NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

STEM Education and the Primary School Curriculum

Report on a consultation with school communities on the nature of STEM Education in a redeveloped Primary School Curriculum

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Introduction

This report describes and recounts a curriculum consultation event entitled 'STEM Education and the Primary School Curriculum' that took place in Athlone on 15 November 2022. The event was jointly organised by the National Council for Curriculum and Assessment (NCCA) and the Burren College of the Arts. The event was designed using an adaption of the *Bringing Education Alive for our Communities On a National Scale* (BEACONS) model, developed by the Teaching Council, and was part of a pilot study entitled *Pilot Study of a Local School Community Engagement Model for Informing Education Policy Making*, supported by the Organisation for Economic Cooperation and Development (OECD).

The BEACONS model is an approach to consultation that aims to bring a diversity of stakeholders into conversation with each other and enable them to listen to each other on educational issues of common interest and importance. The stakeholders involved in this event were primary-school children, parents, teachers, special needs assistants, schools leaders, NCCA executive staff and other educational stakeholders from a range of organisations including the Professional Development Service for Teachers (PDST), the Teaching Council, the National Council for Special Education (NCSE) and Education Support Centres Ireland (ESCI).

NCCA is currently redeveloping the *Primary School Curriculum* (1999). At the time of writing, the *Primary Curriculum Framework* had been approved by Council and was due to be published in early 2023. The framework provides the foundation for a redeveloped Primary School Curriculum in the coming years. The next phase of work involves the development of specifications for five broad curriculum areas, one of which is STEM Education. Science and Mathematics are currently subjects in the current *Primary School Curriculum* (1999). The *Primary Curriculum Framework* introduces Science, Technology Engineering and Mathematics (STEM) Education as a curriculum area in stages 1 and 2 and Mathematics; Science, Technology and Engineering as subjects in stages 3 and 4 of primary school.

Science, Technology, Engineering, and Mathematics (STEM) Education, as described in the framework, supports children's capacity to understand and engage fully with the world around them. Mathematics provides the foundation for science, technology, and engineering and is the study of the relationships, connections, and patterns that surround us. Science, technology, and engineering are intrinsically linked and enable children to benefit from learning about and working with traditional, contemporary, and emerging technologies. The redevelopment of the Primary School Curriculum provides an opportunity to enhance children's learning through STEM Education and the positive impact it can have in the lives of children.

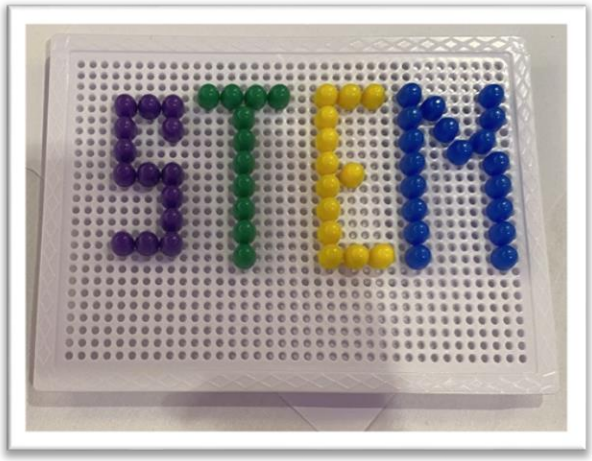
The purposes of the event were

- to gain greater insight into the role and place of STEM Education within the Primary Curriculum.
- to help develop a consensus around the learning experiences that STEM Education should provide in a redeveloped primary school curriculum.

This report follows the sequence of activities on the day as they evolved, and provides a description of the day's discussions and conversations. Suggestions, views and opinions in italics are as they were spoken or written. Given the relatively small scale of the event, the picture that emerges cannot be claimed to represent the general views of Irish primary school children, their parents or their teachers. It simply represents the views of these stakeholders at this point in time. Of central importance during the day was the process of engagement, with children and adults being given an opportunity to enter into conversation with each other on matters of curriculum development.

