Education Scotland

STEM sharing practice blether

Tuesday 16 June 2020

Scene setter

In the current climate, the importance of STEM has never been greater from NHS staff to the government scientific advisors, from manufacturing companies switching focus to technical departments in schools producing visors.

Key questions

- What has STEM learning looked like in your setting in the past?
- During lockdown how have you and/or your learners been engaging with STEM?
- How could you incorporate STEM in a blended learning approach for your learners in August and beyond?

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Key links

- STEM Wakelets, STEM Nation Blog and STEM Resources page
- Professional Learning Communities (PLCs) on Glow - including Sciences, Technologies, Numeracy & Mathematics and other national PLCs
- STEM education and training strategy for Scotland and second annual report
- Scotland Learns: for parents and carers and for practitioners
- Practitioner support for remote learning, Learning and teaching online guidance
- Contact your regional STEM education officer using the email address below:

FVWL	North	South East	South West	Tayside	West	RAiSE
Mairi Thomson	Janey Irving Mark Irwin	Lynn Yeneka	Lorraine Ross	Hazel Gardner	Margaret Craw Carole Gillespie Ian Menzies	Gayle Duffus

Notes and weblinks from group discussion

Room 1 with Lynn Yeneka

PAST

- Secondary: STEM engagement across the school, common approach in St Andrew's - e.g. graphs in different subjects, STEM clubs across the curriculum - making sure pupils realise that it is a range of subjects and interests, making sure of good STEM engagement, e.g.CREST Awards | STEM , Young STEM Leader - training available Events | YSL Programme Pilot , STEM Academy Scotland , upper and lower level STEM challenges in school and now on Showbie – Your classroom, connected.
- Nursery : creating boxes linked to Es&Os e.g. magnets, activities, questions and language, ran workshops with families - family groups, trained practitioners, simple activities to take home and carry on at home - take home sheets and goodie bags.
- What's in the STEM boxes: film canisters, vinegar, cornflour, vitamin c tablets , food colouring , M and Ms, Mentos for cola fountain, syllabus links, USB with demo videos, lesson plans and including expensive items like goggles if European funding available...
- Primary: STEM in a suitcase - e.g. robots, make robotos, read robot books, planning for teachers
- Marvin and Milo | IOPSpark

PRESENT

- Sent out questionnaires to practitioners about needs, STEM through stories, blog and teams page - STEM Falkirk , sending out challenges on Teams to school, creating planners for blended learning for after summer and CLPL videos.
- What people have found works with secondary pupils with complex needs who are working at early/first level and primary activities are not always appropriate????
- The use of IMovies in delivering STEM challenges to younger pupils - have created two to set them a context to get them engaged.

FUTURE

- Do Try This at Home*suitable for home teaching* | STEM , Simple home tasks - things that are in the cupboard but can be related to science, making play dough and gloop, Making Conductive Doug, snappy circuits is always a good one for primary schools.
- Wild in June Wildlife Trust , Seek by iNaturalist app for phone identifies plants and animals.
- Blended learning - packs for vulnerable children.
- Set up a Teams page - with breakdown to EY, Primary, Secondary with videos sharing practice, secondary schools with boxes that circulate round primary schools in their cluster.

Room 2 with Hazel Gardner

PAST

- Pre-lockdown learning featured practical work, investigations, group work, STEM challenges/competitions (such as Shell Bright Ideas challenge), STEM clubs (inc. Young Engineers Clubs), engagement with partners and STEM excursions.
- Contact Gemma Gourlay (g.gourlay@robertson.co.uk) for more information on Robertson Group community STEM engagement - programmes are responsive to needs of school.
- For some, STEM was a focus of transition activity and cluster working.
- Focus on discrete subject areas - now looking to develop IDL, DYW and range of learner pathways (NB Maths teacher at Oban HS delivering FA in Engineering).
- Participation in Digital Schools Award and STEM Nation Award.
- Professional learning from SSERC and other partners.
- Looking to involve parents to help build STEM capital.

