CPSMA

Submission - Department of Education Consultation on the Science, Technology, Engineering and Maths (STEM) Education Implementation Plan 2022-2026

Catholic Primary School Management Association (CPSMA), is the representative management body for Catholic primary schools in Ireland and this submission seeks to represent the perspective of those tasked with the governance of Catholic primary and special schools. We also have a number of associate members, comprised of other school patronages. As a management body which provides training , support and advice on a wide range of areas to over 2,800 schools, we are in a unique position of being able to understand and react to the needs of a large number of primary and special schools.

To what extent have you engaged with either the Policy Statement or the Implementation Plan?

CPSMA has engaged as a stakeholder as part of the STEM Policy Statement and Implementation Plan formulation.

What impact has the STEM Education Policy Statement 2017-2026 and Implementation Plan 2017-2019 made to date?

- Increased awareness by pupils and teachers of the importance and value of STEM related activities in the primary curriculum
- An increase in STEM continuous professional development provision and engagement, especially with the advent of Covid-19 and the move to remote CPD provision through Education Centres around the country
- The School Excellence Fund Digital Learning Clusters, though few in number, have positively impacted on attitudes and engagement in STEM at primary level
- Increase in the use of digital teaching and learning assessment methods, including e-portfolios, videos, audios and text. This area has been transformed as a result of Covid-19 and remote teaching and learning requirement.
- The work of the Professional Development Service for Teachers (PDST) STEM and Technology in Education teams in supporting schools and individual teachers to improve and support the embedding of STEM and ICT practice in teaching and learning has been noteworthy

What are the enablers to implementation?

- **Enthusiasm for STEM.** Schools, pupils and parents who are enthusiastic about the possibilities and advantages of STEM learning at primary level. STEM fosters 21st Century skills, such as innovation, experimentation, teamwork, problem-solving.
- **Curricular benefits of STEM.** STEM has many advantages as an integrated subject, including being hands on, cross-disciplinary, and applying learning to real world issues (Hourigan *et al.*, 2021). Supporting schools to build a culture that supports innovative pedagogy is fundamental to this endeavour
- **Adequate Curricular Support.** Purposefully scaffolding the capabilities of teachers and students to engage with active learning methodologies and assessment methods
- **Adequate Resourcing.** Suitable provision of digital hardware and software, as well as adequate ongoing provision of resources to support teaching and learning in STEM. The upcoming DE Digital Strategy for Schools will be very important in this regard

- **School Leadership.** School boards of management, principals and in school management teams are influential gatekeepers regarding curricular prioritisation in schools. Ensuring adequate communication, support and resourcing in relation to STEM and its possibilities, is critical for STEM related curricular implementation.

What are the barriers to implementation?

- **Inconsistent curricular implementation of STEM.** Studies indicate mixed results on the implementation of STEM in schools, with teachers struggling to fit it into the curriculum, choose what gets replaced and plan appropriately (Delahunty, Prendergast and Riordáin, Ní, 2021). Also, when planning for STEM implementation, teachers struggle to identify how engineering and technology fit into the primary curriculum. Schools require further clarity and support in this regard.
- **Leadership capacity in schools.** CPSMA has concerns in relation to the implementation of any new whole school policy initiative due to the constraints on school management, not only as a result of Covid-19, but also initiative overload in schools. CPSMA has concerns in relation to the possible promotion of a digital champion in schools, when the aim should be for all teachers to attain this role. Instead, to ensure proper co-ordination of the STEM area in every school, consideration should be given to the restoration of Leadership and Management posts to pre-moratorium levels (Circular 0007/2003) for this purpose.
- **Widening of inequity gap of ICT hardware and software provision in schools.** The decentralisation of equipment procurement, maintenance and expertise to each individual school board of management has meant that each school has had to create, implement and embed their own ICT vision for their school. This process has been inequitable as schools have had access to varying levels of broadband provision, in house technical expertise, physical space for ICT storage and group lessons, support from private industry, number of staff in schools, administrative leadership time to formulate school policy and additional funding to supplement grants from the Department of Education (DE). Due to historically inadequate levels of funding, schools have also been playing catch up with regard to the initial purchase and installation of digital infrastructure and also the implementation and embedding of pedagogical approaches using technology to support teaching and learning and assessment.
- **Use of appropriate STEM teaching methodologies**. There is a need to create activities that support effective STEM education experiences for pupils. STEM is considered best implemented using a cross-curricular, enquiry based teaching approach. However, while enquiry based learning is one of the most effective and beneficial forms of learning, is also one of the most complex and demanding types of work for a teacher to engage in (Kidman and Casinader, 2017). Teachers need ongoing additional support to ensure adequate levels of subject matter knowledge, pedagogical content knowledge (PCK), and expertise to innovate and deal with STEM in their classrooms.

