Cymru
National Day Nurseries Association

Factsheet

STEM in the Early Years

Curriculum for Wales

STEM in the Early Years

Supporting STEM development in the early years is not just providing 'activities' that link to STEM, it is about practitioners understanding that children are capable learners who can be inquisitive about their own interests. As enabling adults, you should nurture and expand on their interests and provide a safe effective environment for them to explore the things they're curious about, in authentic contexts. This is how our youngest children make meaning of the world around them.

What does STEM mean?

STEM stands for science, technology, engineering, and mathematics. Every aspect of how the world works and functions relies on STEM. Think about a normal day in your life, almost everything you come into contact with is a result of STEM – where you live, what you eat, how you travel around and communicate with others are just a few broad examples. The four fields that make up STEM have been purposefully grouped together. These four fields are highly interconnected, with learning in one leading to (or even requiring) learning in one or more of the others.

Why is STEM important?

STEM will continue to be a large part of the future your children will grow up in and will directly impact many of the careers they will take. The children within your setting will be the innovators, developers, inventors, and leaders of the future! By supporting STEM learning and development, you can help mould the inquisitive and enthusiastic minds who will create the new and ever-changing world.

In this forever rapidly evolving world, supporting STEM learning develops children's collaborative working, communication, critical thinking and problem-solving skills. Skills that will be integral for children to face future challenges once they leave education. STEM learning is the exploration of the curious mind and its intent to discover, instead of just telling children what to do or how to do it. When children are engaged in effective STEM learning, they become more confident learners who can see the connections in real life contexts and make rapid progress.

Is STEM suitable for children in the early years?

Development of STEM skills is important for children of all ages. Although some people question whether young children should be accessing STEM, a growing body of research suggests that developing STEM skills in the early years builds a solid foundation for STEM education later on. Reading the answer to the previous question, you may have felt that it all feels very familiar to you. You would be correct. The focus on authentic and purposeful learning within the curriculum mirrors some of the concepts behind STEM learning and development within the early years.

National Day Nurseries Association
National Early Years Enterprise Centre, Longbow Close, Huddersfield HD2 1GQ
tel: 01484 407070 fax: 01484 407060 info@ndna.org.uk www.ndna.org.uk

"We know that children learn well when actively engaged in experiences that stimulate their interest, ignite imagination, and inspire curiosity. These experiences should encourage children to investigate, explore, create and be active participants in their learning. Relevant and meaningful experiences that are rooted in real-life contexts will enable children to make connections, apply knowledge and consolidate skills. Real-life experiences can enable children to take the lead in asking questions, identifying problems, taking risks, and finding solutions. Creating opportunities for children to apply what they are learning to real-life situations helps them understand the purpose of their learning and can enhance well-being, self-esteem, and resilience. It encourages exploration and creativity and will support children to develop an understanding of the world around them."

Curriculum for funded non-maintained nursery settings

STEM is a natural part of children's daily lives as they pose questions, explore their surroundings, and figure out how things work. The holistic nature of supporting learning and development in the early years lends itself well to the delivery of early STEM learning experiences. Research demonstrates the importance of introducing children to a wide range of authentic and purposeful learning experiences early on in order to support better development as they move through their education. The sooner children are engaged in this exciting and engaging play, the more likely they are to continue their learning later in life.

Piaget (1936) described children as "little scientists" who actively learn by observing and interacting with the world around them. This was contrary to the popular thinking of the time that viewed children as "empty vessels to be filled with knowledge." Piaget believed that children are always reflecting on their experiences to gain new knowledge. As children have different experiences, they build on prior knowledge and their ideas evolve.

How can practitioners support STEM learning and development?

As enabling adults who plan engaging learning experiences based upon children's curiosities, questions, and explorations, you are in a prime position to encourage the development of STEM skills. If children are not nurtured to explore their natural curiosities, they will not develop the important skills attributed with STEM learning and development. Encouragement and exposure to broad experiences from enabling adults who model a joyful approach to learning, making best use of the teachable moments that occur naturally as you observe or engage in children's play, supports children's STEM learning and development.

Try to notice the little sparks of interests you may see from the children in your setting. Three simple but effective things you can do as an enabling adult include:

1. Engage in sustained shared thinking (see our factsheet on this topic for further support)

2. Introduce vocabulary linked to new concepts
3. Model and encourage imaginative and exploratory play.

What if I am lacking confidence in supporting STEM learning and development?

Do not think of supporting STEM learning and development as something 'additional.' As highlighted above, STEM learning already links extremely well to the curriculum, across all developmental pathways, but in particular the exploration pathway, numeracy and digital competency development. Through effective delivery of the curriculum, you will already be supporting children's STEM learning and development. However, as enabling adults in the setting, it is important to be aware of how you can support to further develop, extend, or challenge children in their learning. By reflecting on your practice, you can become more confident in the above three steps to support children's learning and development.

Designing effective environments that develop STEM learning and development

As mentioned previously, if you are successfully implementing the curriculum, you will already be offering the opportunities to develop STEM learning. However, it is worth considering how you respond to children's natural curiosity and build upon their fascinations to enrich your learning environments.

Reflect upon the areas that you have within your effective environments - are you maximising the opportunities for children to develop their exploration skills, numeracy skills and digital literacy?