PRESENT

- Strong emphasis on digital tools during lockdown, building on existing practice in rural/ remote areas. STEM context/topical science is engaging primary pupils at home.
- Support for disengaged/vulnerable learners through phone calls home. Activity packs issued to some pupils - examples from D&G STEM team and Connolly Campus, WL.
- Platforms being used: Teams, See Saw, Class DoJo, Twitter, Google classroom.
- Resources: Fold n Fly, SSERC TV, Glasgow Science Centre, PSTT (Science at Work, Science Fun at Home, Why How Newsletter), Hour of Code, Great Science Share, STEM Learning starters, Sway Maths lessons (P1 - P3 example), Book Creator (P1 transition).
- Flipped learning in secondary schools is working well with senior phase pupils. Approach has also been effective for some P5-P7 classes.

FUTURE

- Outdoor Learning, IDL (Scotland Learns) and developing further DYW links.
- Should the focus be on Literacy, Numeracy and Health and Wellbeing in August? Suggest STEM as a context (example) or STEM learning at home as part of a blended learning.
- Virtual STEM lunchtime clubs are working well and reaching a wider group of learners.
- Focus on diversity of role models, review resources, continue to challenge stereotypes - STEM and equity paper, embedding equality in resources, more resources from IGBE.
- From “life without practical science” (ASE webinar) - use this time to develop ‘soft skills’ through STEM research tasks e.g. critical thinking, fact-checking, identifying bias, discussion, debate and communication of science and STEM.

Room 3 with Mairi Thomson

PAST

- Connect with colleagues/team of people to work with across schools and departments.
- Keep STEM practical and fun - you don't need lots of resources.Consider STEM CREST Awards.
- Focus on engaging the children – themes, visual fun activities can help with this. Science, Lego and engineering challenges such as Siemens and Dyson are a good place to start.
- Professional learning opportunities offered by SSERC, YSL, STEM Ambassadors and Eco Schools
- Good to explore how STEM fits with employability. Share why STEM is relevant together with building the STEM and science capital of families so they see it as something for them.

PRESENT

- Young STEM Leaders (YSLs) create virtual tasks for the young people to complete. They create weekly/fortnightly STEM newsletters focusing on BGE and careers for those in Senior Phase. STEM Learning - has activities e.g. desert island that can tie in with CREST Awards
- Encourage children to explore STEM through tinkering and developing things through the use of apps such as SEEK, Picture This and Spot a Bee and a range of platforms.
- During lockdown practitioners have created daily STEM challenges and STEM at home grids using easily accessible resources. Example - Practical Action STEM Around the World challenge.
- STEM Ambassadors are keen to engage with schools. Access through an online platform. Aileen Hamilton who leads the West of Scotland STEM Hub was present in the blether and hosts the Science Connects website. The I'm a scientist site also offers secure, live chats with scientists.
- At home children are baking, sowing seeds etc. - good to connect these life skills with STEM.
- Allowing children to lead learning can address issues with low confidence levels. Provide opportunities which enable exploration and tinkering and do not need fancy resources e.g. build rollercoaster and include a loop. This can support learning of angles, height. distance, speed etc.
- Practitioners find that they source STEM ideas through Twitter, TES, TAPS and ASE.

FUTURE

- Draw on pupil leadership to support STEM learning and expand what is on offer. Teachers can help facilitate learning with young people leading. This works well when linked to the YSL award.
- The challenge of marking was discussed and helpful suggestions regarding feedback e.g. generated forms, dictation using Word and audio files on One Note.
- One practitioner shared the plans for three schools to extend the virtual science labs to supporting STEM virtually so all three schools can engage.
- Virtual tours of workplaces – STEM Ambassadors/DYW group can perhaps help.
- Outdoor learning can support STEM learning - ideas can be found here .
- British Science Week - go back through previous resource packs and look for ideas.

Karen Creighton has kindly offered to share access to the professional learning materials from the recent Dumfries and Galloway STEM conference. Joining instruction can be found here.

Room 4 with Janey Irving

PAST

- STEM family challenge boxes. Online learning journals, Twitter & Friday STEM Newsletter.
- **Building leadership capacity**: SSERC Primary Cluster Programme (focus on science investigation skills), secondary school created kit boxes for loan, RAiSE team in Local Authority (focussed on technologies/engineering), Digital Leaders, Young STEM Leaders and STEM Nation Award.
- **Widening STEM Pathways**: Young Engineers Club in S3, F1 in schools competition in S6 (using Teams); YSLs working with cluster on transitions and supporting Early Years; nail bar/barista station (using YouTube 'how to' videos) has helped pupils engage with STEM in a wider context.
- **Employability in STEM**: Bridges - Forth bridges, the science and maths in bridge building, Da Vinci Bridge Challenge; STEM Ambassadors - Royal Marines came in and did a full day on buoyancy, Arnold Clark led a session on engineering and supporting girls into STEM.

