Evaluating Children's Outcomes in CDI's Doodle STEAM Programme

August 2025

Disclaimer and Copyright

Any citation of this report should use the following reference: Butler, P, (2025). Evaluating Children's Outcomes in CDI's Doodle STEAM Programme. Dublin: Childhood Development Initiative.

Contents

Acknowledgements

As author of this final evaluation report, I wish to thank all who have contributed to this evaluation process and who supported my preparation and completion of this document. In particular, I wish to acknowledge:

- The Childhood Development Initiative (CDI) for offering me the opportunity to undertake this work on its behalf. Thanks, in particular, to both Denise Lakes, Literacy and STEAM Co–ordinator, and Clare Bohan, CDI's Programme and Quality Manager, for their ongoing engagement with and support of the evaluation process. The ongoing success of the Doodle STEAM programme is testament to their tireless work on the ground with the schools and their commitment to the wider Tallaght community.

- Special thanks to all the parents who participated in Doodle STEAM over the 2024–2025 school year and who participated in very thoughtful and informative focus group sessions.

- Many thanks to the Home School Community Liaison Coordinators across participating schools who were the critical link between parents, children, and the evaluation process and who also provided valuable insights for the evaluation. Their support for the evaluation process presented a very real insight into their dedication to their teaching and the school communities.

- Most importantly, I want to acknowledge the input of the children who, alongside their parents and carers, immersed themselves in Doodle STEAM and subsequently shared their experiences of the programme. The information provided by these children is central to the output of the Doodle STEAM evaluation.

Paul Butler

Abbreviations

ABC	Area Based Childhood (Programme)
CDI	Childhood Development Initiative
DCEDIY	Department of Children, Equality, Disability, Integration and Youth
DCU	Dublin City University
DEIS	Delivering Equality of Opportunity in Schools Programme
EYLF	Early Years Learning Framework
FGD	Focus Group Discussion
HSCL	Home School Community Liaison Coordinator
NCCA	National Council for Curriculum and Assessment
SCP	School Completion Programme
STEAM	Science, Technology, Engineering, Arts, and Mathematics
STEM	Science, Technology, Engineering, Mathematics

Tables

Charts

Figures

Executive Summary

The Doodle STEAM Programme, developed, promoted and supported by CDI in Ireland, was evaluated in 2024–2025 across four Tallaght-based schools from the Delivering Equality of Opportunity in Schools (DEIS) Programme. The Doodle STEAM Programme was found to successfully foster foundational STEAM (Science, Technology, Engineering, Arts, and Mathematics) habits among young learners while strengthening home–school–community partnerships. This evaluation assessed the programme's impact through pre- and post-programme surveys as well as focus groups with children, parents, and Home-School-Community Liaison (HSCL) officers. It also reviewed its alignment with STEAM literature and within the context of Ireland's new Primary Curriculum Framework.

Key Findings

The evaluation revealed strong enthusiasm among participating children, with the majority expressing high levels of enjoyment and interest in the programme's hands-on, play-based activities: Children eagerly embraced tasks such as building spaghetti towers, conducting mini-beast surveys, and creating playdough mixtures, demonstrating a natural curiosity for exploratory learning. Many highlighted the freedom to experiment – such as testing different tower designs or improvising solutions for photo challenges – as a particularly enjoyable aspect. The group-based structure (working with peers and parents) was frequently cited as a highlight, with children appreciating the shared problem-solving and teamwork involved. Parents noted their children's increased motivation for schoolwork, particularly when tasks mirrored the programme's collaborative, playful methods. When asked about favourite moments, children consistently referenced *"fun"* and *"getting to do*

things differently" from regular class lessons. Role-playing as "young scientists" or "engineers" during activities helped demystify STEAM careers, with some children articulating new aspirations (e.g. *"I want to invent robots with special buttons!"*). The programme's success in engaging children underscores the effectiveness of active, playful, and social pedagogies in fostering early STEAM interest, particularly in DEIS schools, where such experiences may be less accessible.

The programme effectively supports children's STEAM development: Participants demonstrated growth and acquisition in six core STEAM habits: curiosity, skill-building through play, conceptual understanding, creative problem-solving, scientific thinking, and communication. Hands-on activities (e.g. building spaghetti towers, outdoor mini-beast/ecology surveys) boosted confidence, with 91% of children post-programme expressing confidence in explaining STEAM concepts. Some gender differences were noted (e.g. girls' unicorn-themed inventions vs boys' robotics focus), underscoring the need for intentional design to challenge stereotypes, as advocated in national STEAM policy.