Identification of Actions for the period 2022-2026 – STEM Education Policy Statement

Pillar 1. Nurture learner engagement and participation

Nurturing young people's STEM curiosity starts from early childhood and continues throughout their learning journey. We must ensure that learners have a positive engagement with STEM education, while also increasing the uptake of STEM related subjects for learners of all backgrounds, ability and gender. High-quality advice on the importance and relevance of STEM skills and information on the range and diversity of STEM related career opportunities is required for schools, learners and parents.

How can participation of all learners, from Early Years to Post-Primary, in STEM education be increased?

- Attitudes towards science are fixed from early ages. Pupils require the opportunity to engage in STEM related curricular experiences from junior infants onwards, both in the classroom and outside it, which relate to the lives and are appropriately planned to acquire new knowledge and skills and consolidate them
- By considering a programme to assist schools in highlighting the value of STEM for parents, to promote STEM activity in the home. Learning opportunities exist in normal day to day activities. The role of the family should not be underestimated in influencing children to be positively disposed to the STEM area, particularly for girls.
- Encouraging school participation in programmes such as the Digital School of Distinction, DE Creative Clusters and Science Foundation Ireland STEM Awareness initiatives.

How can awareness of STEM be increased? (e.g. the importance and relevance of STEM skills; information on the range and diversity of STEM related career opportunities)

- Role models are powerful influences on the lives of children. Awareness can be increased by providing opportunities for pupils to meet engineers, scientists, mathematicians and those working with technology and understand how their careers relate to the lives of children and the world in which they live.

Pillar 2. Enhance teacher and early years practitioner capacity

Improved teacher capacity is a key enabler in delivering STEM education of the highest quality for our learners. Enhanced preparation, development and support, through high-quality training, Initial Teacher Education, induction and ongoing professional learning is required. We must ensure that we have sufficient capacity within the teaching and early years' profession to respond to current and future developments.

How can the capacity and quality of early years' practitioner/teacher education be enhanced in order to support STEM education in early years' settings/schools?

- Plan, co-ordinate and implement an effective and engaging STEM programme of professional learning for teachers and school leaders nationwide
- Specific emphasis should be placed on supporting existing schools with an identified low uptake in STEM related activities and curricular implementation to close the STEM and digital divide in schools. Relevant and target school support should then follow.
- Enhance relationships between schools, third level institutions, government agencies and industry to support and promote STEM activity in schools.
- Facilitation of the dissemination of best practice currently evident in schools through the use of school clusters, communities of practice and inter school STEM projects. Furthermore, such initiatives should involve 'communities of practice' – online spaces where teachers can collaborate with colleagues, especially when faced with challenges. The network of Education Centres throughout the country should be considered as hubs for such communities of practice.

Pillar 3: Support STEM education practice

We must embrace the changes required in our approach to STEM teaching, learning and assessment if we are to improve learning experiences and outcomes. We must enable learners to become active and reflective participants by providing a range of learning and formative assessment in addition to providing out-of-school STEM learning opportunities. Effective leadership, at both early years and school level, is required to build a STEM culture and enhance the capacity of STEM education. Partnership with business, industry and the research community are also important. In your opinion

How can STEM teaching, learning and assessment practices in early learning and care settings and schools be enhanced?

Curriculum change does not occur by just changing content, but depends on convincing stakeholders, especially teachers (Hargreaves and Fullan, 2012). CPSMA believes that enhance such practices, consideration should be given to:

- Developing opportunities for STEM inclusion in the design and implementation of the new primary Mathematics curriculum
- The inclusion of STEM as an area of focus in the School Self-Evaluation Process, where a school considers such a focus to be a priority
- Ensuring that teachers exposed to innovative STEM teaching pedagogies share this best practice with colleagues in their schools and that they benefit from appropriate support structures (including the support of key stakeholders) in doing so. Positive peer coaching strategies can enhance staff development efforts and offering support for teachers implementing new strategies
- To support primary school teachers in making use of available STEM resources, projects should consider developing guidelines for their implementation in addition to providing the resources themselves. Initiatives should encourage the collaboration between teachers and scientists to ensure that the resources developed are scientifically accurate and reflect the teachers' pedagogical needs.