Setting the Scene

In attendance at this consultation were some 60 people, of whom 30 were children and young people from primary, post-primary and special schools. A list of participating schools can be found in Table 1. The children were accompanied by some of their teachers and Special Needs Assistants, as well as a number of their parents. A number of guests from education agencies also attended. The event took place in a large function room. Within the room, a large collection of STEM resources were displayed and made available to the children during the event's activities and breaks. Schools were encouraged to ensure that their diversity was broadly represented and, where possible, to include people who represent 'seldom heard voices'. NCCA liaised with schools to ensure necessary supports were put in place to support the needs of all children and adults. NCCA staff assisted in the organisation and supervision of the day's activities.



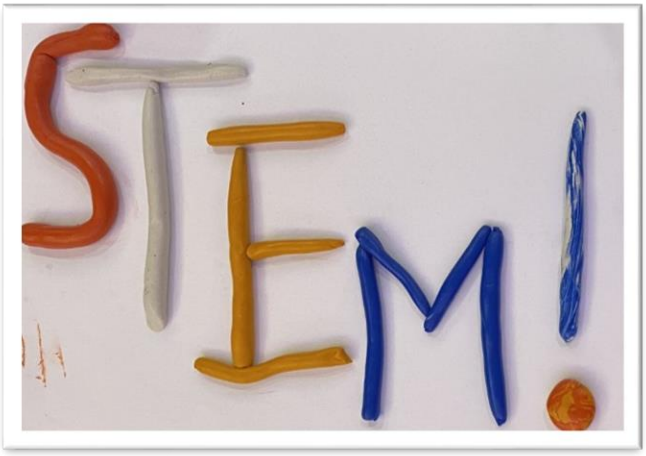


Table 1. List of participating schools

St Michael's Special School, Co. Roscommon
St Coman's Wood National School, Co. Roscommon
St Mary's National School, Co. Roscommon
Enfield Community College, Co. Westmeath

An outline for the day is provided in Table 2. Following an initial welcome and overview, the facilitator, a representative from Burren College of the Arts, directed the event throughout the day. Activities were structured and sequenced towards the purposes mentioned in the introduction.

Table 2. Outline of the day

Introduction
Expectations – 'one word from everyone'
Activity One – Understanding of STEM
Activity Two – Seeing through STEM eyes

Activity Three – Thinking about the future
Activity Four – Thinking about the future of education
Evaluation
Final comments and close of event

Expectations – One word from everyone

Participants at the event were invited to write just one word on their expectation of the day ahead. While this was essentially an introductory activity and ice-breaker, it nonetheless provided an initial indication of how the day's participants anticipated the tenor of its activities. Table 3 outlines the response to this activity. Figures after words indicate multiple references.

Table 3. One word from everyone

Collaboration (4)	*Friendship*
Teamwork	*Voices*
Projects	*Fun (5)*
Friends (2)	*Challenging (2)*
Futuristic	*Active*
Visionary	*Innovation*
Progressive	*Progress*
Inspiring	*Engaging*
Interesting	*Honest*
Accepting	*Inclusive / inclusion (9)*
Diversity	*Respect*
Woodwork	*Maths*
Cookery	*Art*
Science	*Technology*
Equality	*Learning (2)*
Opportunities	*Helpful*
Interests	*Sports*
Community	*Industry*
Education	*Variety*
Small classes	

A sense of possibility and potential were evident in many of the contributed words – *futuristic*, *visionary*, *engaging*, *progressive*, *inspiring*. There were frequent references to *collaboration*, *teamwork*, *friendship* and *fun*. *Inclusion* was the single most frequently mentioned word, and it was a theme further extended by references to *diversity* and *equality*. A number of words mentioned specific subjects or learning areas, most having direct relevance to the day's STEM focus. The sense that STEM Education involved *learning* at its core also came across in a number of contributions.

Activity one: Understanding STEM

For this opening activity, participants were asked to respond to the question – *What do you think of when you hear the word STEM?* Table 4 illustrates the range of responses. The responses are grouped into loosely related categories.

Table 4. What do you think of when you hear the word STEM?