The programme strengthens home–school partnerships through inclusive engagement: The programme fostered meaningful collaboration between parents and HSCLs, creating a supportive network for STEAM learning. Parents, many of whom had limited prior exposure to STEAM, gained confidence in guiding their children's learning, particularly through hands-on, low-pressure activities. Notably, the programme's flexible and practical approach resonated with fathers, a group traditionally less engaged in school-based initiatives. HSCLs played a pivotal role in facilitating these connections, helping to bridge gaps in communities where access

to STEAM role models and resources is often scarce. This model demonstrates how schools can cultivate stronger home–school relationships, particularly in DEIS settings, by prioritising accessible, family–centred learning experiences.

Doodle STEAM helps to mitigate barriers to STEAM participation in disadvantaged communities: The programme addressed socio–economic obstacles that can hinder early STEAM engagement, such as limited parental familiarity with STEAM disciplines and a lack of specialist resources in schools. By using low–cost, hands–on activities (e.g. playdough experiments, spaghetti tower challenges), it provided an entry point for families with varying levels of prior exposure. While these methods align with DEIS equity goals, particularly in promoting inclusive participation, the long–term impact on sustained engagement and career awareness remains an area for further exploration. Nevertheless, the programme highlights how adaptable and resource–light STEAM initiatives can help reduce disparities in early exposure, particularly in communities where such opportunities are often scarce.

Recommendations

Enhance opportunities for increased children's inclusion and engagement: Ensure children participate in at least 50% of sessions with parents, building on the high value placed on shared learning time.

Align with emerging curriculum resources: Integrate emerging STEM/Arts resources from the Primary Curriculum Framework rollout, particularly for maths and science.

Expand local partnerships for greater sustainability of STEAM habits and ideas: Forge links with local youth organisations (e.g. Citywise) to promote STEAM engagement where possible beyond the programme.

Scale strategically within school communities and with other partner organisations: Develop "Early Years Doodle STEAM" and "Doodle STEAM Senior" extensions for pre–school and older pupils, expand the model through provision of Doodle STEAM teacher training, and leverage Erasmus+ funding for European collaboration.

Build on the successful parental participation within the programme and amplify fathers' involvement: Use the programme's success with fathers as a model for gender–inclusive family engagement in DEIS schools.

Conclusion

The Doodle STEAM Programme proves that playful, interdisciplinary, and family–centred approaches can ignite STEAM interest in disadvantaged settings. By operationalising – to addressing educational inequality, the programme offers a replicable framework for fostering 21st–century skills. As CDI advances this initiative nationally, its focus on parent–child collaboration, teacher–HSCL partnerships, and community linkages positions it as a transformative tool for equitable STEAM education in Ireland.

1 Introduction and Background

Doodle STEAM is an evidence-informed programme working directly with parents and their children through the topics of Science, Technology, Engineering, Arts, and Mathematics (STEAM). Doodle STEAM was initially developed and piloted in 2022, targeting parents of children aged 6–8 years old. An initial evaluation of the pilot highlighted positive impacts of the programme on parental engagement and confidence in STEAM topics, with facilitators and parents finding the focus on early STEAM learning to be valuable and enjoyable.

It was quickly established through the pilot research and a follow-up evaluation of parents' outcomes[1] that children should be more directly involved in the programme. Thus, the programme has evolved to now include both parental and child participation. Sessions are delivered in the local schools and focus on showing parents how easy and accessible STEAM activities are encouraging them to bring these activities into their homes. The programme also fosters young children's curiosity and hands-on learning, aiming to boost future STEAM engagement through centring the role of parents as their children's first role models.

In early 2023, seven schools took part in an independent evaluation of Doodle STEAM, which echoed findings from the pilot evaluation regarding increases in parental engagement and confidence in STEAM subjects linked to their participation in the programme. Recommendations suggested that research be undertaken with a specific focus on the participating children and how they were faring within the programme. Nexus was commissioned to undertake this study and has worked with the Childhood Development Inititative (CDI) to carry out this independent evaluation of the impact of the Doodle STEAM Programme on children's outcomes.

This document is the final report of this evaluation into the effect of the Doodle STEAM Programme on the children's learning. The evaluation examines programme effect over one 8-week iteration of the programme, which was delivered in six Dublin 24 primary schools in the 2024/2025 school year.[2] The focus of this evaluation is on the children themselves and how they understand and feel about STEAM subjects and disciplines. It has required giving these young children the opportunity to explain STEAM ideas and habits in their own words. Parents and teachers were also involved and provided insights into how they created a supportive environment for the children to learn about STEAM.

1.1 Childhood Development Initiative (CDI)

CDI, the commissioning body for this evaluation, is a national non-profit organisation dedicated to improving outcomes for children, families, and communities. It achieves this through a commitment to:

- evidence-informed prevention and early intervention practice, including needs assessment and evidence-based design

- sector capacity development

Established in 2007 with a focus on disadvantaged populations in Tallaght, CDI has since expanded nationally, working directly with communities and partners in disadvantaged areas, and providing capacity development and support to the child and family sector through training, consultancy, and comprehensive knowledge transfer processes.

