**STEM in Early Years**

STEM (Science, Technology, Engineering, Maths) is a cross curricula initiative to combine subjects that lead to critical inquiry, creation, and higher order thinking skills. It has the capacity to elicit interest and passion for the subjects, and encourage children and young people to set their sights on careers in these areas. It has recently begun to evolve into STEAM which has the addition of the Arts. This has grown in popularity in the US, and Herold (2016) review of literature on Makerspaces gives a good synopsis as to why this has been the case, thus, there is much research originating from this part of the world in terms of benefits and limitations of STEM delivery; so much so, it has begun making waves in primary, secondary and FE provision in the UK. You will now find STEM Ambassadors and professional experts delivering workshops, training, mentoring and networking in our education system. But what about the Early Years 0-5 age range?

For our 0-5’s, STEM type outcomes can be found within the Early Years Foundation Stage (EYFS) specific areas of development, namely; Knowledge and Understanding of the World and Mathematics. We can use the current curriculum to help us tease out what STEM looks like at this stage, it could be summarised as follows; Science is a way of thinking through observation and investigation, questioning how and why things work and events happen. Technology is a resource to be explored or a means of doing and documenting. Engineering is a way of combining materials to design and create structures and working apparatus, and Math is a way of measuring, sequencing, patterning and classifying. If you look closely, STEM can be found within all areas of the EYFS, moreover, all areas of the EYFS could be enabled by STEM provision. As STEM can be a argued to be a natural part of the EYFS ethos, perhaps it could also facilitate transitions for children progressing from this point of their education, by being the shared ground between EYFS, and the cross-curricula push to these subjects. Engaging a child in a STEM project of their choosing to carry over from year R to 1 could be valuable for the child, family and professionals as the process of transition is supported by the STEM vehicle.

Significant theorists and philosophers have helped shape our understanding of how children learn, Froebel, Goldschmeid, Malaguzzi, and Montessori to name but a few, champion the innate, exploratory nature of babies and young children, and have helped us to facilitate learning via plentiful sensory, open ended and investigative opportunities in our Early Years settings. Advancements in neuroscience have also confirmed that the 0-5 age range is the most sensitive period for stimulation and challenge, as during this time more synapses in the brain are firing and responding, thus, neurological connections are being made, and physical pathways are paved. The Early Years Foundation Stage curriculum notes, ‘babies are born ready, able and eager to learn’. Moomaw (2012) questions that this time of rapid development and learning, organic interest in the world around them, and keenness to explore, surely is the most suitable time to harness a lasting wonderment of STEM subjects. It could be argued that in our Early Years sector we already do this, but are we as professionals largely unaware that we’re doing it?

Typically, if you were to conduct a learning walk in any type of Early Years setting, you are likely to find children; rolling balls, filling and emptying containers, pouring liquids, constructing large and small scale items, balancing toys or themselves, manipulating malleable materials, tinkering at a table, solving jigsaws or puzzles, thus Chelsoff (2012) believes that there is no greater STEM activity than children at play. A baby playing with a ball drop, a toddler constructing a tower, a pre-schooler playing catch, a reception child in the water tray, are all engaged in STEM activities, Killins (2012) suggests it is simply a matter of professionals being more intentional with their observations and reflections of such practice to truly attribute learning to and from STEM. Perhaps then, it is about reframing our own thinking, Katz (2010) highlights that in Early Years a ‘classical science’ style, comprising of questions, predictions and findings is an appropriate approach to our early STEM provision.

Planning or evaluating an activity or teachable moment using this sequence could certainly frame the experience within a STEM context. This is positive and manageable as we may already find ourselves asking open ended questions throughout the day, engaging in sustained shared thinking with children, and sharing their enjoyment when discovering something new or solving a problem. This may be because the ‘classical science’ method shares similarities with Reggio progettazoine i.e. ‘project approach’ that is frequently cited in Early Years literature and training, and has underpinned our passion for following children’s leads.