Are you offering children the opportunity to:

- Access open-ended resources that enliven their curiosity
- Experiment with and begin to understand cause and effect
- Explore lines of enquiry and ask questions
- Gauge and manage risks and to challenge themselves
- Have access to a range of digital resources
- Have authentic experiences in the natural world
- Play and experiment with a variety of materials, textures, and tools, indoors and outdoors
- Support and develop mathematical and scientific concepts and language in meaningful ways.

Delivering STEM learning opportunities through engaging experiences

There are a wealth of opportunities for developing STEM learning through engaging experiences. Through delivery of the curriculum, experiences should encourage children's independence, and offer risk and challenge. They should be rooted in real-life, authentic

contexts, to engage children in deep levels of involvement and long periods of uninterrupted active learning.

Children need practical experiences that:

- Encourage them to use simple mathematical vocabulary when exploring quantity, number, shape, and pattern
- Support their cognitive development by providing opportunities for comparing, sorting, and classifying living and non-living things
- Provide them with opportunities to explore and experiment with digital technology for a range of purposes.

This should feel familiar to you – they are all things expressed within the curriculum. But they should help you to reflect on your practice and the learning experiences that you offer to consider how you can further develop them. For example:

- Create a bug hotel – over time, encourage children to observe and discuss the different insects that might have made a home there
- Creative play – make a cup and string phone with children or experiment with making instruments. What sound can you make?
- Creative/messy play – mixing coloured paints. What colours can you make and how?
- During mealtimes, asking Helpwr Heddiw to set the table. They may start with giving one plate to each person. Later, they begin to realise they can match a plate to a chair, and when they are more sophisticated in their understanding, they realise that's the purpose of counting; to count the chairs, then count the same number of plates
- Encourage children to engage with technology at every opportunity e.g. Use self-service tills, press the button at a crossing, observe/use different modes of transport
- Host a sensory hunt in the outdoors – challenge children to find things which are smooth, rough, bumpy, fluffy, hard, or smelly
- Mud kitchen/messy play – explore reactions of mixing different materials and liquids
- Water play – could you move the water source to further away from the mud kitchen/water play area and provide children with a range of equipment to transport the water. Include challenging or unsuitable items to develop thinking e.g. A colander, egg cups
- When a child causes a spillage, can you challenge them to clean it up – give them a range of material/equipment to investigate cleaning it up.

These are just a few examples of the many ways you could develop children's exploration skills, numeracy skills and digital literacy through engaging experiences.

How to overcome challenges with developing STEM in the early years?

Sometimes a practitioner's own negative experiences of science, mathematics and design technology in school can be reflected in their lack of enthusiasm for STEM experiences. However, highlighting how STEM learning and development is already being supported through the opportunities offered within the setting can tackle these negative feelings and develop confidence in practitioners.

One specific element of STEM which can pose a distinct challenge is supporting children's digital competency. Time and budget constraints can make it difficult to find opportunities to engage with real life technology. The quality of experience with technology within settings can be varied and the same can also be said for children at home. There can be inequality of access to technology at home for children due to their families own financial situation or beliefs about technology.

Technology in the setting, does not need to result in a huge cost implication. Children can gain knowledge and independence from resources that are not actually working as it offers a more authentic experience as opposed to plastic/wooden versions. E.g. Use social media, second-hand sales sites, and communication with parents/families to source materials such as typewriters, walkie-talkies, old laptops, keyboards and phones. And where possible provide opportunities to engage with working technology. Technology is fast-changing, ensure when you do engage with it, it is meaningful to the children and their learning.

Five things to remember about STEM in the early years:

1. It is never too early to start learning about STEM, even babies can learn from STEM
2. STEM is not a new subject – it's based on exploration, solving problems and trying out new ideas through hands-on activities
3. STEM fosters children's love of learning. They feel in control and eager to find out more. Taking the time to help them find out the answers is what STEM is all about
4. Staff do not need to be trained to do STEM, just shown how to link it to what is already being done and extend!
5. You do not need to buy expensive resources – you will have all you need and will find STEM resources everywhere in your setting.

Useful links and resources

- NDNA Cymru Engaging experiences factsheets - http://www.ndna.org.uk/WelshFactsheets
- Digital Competency – Free NDNA Cymru factsheet- http://www.ndna.org.uk/WelshFactsheets
- MyNDNA Resources - https://ndna.org.uk/my-resources/

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Brighter thinking for early years

Factsheet

Our factsheets are written by early years experts for the early years workforce. Most NDNA factsheets are free to our members.

NDNA is the national charity and membership association representing children's nurseries across the UK. We are a charity that believes in quality and sustainability, so we put our members' businesses at the very heart of ours.

We are the voice of the 21,000-strong nursery sector, an integral part of the lives of more than a million young children and their families. We provide information, training and advice to support nurseries and the 250,000 people who work in them to deliver world-class early learning and childcare.

See the full range of NDNA factsheets at www.ndna.org.uk/factsheets

National Day Nurseries Association
3 Connaught House, Riverside Business Park, Benarth Road, Conwy, LL32 8UB
tel: 01824 70 78 23 wales@ndna.org.uk www.ndna.org.uk