---

[1] https://www.cdi.ie/app/uploads/2024/11/CDI-Doodle-STEAM-Eval-v4_compressed.pdf

[2] Of the six schools participating in Dublin 24, four schools participated in the evaluation.

CDI is part–funded under the government's Area Based Childhood Programme (ABC),[3] a national programme of the Department of Children, Equality, Disability, Integration and Youth (DCEDIY) that aims to break the cycle of child poverty in areas where it has been most deeply entrenched. CDI designs, delivers, and evaluates a suite of programmes across a spectrum of local needs including language, literacy, parenting, health, early years, youth mental health, and conflict management. All CDI programmes are evidence–informed and manualised, and are delivered through existing structures and services. Doodle STEAM is one of the latest programmes to be designed, piloted, and implemented by CDI with the aim of improving early STEAM learning outcomes for children in disadvantaged communities of Tallaght and beyond.

Full details of CDI interventions are available on the CDI website, while a diagrammatic overview of CDI's portfolio of programmes is presented in Figure 1 below.

Figure 1: CDI's Portfolio of Evidence–Based and Evidence–Informed Prevention and Early Intervention Programmes

1.2 STEAM, EARLY LEARNING, AND THE ROLE OF PARENTS

Here, the concept of STEAM and its role in the Irish education system are introduced. These will be further examined in Chapter Two, with the idea of better understanding how learning outcomes for young children can be improved using STEAM programmes, as well as an examination of literature on the rationale for promoting STEAM habits and ideas with young children.

The acronym STEAM stands for Science (S), Technology (T), Engineering (E), Arts (A), and Mathematics (M) and refers to a process of blending these individual subject areas into a set of educational or learning activities. Recent years have witnessed growing policy interest in the subjects of Science, Technology, Engineering, and Mathematics, otherwise known as STEM (McNally et al., 2022; Murphy et al., 2019; Wan et al., 2021). In particular, Irish educational policy has increased its emphasis on STEM education, from early childhood to third level, through a variety of policy documents and implementation plans (Dept of Education & Skills, 2011; Dept of Education & Skills, 2017a; Dept of Education & Skills, 2017b; Dept of Education & Skills, 2020). More recently, Arts has been included alongside the STEM subjects, leading to an integrated focus on STEAM. The addition of Arts has particular relevance to the STEM learning of young children. According to Jamil and colleagues (2018), the world is full of endless possibilities and opportunities for young children, and through art and creative expression, they learn what works and what does not. In addition, the arts provide motivation and enhance memory systems, analytical skills, and motor coordination (Sousa & Pilecki, 2013).

A review of national and international literature by a research team from Dublin City University (McNally et al., 2022), which informed the development of Doodle STEAM, identified a strong rationale for focusing on STEAM learning in early childhood education. Young children are naturally curious about the world around them (McNally et al., 2022; Murphy et al., 2019; Wan et al., 2021), and this curiosity lends itself to early interest in STEAM concepts and experiences. Motivation to engage in STEM learning is an important predictor of attainment in STEM (Patrick et al., 2008). However, early interest in STEM has been shown to decline with age (Fredericks & Eccles, 2002).

Parents play an important role in young children's early learning experiences, largely due to time spent in close proximity with one another, with parents supporting children's learning in diverse ways in the time they spend outside of school (Hadani & Rood, 2018). Both Ireland's primary school curriculum (Government of Ireland, 1999) and its early childhood curriculum framework, Aistear, identify parents as children's first educators and endorse close, positive, and reciprocal working partnerships between informal learning processes in the home and formal learning processes in the school. These working relationships, and the engagement of parents in their children's education, especially outside of school, are viewed as both enablers and predictors of learning outcomes for children (Crowley et al., 2001; Pattison & Dierking, 2019), regardless of ethnicity, parent education, or socio–economic status (Cian et al., 2022; McClure et al., 2017).

Research shows that parents are enthusiastic to support their children's STEM/STEAM learning (McClure et al., 2017; Pattison & Dierking, 2019), while also suggesting that these views are not enough to facilitate actual parental involvement in early STEM/STEAM learning. Gender and socio–economic status are significant influences on parental confidence to engage in STEAM activities with young children (McNally et al., 2022). McNally and colleagues (2022) also suggest that mothers are more likely to have lower levels of confidence, and parents with less formal education are less

likely to engage in their children's early STEAM learning. Consequently, increasing parents' enjoyment, confidence, and self-efficacy in STEAM subjects – in a supportive manner – is considered vital to increasing their engagement with their young children's STEAM learning. These findings were central informants of the Doodle STEAM Programme.