Problem solving (3) *Active* *Interactive* *Doing* *Hands-on learning*	*Experiments (3)* *Exploration (2)* *Inquiry* *Possibilities* *Discover* *Learning (3)* *Education* *Linking*	*Creative (2)* *Creativity (2)* *Improving* *Growth* *Ideas* *Innovation (2)* *Integration* *Opportunities*	*Specific skills* *Life-skills* *Trade* *Making things* *Building* *Designing* *Drawing up plans*
Computers *Coding* *Laptops* *Electronics* *Communication* *Data* *Internet* *Robots*	*Knowledge* *Logic* *Blended knowledge*	*Engineering (3)* *Cars* *Science* *Equipment* *Aviation* *Transport* *Architecture*	*Work* *Teamwork* *Co-operation* *Teambuilding* *Interconnection*
Nature *Geography* *Biology* *Oxygen*	*Extracurricular competition* *Science and maths competitions* *BT Young Scientist*	*Maths (4)* *Numbers (3)* *Counting*	*Assessment* *Interesting (2)* *Fun*
Some additional teacher responses: - *I think of 'STEAM' – I like to see Arts included in STEM – the chemistry of creativity* - *Endorsement of ideas and thoughts* - *Something used for purpose* - *Innovation and creation through problem solving*			

Responses may be summarised under the following main themes:

- Inquiry / exploration / experimenting
- doing / making / problem solving

- innovation / creating
- teamwork
- skills, knowledge
- competitions.

While we don't know the extent of the children's previous experience of STEM Education, it's apparent that they have already established an association between it and the concepts of creating, making, inventing and problem solving. There's an obvious orientation towards development and progress, towards the generation of new knowledge, and that this is consequent on inquiry and experiment. Skills and hands-on learning are seen as integral to STEM Education, and there's an emphasis on co-operative learning and teamwork. All four elements of the curriculum area of STEM receive attention, with a particular area of interest likely to be evolving already for some children. (That early focusing would be further explored in later activities during the day). There were also references to competitions that children may have already been involved in.

To further explore children's experiences of STEM learning, they were asked to *recall a STEM lesson you did in your school that you enjoyed.* One child told of a trip by his class to the Science Centre (Dublin) – here he described making a volcano –*'I really remember that'* [referring to 'the mess'], where he and his classmates could do that which might not normally be done in the classroom. From another school, a child recounted making lava lamps – '*we learned that oil doesn't mix with water*'. '*It was really fun because we got to make our own ones'*. A child told of experiments with static electricity – running a comb through hair, then being able to pick up paper – '*that was fun'*. A young person from the post-primary school attending told of a series of lessons in their outdoor classroom which involved them in learning about how to grow things. She mentioned that because of online lessons during the Covid-19 lockdowns, they lost out on science lessons, but did more maths. Another child remembered an experiment with slime and rice on cling film, where music caused rice to vibrate – he remembered it being fun. Children in one school recalled making chickens out of wool – this was for a young entrepreneur event - they had to decide which wool was best - they also referred to the finances side of the project.

Making lava lamps - *'It was really fun because we got to make our own ones'*

Making a volcano - *'I really remember that'* [referring to 'the mess']

An experiment with slime and rice on cling film, where music caused rice to vibrate – *'I remember it especially being fun'*

'[We did*] a series of lessons in outdoor classes learning how to grow things'*

The examples above, provided by the primary and post-primary children at this event, may indicate their experience of a relatively narrow range of STEM lessons in their classrooms. This is readily understood since, in effect, STEM learning at present comprises lessons only in science and maths in most schools, and the absence of maths lessons being recalled here is possibly due to children's existing understanding of STEM as mainly science lessons. While not explicitly named in the current curriculum, engineering concepts are present in the 'Design and make' strand of the current Science curriculum and technologies are readily used and explored in many primary schools. The overt naming of these subjects in the redeveloped curriculum will likely provide teachers with ideas and pedagogies to expand children's STEM learning beyond but inclusive of maths and science.