How can a meaningful link between STEM and the Arts be progressed for all learners?

- CPSMA believes that the notion of STEAM (STEM plus the Arts) should be broadened to meaningfully involve all curricular areas. Fundamental to this is an emphasis being placed on developing and enhancing schools' use of enquiry-based learning as a methodology to facilitate cross-curricular teaching and learning. By focussing on pupil topics of enquiry, many curricular areas and skills can be integrated and taught simultaneously, reducing curriculum overload and the jostling of curricular areas for individual time and space in the school week.

How can schools/ early learning and care settings establish and maintain effective STEM Education partnerships with business/industry and the research community?

- CPSMA argues that the opposite question should be posed. How can business/ industry and research community establish and maintain STEM education partnerships with schools? It is surely in their interest to do so
- DE to co-ordinate a group comprising of education stakeholders, STEM related businesses/ industry to consider how co-ordinated engagement can take place with primary and special schools to promote STEM.
- STEM education outreach initiatives can play an important role in raising awareness of the importance of the area in society. Provision of STEM events, festivals and national/ international competitions which celebrate innovative teaching should be built upon and appropriately disseminated.

Pillar 4. Use evidence to support STEM education

Building and sustaining a vibrant STEM education eco-system for all learners will require ongoing innovation in STEM education. The adoption of an evidence-led approach to STEM education will assist the Department in implementing and informing future policy decisions. It will also involve monitoring the impact of programmes and initiatives, both formal and non-formal, to improve STEM outcomes across our education system.

How can evidence based research best be used to identify successful pedagogical strategies, inform school/early learning and care setting practice and contribute to the ongoing development of curriculum policy and teacher/ early years' educator education?

- Initiatives should be considered to foster the collaboration between universities / research institutions and schools to facilitate the flow of knowledge between the two. Integrating these initiatives with school related STEM clusters, projects and communities of practice, as previously outlined, would provide a practical application of such an initiative.

- By strengthening links between Higher Education Institutes (HEIs) and schools in relation to best practice in relation to both STEM content and pedagogical knowledge for use in classrooms.

Are there any further observations/ comments that you would like to submit? (500 words)

STEM has many advantages as an integrated subject, including being hands on, cross-disciplinary, and applying learning to real world issues (Hourigan *et al.*, 2021).The area has recently become a high priority area in Irish primary education (Department of Education and Skills, 2015a, 2015b, 2017), benefiting from multiple Department of Education professional development opportunities for schools.

However, CPSMA would like to sound a note of caution in relation to the emphasis being placed on this area. STEM is an area promoted by capitalist ideologies and economic interests (Delahunty, Prendergast and Riordáin, Ní, 2021). It is argued that some of it objectives are overly concerned with the production of human capital to serve a future economy and that its prioritisation has led to the marginalisation of other curricular areas. This is in contrast with the aims and objectives of the Primary School Curriculum (PSC) (National Council for Curriculum and Assessment, 1999), which emphasise the holistic development of the child in relation to curricular provision. This emphasis was lauded internationally in relation to the PSC, and should be retained in the current plans for a new redesigned curriculum.

As outlined in this submission, one solution is a focus on cross-curricular teaching and learning methodologies, including the use of enquiry based learning. Such an approach can integrate multiple curricular areas, while also ensure the acquisition of 21st century skills, including problem-solving, teamwork and critical thinking. Consequently, enquiry-based learning has the potential to reduce fragmented approaches to teaching and learning and minimise the jockeying for position of individual curricular areas.

The Covid-19 pandemic has put an emphasis on STEM teaching and learning, as well as the embedding of ICT, as beingcentral to primary education. However, much of the development has happened organically, from the ground up, with schools sourcing digital platforms, equipment and applications and teachers upskilling in their own time to support learning. To ensure that the implementation and embedding of STEM in the longer term, will require improved and sustained investment of finance, resourcing and support for schools to ensure its successful implementation.

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