1.3 DOODLE STEAM

Doodle STEAM was established by CDI in 2022. The Logic Model for the programme observes that, in the longer term, it aims to contribute to improved early STEAM learning and improved child and family literacy outcomes in disadvantaged communities of Tallaght and beyond. This is to be achieved in the short-term by contributing to improvements in:

- the attitudes of parents and carers to STEAM learning of their young children

- the knowledge, confidence, and capacity of parents/carers regarding STEAM learning and activities

- the engagement of parents and carers in STEAM-related learning activities

Since its inception, the programme has set out to support parents/carers in valuing STEAM learning and increasing their expectations of their children's STEAM achievements through informal and playful STEAM activities.

Doodle STEAM was developed by a research team at Dublin City University (DCU) for CDI in collaboration with a Project Advisory Group convened by CDI specifically for that purpose. The Advisory Group included representatives from the library service, academics, and parents. Following a comprehensive review of national and international literature, the DCU team prepared a Facilitator's Manual for educators and a Programme Handbook for parents/carers as key supports for early STEAM learning and activities.

The programme was initially piloted by the DCU team, in collaboration with CDI, in three primary schools in Dublin 24. This phase ran between October and December 2022, and concluded with a review of the pilot, involving consultation with parents, children, and facilitators. The pilot report identified a number of areas for modification, all of which were applied to the next phase of the programme.

Following completion of the pilot phase and the application of the aforementioned modifications to the programme, CDI prepared formal Doodle STEAM materials. These comprised:

- a Facilitator's Manual

- a Facilitator's supplementary handbook

- access to the Doodle STEAM Portal

- Facilitator Presentation Slides

- a Parent Handbook

- STEAM Training for Facilitators

- Certificates of Completion of Doodle STEAM for participating parents/carers and children

- a Doodle STEAM Lyrics Book.

A 2023 evaluation of Doodle STEAM focused on parental outcomes, and suggested the programme improved parents' confidence around engaging with STEAM activities with their child.[4] In 2023, Doodle STEAM was still considered a parental programme; however schools were not discouraged from involving children in whatever way suited their

4 https://www.cdi.ie/app/uploads/2024/11/CDI-Doodle-STEAM-Eval-v4_compressed.pdf

context. In this 2024/2025 evaluation, schools were given guidance on how to involve children in the sessions to standardise this as much as possible across participating schools. It was anticipated that the current evaluation could structure the involvement of children by investigating the impact of the programme with them.

Primary schools involved in CDI services in Tallaght were invited to apply to participate in this phase of the initiative, understanding that the research would examine the impact of Doodle STEAM on children's outcomes. It was originally anticipated that up to 10 primary schools would participate in the evaluation exercise. In total, five schools applied to participate, with the premise that all Home School Community Liaison Coordinators[5] (HSCLs) had attended training and were ready to facilitate the programme with their children and parents in the school year of 2024–2025. The principals of each school were included in the invitation to participate in the children's outcomes evaluation, with all consenting to do so. Ultimately, one of these schools was unable to participate, meaning four schools partook in the current evaluation. A total of 45 children participated in the Doodle STEAM programme in these four schools, some 39 of whom were involved in the research.

Participating Schools

HSCLs from each of the schools involved in the evaluation had attended programme orientation training before they began their implementation of the programme. Two of the teachers were implementing Doodle STEAM for the first time, but the others had been involved in the programme for up to three years. All were invited to recruit a group of up to 15 parents and their children to participate in the programme. Following difficulties recruiting parents and children, one of the schools withdrew from the process, leaving a total of four schools to implement the programme over the final term of the school year.

In addition to training, participating schools were provided with resources to support educators to teach STEAM theory and activities to the parents/carers of young children, namely the Facilitator Manual and Parent Handbook. Funding of €300 (for schools running the programme for the second time) or €500 (for schools running the programme for the first time) was also offered by CDI to each school towards programme resources. Using their budgets, HSCLs purchased STEAM-related materials, which were used during the programme.

What Is Involved

Doodle STEAM comprises of an eight-week STEAM-engagement programme (lasting one hour per week) which is offered to a maximum of 15 parents/carers of children aged between 6 and 8 years. The key themes covered in Doodle STEAM with parents are:

Session 1: An introduction to STEAM

Session 2: Science

Session 3: Technology

Session 4: Engineering

Session 5: The Arts

Session 6: Mathematics

Session 7: STEAM in outdoor environments

Session 8: STEAM and messy play

---

[5] Home School Community Liaison Coordinators (HSCLs) in Irish primary schools, particularly within the DEIS (Delivering Equality of Opportunity in Schools) programme, act as a vital bridge between the school and families, focusing on fostering positive relationships and supporting the educational engagement of pupils, especially those from disadvantaged backgrounds. Their core role involves identifying barriers to attendance and participation, working directly with parents/carers to provide guidance and practical support (e.g. accessing resources or services), facilitating effective communication between home and school, and implementing strategies to improve pupil attendance, retention, and overall well-being, thereby enhancing the child's ability to benefit fully from their education.