Activity two: Seeing through STEM eyes

Here, the children were asked to think in terms of STEM issues when looking in turn at their school, a local park and a supermarket: *what aspects of science, technology, engineering and maths might be relevant to these settings*?

This exercise produced the following range of responses:

IN THE SCHOOL, children noted:

- clever touchscreens, the interactive whiteboard, laptops, Chrome books, iPads;
- measuring painted lines in the basketball court, blocks, school budgets, using a compass, e-share, calculator, posters;
- lighting, bushes, trees, grass, bugs, sun; yard and field, projects;
- measuring the schoolyard, kitchen, PE hall, science lab, laptop room, tech graph room, sensory room, stairs, toilets;
- the design of the school, outdoor classroom, jungle gym, basketball court;
- gardening, Hallowe'en, Science Week, Maths Week, experiments, using tablets and computers to teach/learn about coding, doing science projects.

This activity clearly demonstrated children's awareness of the multi-faceted role of technology in their school setting. They see technology in devices, equipment and a range of screens in their day-to-day learning. Engineering is recognised as central to school buildings, the design of classrooms and the school's infrastructure such as playgrounds, toilets, kitchen and gymnasium. They appreciate the role of mathematics in, for example, school budgets, measurements and calculators, and the learning of coding. Science is also noted in a range of learning situations, internal and external to the classroom, examples being the school garden, study of bugs, using a compass, and carrying out experiments.

IN THE PARK, children noted:

- Car park, playground, shapes, castle, bridge, man-made lake, duck ponds
- Flora and fauna - plants, grass, trees, animals' habitats, worms, eco-friendly, bee-friendly
- Play equipment, exercise bikes, swings, seesaw, slides, zipline, zipline physics (weight, speed, etc.), electric scooters and bikes, monkey bars, climbing frames, wheelchair swings
- Placement of equipment, angles of slides, paths (engineering), special surfaces, information signs
- Musical instruments, smells
- Wheels, lights, height limits, gravity (swing), technology to plan
- Gates, soft surfaces (safety), solar panels, exercise
- Well-designed playground, park layout, gates to park, speaker phones, structure.

It's not surprising that children show themselves as very familiar with the detail of parks and playgrounds. Looking through a STEM lens, they see a blending of the learning areas in the very

equipment they regularly play on. Arising from their sensory experiences of play and movement, swings and slides come in for frequent mention, as do ziplines, climbing frames and seesaws. This might be the first time some children considered why climbing frames or slides are designed as they are. Even the safety surface mats around equipment might not have received their attention before this. There is a strong emphasis on movement in the features children identify, perhaps highlighting again how play and familiar spaces can be an entry point into STEM learning for many children.

The natural features of parks are noted and biology is not neglected – grassed or wooded areas and their flora and fauna. Habitats such as lakes and ponds, and the wildlife that inhabit them, are given attention. Receiving less attention but still noted are the design features of parks – the spaces allocated to particular activities or functions – paths and gates, the carpark, a bridge, a pond.

IN THE SUPERMARKET, children noted:

- Automatic doors, scanners, lights, wheels, food labels, data, speakers, alarm, trolleys, baskets
- The building, weight a shelf can hold, area and volumes, temperature of fridge, self-service checkout, 'scan as you shop', card scanner
- Cash register, signs, self-service checkout, barcodes, prices budget
- Security cameras, marketing, tills, fridge, shelves, windows, roof, lights, sockets, air-conditioning
- Parking, locks, ATM, monitor, freezers, weighing scales, designs
- Prices, layout of products, ingredients, weights, advertisements, security, safety
- Sorting products, discounts and sales, staff shifts, profits, cash, pharmacy.

Perhaps it is in the supermarket that evidence of STEM is most immediately and strongly recognised by the children. From the very entrance through automatic doors, into the layout and design of one's movement through a store, on through the use of many features and devices to facilitate the shopping experience, to the infrastructure of the store – shelving, scanners, refrigeration - to the checkouts and tills where technology and maths combine. Even 'invisible' features such as air conditioning, security cameras, or the working conditions of staff are listed as having STEM dimensions.

