that could make it more appealing to you?** e.g. proven results, impact, reaching hard to reach children etc.

Q10. **In the future, the plan is that the Skills Miner games will go further than mapping to the curriculum, and will be part of a scheme of work over a 5-6 week period (half term). Would a 5-6 week scheme of work that was relevant to your subject appeal to you, or would you prefer resources that cover individual lessons?**
  a) A 5-6 week scheme of work would be of interest to me
  b) I would prefer resources for individual lessons
  c) I would be interested in both approaches
  d) I would not be interested in either approach
  e) Don't know

GRID – Aware / Aware and used / Neither aware or used / Don't know
Q11a. **The Skills Miner games will be designed to align with the following two career frameworks. Which of these are you aware of and which have you used?**
  a) **Gatsby Benchmarks** – eight benchmarks providing a framework for good career guidance developed to support secondary schools and colleges in providing students with the best possible careers education, information, advice, and guidance
  b) **Skills Builder Universal Framework** – prepares secondary students for the future. The Skills Builder partnership supports the school's career strategy, providing engaging resources for building essential employability skills

SINGLECODE
Q12. **Enginuity will also map the games to the UN Sustainability Goals. These goals were adopted by the UN in 2015 as a universal call to action to end poverty, protect the planet, and ensure by 2030 that all people enjoy peace and prosperity. How useful would this be in your opinion?**
  a) Very useful
  b) Quite useful
  c) Not very useful
  d) Not at all useful
  e) Don't know

GRID – COLUMN FOR WAYS TO DELIVER (MULTI) AND BEST WAY TO DELIVER (SINGLE)
Q13. **In which of the following ways do you think Skills Miner could be delivered to students aged 11-14, and in which way would you prefer it to be delivered in your school?**
  a) During regular lesson time
  b) As part of a STEM club
  c) Delivered by an external expert on the school's behalf
  d) As part of a Skills Miner weekend camp
  e) Some other way – write in
  f) Don't know

TOP THREE ONLY
RANDOMISE ORDER OF CODES a to g
Q13a. **What would be most helpful to you when helping students to learn about Engineering opportunities? Click up to three answers**
  a) Detailed Job descriptions that describe the skills required for all roles in engineering and manufacturing
  b) An interactive map where students could find information about all the different industries that exist within engineering and manufacturing
  c) More certified Skills Miner games and resources to teach in the classroom or via a training provider
  d) A series of skills and personality assessments so students are able to understand their strengths and how to channel those into certain careers
  e) Case studies, interviews and videos about people who are in engineering careers
  f) Skills Miner days or camps where Enginuity would host a STEM event where students could play games and speak to experts from industry
  g) A competition where students and/or schools could submit their innovative ideas and win a cash prize to build a working prototype of their invention

Enginuity

h)   Something else? (TYPE IN)
i)   None of these (EXCLUSIVE)
j)   Don't know (EXCLUSIVE)

OPEN RESPONSE

Q14.   **Finally, each minigame has a short survey at the end to help measure the impact of the game and the extent to which it has met its learning objective. Student completion levels are very low though. What could Enginuity do to help encourage more students (and teachers) to complete the reflection survey at the end of the game?**

7.2 CHILDWISE Survey with 11-14 year olds (via Omnibus)

MULTICODE
1. Now, thinking about careers, how do you learn about career options at school? *Tick all that apply*
a) We have specific careers lessons
b) We talk about careers in across different subject lessons
c) We have a careers advisor we can talk to if we want to
d) We get to do work experience
e) We have employers come in to talk to us
f) We have careers evenings at school
g) Some other way? (TYPE IN)
h) I haven't learnt about careers at school yet (EXCLUSIVE)
i) Don't know (EXCLUSIVE)

SINGLECODE
2a. How much thought have you given to the sort of job you want to do when you're older? *Tick one only*
a) I know what job I want to do when I'm older
b) I have some ideas but I haven't decided yet
c) I don't know what job I want to do when I'm older
d) I haven't thought about this yet

SINGLECODE
3a. How interested are you in a career in engineering? *Tick one only*
a) Very interested
b) Quite interested
c) Not very interested
d) Not at all interested
e) Don't know