Each of the sessions is guided by the Facilitator Manual and PowerPoint slides, while the Parent Handbook also contains session–by–session chapters to which parents/carers can refer.

The Doodle STEAM Programme works closely on building relationships with parents to build knowledge, confidence, capacity, and engagement. This focus means that a lot of the primary interventions are undertaken with parents. Programme materials advise participating schools that the children might be included in the last 15 minutes of some of the sessions, typically 10 minutes for the activity and 5 minutes for closure (at the discretion of the HSCL delivering the programme). In practice, HSCLs found that it was more beneficial to include the children in the last 20–30 minutes of the session. For the purposes of this evaluation of children's outcomes, all participating HSCLs were asked to include the children with the parents for one half of the session. This would mean that the programme would entail working with the parents on their own initially for some 30 minutes and then the children would join for the remaining 30 minutes. In the context of this evaluation, the programme was delivered by the four participating schools over an 8–week period of the first and second terms of the school year, namely between October 2024 and February 2025.

1.4 EVALUATION PLAN AND REPORT STRUCTURE

The evaluation took place over a number of phases. Given the absence of specific research in Ireland and internationally focusing on how 6– to 8–year–old children acquire STEAM habits and ideas, the aim of the first phase was to review the policy and curricular environment, including carrying out interviews with key informants. This is presented in a summary manner in Chapter Two.

The second phase involved translating these findings into an evaluation framework that could not only be communicated not just to the teachers and parents involved in the research, but could also be explained to the children during the sessions to ensure that they were fully involved and aware of their role and input into the evaluation. Chapter Three highlights this process of developing a specific framework that would address the evaluation requirements, especially given the age of the children involved and their capacity to offer informed feedback.

A key part of this phase was to then operationalise the framework, involving the development of bespoke survey instruments that could address the aim of allowing these children to participate fully in the evaluation. A pre–programme survey was developed that would allow the children to discuss STEAM issues, ideas, and habits, as well as a follow–up post–programme survey allowing them to offer feedback on their learning. Both questionnaires are appended, as are the interview schedules for the focus group sessions with the parents and HSCLs.

Ensuring approval from Tusla's Independent Research Ethics Committee was a prerequisite before commencement of the evaluation work within the school communities. The Ethics Committee was consulted and a series of submissions were made taking into account all aspects of the research work. This process was also reviewed by a member of CDI's Research Advisory Committee (RAC). Approval was granted in advance of the beginning of the research work in the schools. This evaluation involved engagement with the school communities and direct work with the HSCLs in their roles as facilitators. A schedule was prepared, based on the agreement of each school as to how best to access the students at the key milestones within the programme delivery and following its conclusion. Consent forms were collected from parents and assent forms the children.

Feedback was gathered through the data–gathering tools and was collated and analysed. The pre– and post–assessment datasets then formed the basis for this report. The framework and STEM habits indicators were tested using the data gathered from the children, their parents, and the HSCLs. Chapters Four and Five present the results of the evaluation work. Chapter Four does so in relation to the perspectives of the children and their achievements in acquiring STEAM habits. Chapter Five does so in terms of how the adults created a supportive environment for these STEAM outcomes.

2 Policy and Curricular Environment

This chapter examines results from international research studies highlighting developmental outcomes associated with the promotion of STEAM opportunities in early childhood and primary educational contexts. Barriers and challenges are also examined. The focus throughout the chapter is related to developing a clear understanding of the importance of promoting STEAM habits and competences from an early age at both policy and practice levels.

From the policy perspective, this chapter looks to how the early years and primary education system aim to work cohesively to build a strong case for STEAM education. For example, by emphasising play–based and inquiry–driven learning, Aistear aligns with foundational STEAM skills. This in turn supports the primary curriculum as it promotes more structured STEAM concepts. This alignment drives an early curiosity and sensory exploration that can be formalised as children move through their primary education by bridging concrete and abstract thinking. At a formal level, the curricular frameworks are moving to become more integrated to enhance STEAM priorities, although as is noted, not necessarily including Arts within cross–curricular thinking and linking.

The chapter examines the evolving curricular context to situate a programme such as Doodle STEAM. It also looks to emerging ideas of how STEAM ideas and habits can be best promoted, understood, and in turn reviewed within a classroom setting, specifically looking to the new strands of STEM and Arts Education. The evaluation will make use of these important ideas within the survey tools developed to work with the children, parents, and educators in each school.

The role of parents within the new framework is also reviewed, as is recent EU policy that provides a clear mandate for promoting a supportive environment for children within their school and home lives in their acquisition of basic STEAM skills.