Barriers surrounding STEM and Early Years are not solely due to an unawareness of how positive practice already is. It could be down to individual professional’s confidence in subjects such as maths and science, nevertheless, this provides all the more reason to celebrate the activities and good practice we are involved in. Being overt about STEM practice in Early Years does not mean a requirement to ‘formally teach’ these subjects, but simply being open to children’s (and our own) questions will naturally allow STEM inquiry. Referring once again to Herold (2016) and Makerspaces, it has been the power of Lego that has facilitated a love of STEM in many settings, and specifically STEAM for Early Years, and Lego is a resource that is fondly enjoyed by children and adults of no limiting age, subject specific knowledge or prior ability. The best lessons are often not learnt from someone who is an expert making tasks look easy, but off those who are working alongside us, championing process over product.

Another barrier to Early Years involvement in the STEM educational movement could be that of incorporating Technology. Whilst Technology is undoubtedly a part of children’s lives, a fear of screen time and digital literacy is arguably becoming apparent, and practice pertaining to anything technology related is frequently exercised with caution (Kucirkova and Linvingstone 2017). Nevertheless, we must be mindful to not overly associate Technology with sedentary behaviour, instead, consider Technology as a ‘computational’ way of thinking to be developed in our children. The 4 cornerstones of such computational thinking are described as;

Decomposition – breaking down problem/task into steps,

Pattern Recognition – noticing reoccurrences and sequences

Abstraction – sieving important information from the less important,

Algorithm – a set of instructions (Barefoot 2014)

With this in mind, technological activities could be ‘unplugged’ and disassociated with a screen or sedentary behaviours, activities such as; creating and navigating around labyrinths, a touch of orienteering, or playing with handmade puzzles or marble mazes, could each prompt computational thinking skills appropriate for the Early Years. Like STEM activities, these are already evident if you took that Early Years learning walk around different settings. Once again, the solution is reframing our own perception and championing what we already do, not being afraid individually and collectively to contribute to research, or, join professional networks and associations within the STEM field.

Therefore, another suggested process for facilitating STEM in Early Years could be a 5 step ‘DDIDD’ sequence that I have developed, largely influenced by the ‘Plan, Do, Review’ Highscope perspective, and from reflections on US STEM planning. Professionals and children alike will remember that they ‘DDIDD’ it, following these simple steps…

The benefits of reframing our practice within a STEM context allows us to stay innovative and prevents our sector from being ‘missed out’ from STEM research, networking and CPD. In terms of children’s learning and development, a focus on STEM can support positive progression, build upon individual preferences and interests in a way that is not constrained to curricula goals and outcomes, but actively and deeply broadens horizons for the child.

Shonkoff *et al* (2012) Ecobiodevelopmental Theory states how ecology, biology, health and development can contribute to, or even impede, life chances from the offset. It is widely publicised that life outcomes are influenced by our earliest years, and unfortunately gaps across and within aspects such as gender or socioeconomic status, are each apparent before a child starts school. As there is a push to ready and encourage children and young people to enter into careers within STEM as evidenced in the 2017 Government paper ‘Careers Strategy: making the most of everyone’s skills and talents,’ we must start early to prevent these gaps, and invest thoroughly into the future. What better way to do so than by practice specifically aiming to provoke awe and wonder in our world?

The DDIDD process may help us to frame STEM in Early Years far more explicitly than we already do, and potentially help us to shout a little louder about how we are already getting the movement towards STEM right. To help embed this practice I propose when on a learning walk in your provision, ask professionals to narrate the learning happening, the challenge is for them to explain the learning using STEM, ‘classical science’, computational thinking or DDIDD phrasing. Perhaps try this after adding laminated arrows to the car mat, balls in the duplo or mega blocks, rulers in the playdough, graphical paper and pre-cut squares to the mark making area, bubbles to the painting area, a blindfold by the bee bot, the possibilities are endless.

I hope this article stimulates thoughts and provokes conversations in your settings. I invite expressions of interest for connection and collaboration so feel free to contact me and we can share in STEM successes in Early Years, after all, it’s a wonderful world to explore.

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