Children were then asked to narrow down their specific learning interests. The question was posed to them as *'Of all these things*, [i.e. the items listed above] *what would you like to learn more about?* The following is a summary of their responses:

IN SCHOOLS:

- more tech (3), learning with technology (2)
- design of school building
- graphical drawing
- class iPads; cameras; touchscreens
- more engineering through Lego; more engineering in schools.

IN THE PARK:

- Designing playground equipment; play equipment
- Layout of the park and playground
- Physics of the zipline
- The bridge
- Outdoor classroom: Wildlife, trees, animals
- Ruins, castle.

IN THE SUPERMARKET:

- Displays and temperatures
- Marketing
- Alarms, scanners; 'scan as you shop'
- QR codes, barcodes
- Staff shifts and salaries
- Profits and prices; prices
- Price budget.

Most prominent in the learning 'priorities' above is children's desire to know how things work. These are mainly issues about the technology employed to make things happen. However, there's also interest expressed in what might be termed 'issues' – how prices are set, how the park is planned, how much retail staff are paid. In the school setting, strong favour is expressed for learning by using technology, as well as understanding how the technology actually works.

Activity three: Thinking about the future

As an introduction to this part of the day, participants were asked – *how useful do you think STEM education will be to you in the future?* Responses to an orally-presented Likert Scale were indicated by a simple show of hands. No hands showed for 1 (*not at all useful*), or 2 (*somewhat useful*), while just two chose 3 (*quite useful*). The remaining two levels - 4 (*very useful*) and 5 (*extremely useful*) between them received the great majority of support. Allowing that this was an unscientific survey - and conducted on a day devoted to a positive exploration of the role of STEM in their education - it yet reflected a dominant view among children that STEM will play a very significant role in their future lives.

Building on this survey, the focus turned to occupations and the place of STEM in people's work. Two questions were posed to the six groups:

1. Who are the people using STEM in their jobs?
2. How is STEM important in those jobs?

Each table group returned a chart listing the occupations they identified, and the role of STEM in the work done. Examples of the groups' returns can be seen in Table 5.

Table 5. Who are the people using STEM in their jobs?

Dentist	*Carpenter*
Blacksmith	*Farmer (2)*
Doctor (2)	*Mechanic*
Designer	*Scientist*
Hairdresser	*Archaeologist*
Builder	*Technicians*
Teacher (2)	*Astronaut*
Vet	*Coder*
Garda	*Architect*
YouTuber	*Entrepreneur*
Physiotherapist	*Athlete*
Builder	*Forensic scientist*
Baker	*Banker*
Cashier	*Cleaner*
Dressmaker	*Electrician*
Engineer	*Fireman*
Footballer	*Game designer*
Investigator	*Jeweller*

Mathematician	*Media designer*
Paramedic	*Radiologist*
Secretary	

Responses to the question 'How is STEM important in those jobs?' were as follows:

- *Most of the jobs require precision; they all include science in some way*
- *Technology is used for these jobs to work*
- *You usually use maths for everything*
- *Technicians use maths, science and engineering in their jobs.*
- *They all benefit society*
- *A coder needs technology*
- *They all have problem solving in common*
- *They need science for their work, e.g., the vet, the astronaut.*
- *It helps us with our jobs and daily life*
- *There is an element of STEM in every job*
- *Measuring quantities*
- *Observing reactions*
- *Using 3D technology for visualisation*
- *Mixing chemicals*
- *Co-ordinate geometry*
- *Find answers, discover, research*
- *Helping*
- *Planning; Designing*
- *Creating new ways*
- *Fix lives.*

The pervasive nature of STEM across the range of occupations was noted by the children. They saw that virtually every kind of work uses some elements of STEM, albeit some more than others. Teasing out the uses and benefits of STEM in people's daily lives further reinforced this understanding.