2.1 INTERNATIONAL RESEARCH OUTCOMES AND LEARNING

Early exposure to STEAM opportunities plays a pivotal role in shaping children's cognitive, social, and emotional development. High–quality STEAM experiences across early childhood care and education (ECCE) (O'Neill et al. 2023) and primary educational contexts (Yim et al. 2024) can foster critical thinking, problem–solving, and creativity while laying the foundation for future well–rounded developmental outcomes and academic success. Such research points to key developmental benefits including cognitive development, improvements in language and literacy skills, physical coordination, and spatial awareness. Collaborative STEAM tasks encourage teamwork, persistence, and resilience. Children learn to test hypotheses, embrace trial and error, and develop confidence in their problem–solving abilities. Early positive experiences with STEAM increase the likelihood of sustained interest in these fields, influencing future educational pathways and career aspirations.

By integrating the five STEAM areas into early learning environments, teachers and parents can nurture essential skills that extend beyond STEAM disciplines, contributing to well–rounded developmental outcomes and accommodating creative–thinking skills (Wan et al. 2023). Teachers and parents play a critical role in the development of young children's STEAM interest. Early exposure to these concepts and processes can have a positive impact on children's learning, laying the foundation for success in later schooling.

These research studies also highlight persistent challenges in implementing effective STEAM pedagogy across early childhood and primary educational contexts. A meta–analysis of studies in relation to early STEAM education (Wu et al. 2024) showed that factors negatively impacting on successful implementation of STEAM in early

childhood and primary classrooms included lack of time, lack of materials/resources and administrative support or funding. There are also concerns raised in the research relating to how STEAM opportunities are promoted for children with additional needs.

It is relevant to examine the development of the children's STEAM learning experiences and outcomes within their specific educational environments, as well as the degree to which they have been exposed to foundational opportunities and supports. Based on the research lessons, the study will examine how children have experienced engagement with exploratory materials and activities and how they have been supported to develop STEAM habits and ideas.

The evaluation will look to better understand such foundational experiences and supports from the perspective of the children in order to develop a comprehension of their inner worlds and how STEAM education has potentially impacted this evolving picture. Further research (Carter et al. 2021) indicates that early exposure to STEAM-related activities has a sustained influence on children's future engagement with STEAM disciplines and their long-term career aspirations, and so this study will also ask the children to look to their future aspirations.

The manner in which children acquire and develop STEAM ideas and habits is important as the means of examining the Doodle STEAM Programme.[6] As this type of STEAM-related research is new in Ireland for this specific age group of children, there is a need to frame the evaluation according to their own lens and experiences. Therefore, the framework will look to how STEAM ideas and habits can be acquired by these children aged for the most part between six and eight years, supported by parents and teachers within school

and home lives. The Doodle STEAM Programme operates over an eight-week cycle with one hour per week of contact time between teachers, parents, and children. This represents the operational context for the programme; therefore, it is important to consider the limited potential for significant learning outcomes for the children during the programme itself. However, the opportunities exist in this innovative programme for these children to develop a keen awareness of new ideas, while receiving support from parents and teachers to acquire STEAM habits within a safe and inclusive environment. The evaluation will examine these results, while also considering the way the supports operate.

2.2 THE CURRICULAR FRAMEWORK AND STEAM

Aistear is the early childhood curriculum framework for children from birth up to the age of six years and its Early Years Learning Framework (EYLF) includes five learning outcomes:

- Children have a strong sense of identity.
- Children are connected with and contribute to their world.
- Children have a strong sense of well-being.
- Children are confident and involved learners.
- Children are effective communicators.

As children are supported to achieve these learning outcomes through their participation in formal and informal early years education, the scaffolding for an interest in STEAM subjects can be ignited using play-based approaches and promoting curious minds.

---

[6] The framework will look to STEAM ideas such as integrating arts with technical subjects, project-based exploration, and innovation, as well as STEAM habits linked to nurturing curiosity through questioning, experimenting, and learning from failure, collaborating with peers, persisting through challenges, and reflecting to improve solutions.

While it is recognised that children are "inherently curious and equipped with basic capacities and dispositions to make sense of the world around them" (Spaepen et al., 2017, p. 13), these skills do not persist without appropriate support, encouragement, and experiences that sustain children's interest and investigation. This recognition of children's innate competence and confidence in exploring, questioning, investigating, and negotiating is made explicit within the EYLF outcome areas (while being more implicit in relation to STEAM subject themselves). The aim of making STEAM more purposefully visible within the curriculum begins to take shape as the children move into the primary school system.