OPEN RESPONSE
ASK IF RESPONSE TO 3a (CODES a – d)
3b. Why do you say you are (RESPONSE FROM 3a) in a career in engineering? *Type in below*
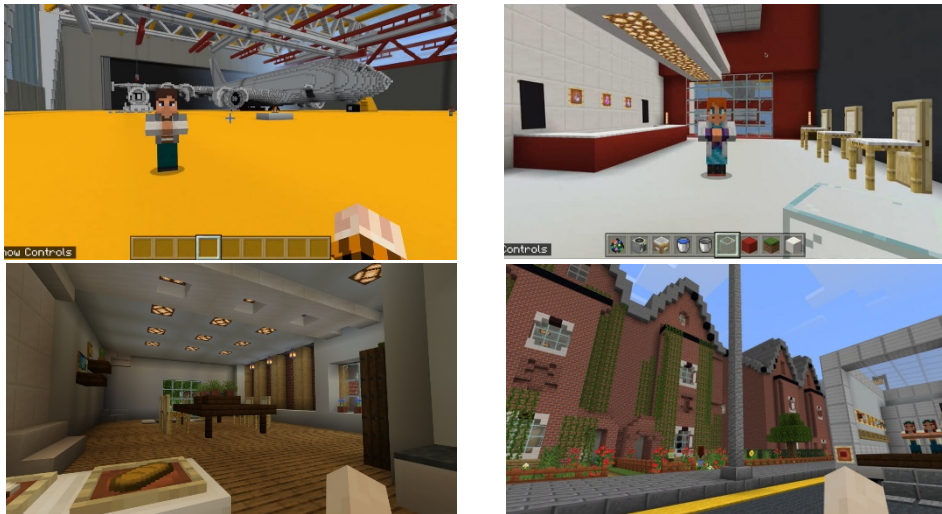
SINGLECODE
3c. How much do you know about careers in engineering? *Tick one only*
e) I know a lot
f) I know a little
g) I don't know anything at all
h) Don't know

SINGLECODE
4a. **We'd like to introduce you to Skills Miner!**

Skills Miner is a series of interactive maps set in Minecraft, designed to help young people discover more about careers in engineering. The minigames are designed to be played in lessons in schools, and encourage young people to navigate different industries within the engineering sector, including Aerospace and Energy.

Now that you have learnt about Skills Miner, how interested would you be to give this a go in your lessons at school? *Tick one only*
a) Very interested
b) Quite interested
c) Not very interested
d) Not at all interested
e) Don't know

OPEN RESPONSE
ASK IF RESPONSE TO 4a (CODES a – d)
4b. **Why do you say you are (**RESPONSE FROM 4a**) in doing some school lessons in Minecraft?** *Type in below*

GRID / SINGLE RESPONSE PER CONCEPT – ROTATE ORDER
5. **How interested would you be in new Skills Miner games that focus around the following themes?**
Very interested / Quite interested / Not very interested / Not at all interested / Don't know
a) The future of food *e.g. Zero hunger, clean water, new and innovative farming methods*
b) The future of energy *e.g. affordable and clean energy, using more renewable energy*
c) The future of communities *e.g. sustainable cities with zero waste, rural communities, environment, flood defences*
d) The future of industry *e.g. innovation and modernisation, how we travel, clean fuels*
e) The future of waste *e.g. zero waste, recycling, responsible production*

TOP THREE ONLY
ASK IF POSITIVE RESPONSE TO 3a (CODES a / b)
6. **What would be most helpful to you when learning about different careers in Engineering? Click up to three answers**
k) Detailed Job descriptions that describe the skills required for all roles in engineering and manufacturing
l) An interactive map of a city where you could find information about all the different industries that exist within engineering and manufacturing
m) More Skills Miner games and resources to use in the classroom complete with certificates for proven skills

n) A series of skills and personality assessments so you are able to understand your strengths and how to channel those into certain careers
o) Case studies, interviews and videos about people who are already in engineering careers
p) Skills Miner days or camps where you could play games and speak to experts from industry
q) A competition where students and/or schools could submit their innovative ideas and win a cash prize to build a working prototype of their invention
r) Something else? (TYPE IN)
s) None of these (EXCLUSIVE)
t) Don't know (EXCLUSIVE)