STEM disadvantages

Here, the facilitator, while acknowledging the very supportive remarks on STEM that predominated to that point, asked the participants if they had any concerns about STEM in terms of work and learning. The question posed was – *STEM has helped us in many ways, but what might be any dangers related to STEM?*

The following are a representative sample of responses from those attending:

- *If you don't build a bridge properly, people could die*
- *Engineering is dangerous, there could be an accident*

- *You could get hacked and lose a lot of things that you have saved*
- *Technology is dangerous if it falls into the wrong hands*
- *Mixing chemicals could be dangerous*
- *Bombs*
- *If an experiment goes wrong, it could end up with someone losing their life*
- *Wrong medications*
- *Cyber-bullying*
- *You can become obsessed with your job*
- *Isolated work – they get so focused on work, they forget how to communicate*
- *Overfocused – forget about things that are important*
- *Privacy*
- [Technology] *reducing jobs in the future*
- *Animal testing; ethics.*

As might be expected from children of primary years, most of their expressed concerns related to physical dangers associated with the use or misuse of technology or scientific processes. It would be interesting to explore the origins of these fears, which co-exist alongside children's enthusiasm for the use and exploration of technology.

A more reflective set of concerns appears in the second half of the list above. As responses here were not filtered out between adults (mainly teachers) and the children, it's not possible to say if those later comments came from adults. However, the nature of the concerns suggests that they did. The main theme they reflect is a fear of STEM depersonalising people's work and their lives generally.

Activity four: Thinking about the future of education

The day's final sessions focused on looking to the future and on suggestions for moving forward in thinking and acting in relation to STEM Education.

In the first part of this activity, participants were asked to *'list three things schools need to do more of'*. Responses here were as follows:

- *More groupwork (3)*
- *experiments (2), more hands-on science instead of research, like more discovery and experiments; more experiments, fun; more science for younger children; more constructive learning*
- *more projects, quizzes on technology*
- *outdoor learning (3), more outdoor science*
- *more maths (2), make maths fun*
- *educational trips, events (2), teams; go on STEM field trips*
- *more creativity/ways/options with learning*
- *get us more ready for secondary*
- *have small assessments but often.*

(Responses were fewer from this point as one school needed to depart early.)

As can be seen, the central theme here is a desire for active learning. No-one recommended using more textbooks, but many believed that learning should be more hands-on. Children generally expressed a preference for activities, regardless of the learning area or subject designation. That preference is even more emphatic in respect of the experiences they expect in STEM learning.

For the activity's second part, the questions posed were: *Why do you think the STEM subjects have been put together? Which STEM subject is the most important? And why?*

The method used for this activity was the 'walking debate'. Here, children were asked to '*vote with your feet'*. Posts had been set up at four points in the room, each labelled with one of the four STEM designations. The children were asked to walk to the post that represented the area they considered to be the most important of the four.

Large groups went to both the maths and science posts, a few chose engineering, with just two prioritising technology. Asked why they chose the STEM post they had walked to, one child said '*You need maths to support all the others'*; another said '*You can't do anything without maths'*. In support of technology, reflecting earlier conversations, a child said '*It's all around us'*, while another view was '*It's where it's at for the future*.' A supporter of science believed that '*It's how you discover things'*. Instancing an example of such discovery, another said '*It was science that made vaccines during the pandemic'*. There was universal agreement with the statement that all the elements of STEM learning are interdependent, and that no one area could be separated from the others. Asked then which STEM post they would go to as a second option, 'to learn more about something', a number of the larger groups moved to engineering, the others mainly to technology. A voice among those who moved to science declared that there was '*so much to learn, so much to discover'*. Wishing to show they were choosing a number of areas together, a few children took up

a position in the centre of the hall to emphasise their understanding of the interdependence of STEM. They further added to this, saying that '*the best jobs in the future will be in STEM*'.