The new **Primary Curriculum Framework** provides the educational policy context in which Doodle STEAM is operating. Published in 2023, it represents the first re–ordering of the curriculum in almost 25 years. A number of key features are relevant for Doodle STEAM and how the programme can align with some of the new thinking that is informing how our primary schools will be evolving in the coming years. Among these features include how STEM and Arts education[7] are to be integrated into the school day, as well as how the role of parents is being understood. Furthermore, there is a new approach to how competences are being measured.[8]

The new Primary Curriculum Framework is designed to respond to the significant societal and educational shifts which have occurred since 1999, ensuring it meets the needs of today's children by placing them at the centre of the learning process. It prioritises high–quality, flexible, and inclusive teaching and assessment practices, offering greater choice to accommodate diverse learner needs and interests. By empowering school

leaders and teachers to foster engaging, adaptable learning experiences, the framework strengthens educational outcomes while reflecting the evolving demands of modern classrooms and communities.

Each of these features deserves further analysis in order to situate Doodle STEAM within the primary classroom within which the children within the study are located. The curriculum is presented across four stages, with the subjects becoming more differentiated by areas as the children move through these stages. The initial two stages (Junior to Second Class) and education areas of STEM and Arts are of most relevance. The Curriculum Framework approaches learning through integrated curriculum areas, embedding competencies across all subject areas and providing meaningful ways to connect subjects to children's lives. As noted, the National Council for Curriculum and Assessment (NCCA) is currently producing a set of resources to support the teaching of these subject areas, including dedicated online toolkits, allowing for teachers to customise the learning approaches for the children in their schools linked to specific learning outcomes and competencies.

2.3 STEM AND ARTS EDUCATION WITHIN THE NEW FRAMEWORK

The STEM education curriculum is regarded in the new framework as a foundational component of children's learning experiences in primary and special schools. By integrating the STEM subjects, the curriculum emphasises playful experimentation, scientific inquiry, and the use of an engineering design process to solve real–life problems. The STEM subjects are to be interconnected, with mathematics serving as the foundation for science, technology, and

---

[7] The framework will look to STEAM ideas such as integrating Arts with technical subjects, project–based exploration, and innovation, as well as STEAM habits linked to nurturing curiosity through questioning, experimenting and learning from failure, collaborating with peers, persisting through challenges, and reflecting to improve solutions.

[8] The practical aspects of how each of the five subject areas will be supported, monitored and assessed will be finalised by the NCCA in 2025. Some draft materials are available in the interim.

engineering. STEM education is to be integrated with other curriculum areas[9] to provide a more holistic learning approach, again emphasising a focus on playful and engaging learning experiences that allow children to actively participate and develop agency in their learning. The specific time allocations for STEM vary across different stages of primary education to ensure that teachers can deliver this holistic approach but also have the flexibility to cater to the diverse needs of children.

The following six aims describe a vision for children's learning in STEM Education.

- **Curious Disposition:** To explore the world with curiosity and playfulness and develop an appreciation for the endless possibilities that science, technology, and engineering offer us as human beings

- **Skills Development:** To develop, use, and adapt a variety of science, technology, and engineering skills in effective ways

- **Conceptual and Procedural Understanding:** To comprehend key science, technology, and engineering concepts and procedures

- **Creative Innovation:** To use imagination and creativity to generate ideas, make discoveries, and explore possible solutions to real–life and imagined problems in science, technology, and engineering

- **Critical Engagement:** To be open–minded while questioning, discussing, and making judgements using evidence

- **Communication and the use of Disciplinary Language:** To use and apply science, technology, and engineering language in order to communicate, evaluate, and reflect on learning experiences

The Arts Education strand has also been developed in the new Primary Curriculum Framework with a similar approach. It covers visual arts, media arts, music, drama, and dance and aims to develop children's creativity, imagination, and cultural awareness. The aims of Arts Education encompass creativity, expressiveness, artistic engagement, conceptual understanding, multi–sensory engagement, aesthetic appreciation, and cultural and contextual awareness. Importantly, these aims are interwoven and interdependent. The curriculum encourages active participation, exploration of different art forms, and integration of arts across subjects. Arts education seeks to provide opportunities for self–expression, collaboration, and understanding of the world through creative means.

As above with STEM teaching, time allocations are to be designated to ensure sufficient exposure to Arts Education. Again, there is also an emphasis on playful and engaging approaches to teaching and learning in the arts. Where relevant, the aims, strands, and elements of the Arts Education which offer clear linkages with our STEAM model will also be integrated within the Doodle STEAM outcomes framework.

2.4 ROLE OF PARENTS

A further feature of the new curriculum, while not necessarily a new practice for all schools, relates to how parents are to be encouraged to be actively involved in their children's education through various means, such as sharing relevant information about their children's backgrounds, building positive relationships with teachers, participating in assessment processes collaboratively, being informed about their child's learning progress, engaging in partnerships with schools, contributing to creating a respectful and inclusive school climate, and collaborating with

---

[9]   The curriculum will also progressively introduce modern foreign languages and focus on developing linkages with the biological, material, and physical world.

teachers and the wider school community. The new curriculum sets out to promote a partnership approach between parents and schools to support the holistic development of children.