PRESENT

- **STEM Partnerships**: developing STEM in your communities and making links e.g. RBS is keen to link with schools. Other examples: local construction company supporting model car/racetrack project . Living Spaces - Eco house; construction companies, architects, energy specialists all involved. STEM Ambassadors work with pupils then invited in to judge the work.
- **STEM Learning at Home:** Creating basic kit packs of materials & resources to support further learning at home. Printed instructions to reduce screen time. Promoting learning outdoors and whole family learning "STEM with siblings". IDL - put the M in STEM - how to apply Maths skills through Science/Tech/Engineering practical activities. Nursery children sent sunflower seeds as a project with activities to do over the summer. Support parents at home to engage with STEM.

FUTURE

- **STEM Nation Award**: request for PL on this from Ed Scot to support STEM Leads in LA.
- **Pupil engagement**: pupils working collegiately where they are responsible to the group improves participation. YSLs support younger pupils in their online learning through Microsoft Teams.
- **Planning for blended learning:** share responsibility for curricular areas, work across cluster. RIC developing IDL planners for Early/First/Second level. Sharing in secondary sciences - look at BGE

Further practice examples and weblinks:

- PSTT - Science Fun at Home, Science at Work, Science for One, SSERC TV on YouTube
- STEM Learning - online CPD, Home Learning, Survive Desert Island
- I'm an Engineer, Royal Society of Chemistry, Reach Out CPD, STEM module for ELC (register here)
- STEM in the outdoors for ELC (senses, minibeasts, sorting and grouping leaves etc.)
- STEM Sways for families, S1 and S2 Wakelets, Great Science Share, SUMDOG maths challenges, back garden bird watch using Seek App, Microsoft Forms, Fold n Fly, Minecraft Education.
- Linked STEM to health week by setting STEM challenges to build hurdles and basketball nets.
- TeenTech competitions for primary and secondary - industry links and increased uptake.

Room 5 with Lorraine Ross

PAST

- Sunflower Family Nurture Centre - staff and practitioners are engaged and enthused by STEM learning. Families regularly participate in STEM activities. Expectations are high for all and strong connections with the local community exist e.g. biomass company.
- East Wemyss Primary has a maker space and runs popular family engineering sessions.
- Within Kilmaron complex ASN provision, STEM focus is predominantly ecological and learning for sustainability in nature. Learning is made relevant to learners e.g food growth cycle.
- Settings have embraced tinker time and peer to peer learning to engage children. These link to the local context and the curriculum in terms of skills development/progression pathways.
- Early years' maker space included challenges to solve/engineer. Further development focusing on 5c's - collaboration, creative, communication, curiosity and critical thinking. Maker station now has its own space enabling the children to develop skills at their own pace/with support.
- Revised S1/2 BGE course is both context and skills driven. Skills focus helps with gender balance in terms of uptake in subject areas.
- Practitioners were keen to share BGE course outlines and also secondary IDL work.

PRESENT

- Denny Ambassadors active on Twitter and Teams for activities for EY to AH. Working towards Leadership Award, PDAs & baccalaureate. Focus on STEM in P7/S1 transition (video links).
- Colleagues engaging via social media platforms. Encouraging parents/carers to engage - maker Monday's, using Lego, creative with resources from home. Families to share online journals
- Home experiments for senior physics - using apps for experiments etc. - 95% engagement. Instructions vital for home learning & video content engagement. Range of engaging level 3/4 science videos on YouTube and a website - FuseSchool
- EY - strong relationships with families maintained. Supporting with resources - make it Monday, thinking Thursdays, singing Saturday, signing Sundays - sharing learning & achievements via videos, photos. STEM Market - successful. STEM module from UWS - fantastic.