A question was then posed to the plenary group – '*What would you most like to learn more about in STEM?*' In responses, most interest was expressed in science and technology, some in engineering, a little in maths. The following are representative examples of responses:

- *I would like to learn more about science (5) because I want to do more experiments (3)*
- *Using technology in science or a few classes linking STEM together*
- *We should learn more about science because there is so much we need to learn about and discover*
- *I would like to learn more about technology, coding, how things are made*
- *Exploring how technology works*
- *Technology (4) 'because it's the future'; coding*
- *I would like to learn more about them all but I find engineering the most interesting*
- *I would like to learn more about engineering (5); engineering, because my dad gives me advice*
- *I would like to learn more about maths because you need it in nearly everything and with science it is very interesting because it is all around you*
- *I would like to learn more about editing because that's how movies are made*
- *I would like to learn more about graphical drawing*
- *I would like to learn more about everything (3).*

Children's positive and affirming views on STEM learning are again evident in their responses here. Given that both science and maths are already within the primary curriculum, posing the question in terms of wanting to *learn more* about the area or subject could be expected to produce a favouring of the new areas of engineering and technology. Both are indeed favoured in the comments recorded (the above being representative examples), but further interest in science was also indicated. Maths received few comments, but earlier exchanges showed that its role in support of all STEM learning was understood.

One parent's concerns echo those of some teachers in earlier consultations around curriculum overload. This parent's perspective was written thus: *What are you going to lose in order to make room for engineering and technology? Will it be a dumbing down of maths and science? Why is engineering and tech so important? . . . Why specialise, i.e., give children these skills to all so young? . . . Is it based on current employment opportunities? This landscape will shift.*

The final question posed to the participants was *What ideas or insights do you have now that you didn't have before this event?* It was also presented as *Something new I've learned today is . . .* Responses are set out in Table 6 and loosely grouped by theme.

Table 6. Something new I have learned today is…

STEM is the most important set of subjects *All of STEM is connected in some way (3) because you need them to operate any one of them* *I have learned that all of them are important/significant (3) and they all go together (2)*
[I learned] how you don't have to make tons of fancy equipment because technology is everywhere *How technology is everywhere*
You need all these subjects to create the future *I learned how STEM is important involving school, jobs and the future* *I learned about how important STEM is within our daily life (5) and how a lot of jobs use STEM.*
Maths is the most important subject but they all rely on each other
We should listen to everyone's ideas
Teachers' comments: *How fun is a big factor of student enjoyment* *Often children don't realise they are using the skills of STEM in the classroom* *Children really recognise the importance of maths!*

Summary

For many children participating in this consultation event, the proposal to organise science, technology, engineering and maths under the STEM banner may have been their first encounter with the acronym. The day's activities provided them with several opportunities to consider the relationships between the subjects concerned and to reflect on what STEM learning could and should look like.

Children's feelings about the nature of learning in these areas were predominantly positive. In their contributions to discussions and in their responses to questions posed, children had a strongly future-oriented perspective, referring to potential and possibilities in STEM learning. There was much reference to people's jobs and the role STEM has and would likely have into the future.

As to the nature of STEM learning, children emphasised some desired characteristics, namely *teamwork*, *friendship* and *fun*. (Teacher participants added *inclusion* and *diversity* to those.) As in surveys of children's views on other areas of learning, the practice of working in teams or groups is affirmed here – that STEM learning is better done with others. Active, participative, hands-on engagement is desired, and children wish fun to be an element of their learning, echoing the Draft Curriculum Framework's proposal for *playful experimentation and investigation*.

The children's understandings of STEM Education were undoubtedly shaped by their experiences of learning in science and maths; technology and engineering would bring new experiences, complementing and being complemented by the existing curriculum provision, with increased attention to transferable skills. A collateral benefit for teaching and learning in maths may be that it is more readily seen in its enabling and supportive role rather than only as a standalone subject in its own right. Proponents of greater integration across the curriculum would see the possible blurring of subject separateness as interconnections become more obvious and indeed necessary. The frequent references during this day to STEM learnings all being interdependent suggest that many children already think in that way about it.

Some children's fears expressed about possible STEM dangers are natural to their age and stage, with physical risks foregrounded. Expressed parental concerns may also be reflected in such fears. Whether fears and concerns regarding the direction of some STEM developments come from children or adults, they do prompt consideration of the need for education in ethics and social responsibility to be applied to some aspects of STEM Education.

NCCA

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