FUTURE

- Primary and ELC STEM bags - Given a specific STEM challenge/problem to solve using what they have in the bag. Not huge digital element, not costly to support & equitable - fully inclusive. Secondary suggested a similar bag devised using equipment on loan from labs - practical in labs in school to be difficult - something to take home may be answer.
- YSL seniors ideas to support pupils at home accessing STEM in blended learning
- Stop go animation videos but make sure that the science is completely correct.
- Some resources collected here for blended learning https://wke.lt/w/s/QAuoPp

STEM supplementary information - Karen Doherty

Ideas for STEM bags and books were shared by Karen Doherty (Karen.Doherty-sa@fife.gov.uk)

STEM bags

Mesh bags from Sainsbury's are inexpensive and roomy. Contents could be changed to support investigation of electricity, forces, vibrations and waves. Assorted contents, ideally items found around the house or outdoors. Encourage pupils to collect outdoor items in a clean margarine/ice cream tub:

elastic bands	drawing pins	buttons
beads	paper clips	straws
sticks (various lengths)	Playdoh	Blu tak
ribbon	string	bottle tops
cotton reels	wood offcuts (small & sanded)	hair bands
scraps of jewellery	laces	pencil stubs
cocktail sticks	photo clips	safety pins
scraps of fabric	foam scraps	Lego
clothes pegs	card	toilet roll inner
pen casings	netting from oranges	K'Nex
twigs	pebbles	feathers
leaves	bark	nutshells

Suggested uses:

Challenge 1 – Create a model of your dream playground/theme park
Challenge 2 – Create a model of the perfect zoo
Challenge 3 – Create a model of your dream bedroom
Challenge 4 – Create a model of your dream classroom
Challenge 5 – Create a model of a castle
Challenge 6 – Create a model of a space rocket
Challenge 7 – Create a model of your dream car
Challenge 8 – Create a model of a ship which can clear the ocean of plastic without harm to nature
Challenge 9 – Create a model of a machine which will stop forest fires
Challenge 10 – Create a model of a machine which will make dirty water safe to drink
Challenge 11 – Create a model of a machine which will provide free renewable energy
Challenge 12 – Create a model of a machine which will assist a person with a disability

STEM books

For use with learners:

Title	Author	Level/Stage	Curriculum Links	Extension Ideas
One Mole Digging a Hole	Julia Donaldson	Early, First, Second	Num, Lit, Life Sciences, HWB	
Rosie's Hat	Julia Donaldson	Early	Lit, life sciences	Career education standard, Improving gender balance
One ted falls out of bed	Julia Donaldson	Early, First, Second	Num, Lit, Science of sound	
Count to 10 with a mouse	Margaret Wise Brown	Early, First, Second	Num, Lit, Measure (Time)	
Harry and the dinosaurs say Raahh	Ian Whybrow	Early, First, Second	Lit, HWB (dental)	
Harry and the robots	Ian Whybrow	Early, First, Second	Lit, HWB, Tech	Supports recovery curric – features sick Nana in hosp
Fix it Duck	Jez Alborough	Early, First, Second	Lit, science – forces, properties of water	Set up a tinker table so pupils can investigate & create
Messy Maths	Juliet Robertson	Early, First, Second	A playful, outdoor approach for EY	Many ideas can be adapted/extended for older pupils
Dirty Teaching	Juliet Robertson	Early, First, Second	A beginner's guide to Outdoor Learning	Similar to Messy Maths but wider curric application
Above and Below	Hanoko Clulow	First, Second	Lit, Life sciences	Useful for Cop26, SDGs, Eco schools work
Project Space	Ian Graham Miles Kelly	Second, Third	Lit, Science - Space, Tech	

For teacher reference:

Title	Author	Teacher resource	Description
Build it	Caroline Alliston	25 creative STEM projects for budding engineers	Excellent diagrams & clear instructions. Specifies difficulty level for each activity.
Coder academy	Sean McManus	Step by step guide for novice coder	Designed for single user but ideas could be adapted for group work
The Bacteria Book	Steve Mould	Highly detailed but accessible guide to germs, viruses, fungi etc	Topical link with Covid19 – use with visualiser for max benefit in class. YouTube channel too.
DIY Science	Autumn Publishing	30 general science experiments for primary level physics, biology, chemistry	Kitchen sink science format but with clear explanation of core principles behind each task.
Particle Physics brick by brick	Dr Ben Still	Atomic and subatomic physics explained in Lego	Colourful and written in sensible chunks for the novice physicist