The earlier Doodle STEAM evaluation provided clear evidence on how the programme fostered positive relationships and proactive communication between parents and schools, as well as how parents have extended and consolidated their child's learning at home through positive dispositions towards learning. The evaluation also demonstrated that by providing diverse and enriching experiences and purposeful and engaging learning activities, parents can be recognised as essential partners in their children's learning journey. This study builds on the findings from the earlier evaluation. It engages with parents with a specific focus on their children's learning outcomes and whether the unique nature of the Doodle STEAM Programme, and their core involvement in it, has facilitated high levels of STEAM confidence and curiosity among the children. The new Curriculum Framework acknowledges the importance of the home learning environment in supporting children's education, and this study examines the unique and valuable contributions and perspectives that parents bring to their children's education.

2.5 EUROPEAN CONTEXT

The European Commission has recently launched the Union of Skills, an initiative to equip people across Europe with the skills they need to thrive in an evolving job market. A STEM Education Strategic Plan is a key element of this initiative and sets out measures for advancing STEM education and training. It suggests a flexible approach to education that extends beyond traditional classroom settings with focus areas for improving basic skills development. With socio–economic background recognised as the strongest predictor of student performance, and with acute teacher

shortages in STEM subjects, the strategy highlights actions required to address underachievement and enable supportive environments.

The EU Action Plan (Commission, 2025a) places a very specific focus on how supportive environments need to be enabled. Their analysis highlights how:

> *"Declining parental involvement in recent years poses a significant risk to student success, particularly among disadvantaged students. PISA shows that supportive home environments are crucial for fostering positive student attitudes to school. Education systems that maintained or increased parental engagement, e.g. parents who discussed their child's progress with a teacher on their own initiative, have seen better performance, notably in mathematics."* (Commission, 2025b, p. 7)

In order to build dynamic learning ecosystems, parents and families as a child's first educators require enhanced supports, especially those "hardest to reach" groups, who are at significant risk of exclusion. A multi–stakeholder engagement involving schools and the wider community is seen as particularly crucial given the persistent link between socio–economic background and educational outcomes. The strategy highlights the need for programmes to support parents in promoting and encouraging their children's learning, developed in cooperation with other sectors.

The strategy also looks to how gender differences impact learning outcomes and how teaching styles and classroom environments can affect boys and girls differently, highlighting the need for gender–sensitive teaching approaches. The need to access quality early education and care is recognised as having profound individual and societal

consequences, particularly for disadvantaged children. Early experiences are noted as crucial, in particular for building socio–emotional skills, which are essential for resilience, well–being, motivation, learning outcomes, and lifelong–learning capacity.

Early identification mechanisms and regular monitoring at national, local, and school levels, including individual assessment of basic skills and offers of suitable remedial courses, particularly at key transitions in a pupil's educational career, are essential to ensure equitable learning opportunities, address disparities early, and prevent long–term skill gaps by providing timely support during critical phases of academic development. Throughout this approach, there is a recognition that increased support for teachers and educators is needed as they develop and implement basic skills improvement plans at school level, including extra learning time and personalised support, with tutoring and mentoring programmes.

2.6 BUILDING RESILIENCE WITHIN TALLAGHT SCHOOLS

The Doodle STEAM Programme is now operating across Ireland in a wide range of community and school settings. The specific context for this evaluation is its original site and the Tallaght schools involved in the research that have experience in implementing the programme since 2022. It is sufficient to note for the purposes of the study that parts of Tallaght are faced with significant education barriers, deprivation levels, and health inequalities. These external factors matter to the extent that many children in Tallaght may lack exposure to hands–on STEAM activities and resources due to either cost or logistical barriers (Shumba, et al. 2021).

Tallaght is also a vibrant, resilient community with strong local initiatives. There are many community–based programmes working to bridge such gaps and looking to provide targeted STEAM interventions in order to counter systemic disadvantages by fostering skills, confidence, and pathways to further education. CDI continues to demonstrate how such community–led education projects improve outcomes, resilience, and local innovation.

2.7 SUMMARY AND IMPLICATIONS FOR THE EVALUATION

The research under review for this chapter indicates that STEAM competences and habits are formed and supported through access to:

- play–based learning approaches, driven by teachers and parents that allow for problem–solving and building curiosity

- positive early experiences that promote confidence–building activities and expose children and young people to role models and diverse STEAM professionals

- supportive learning environments and inclusive pedagogies ensuring equitable participation

- integrated, cross–disciplinary experiences that enhance creativity, retention, and real–world problem–solving

The evolving curricula that young children experience are intended to promote these skill sets and learning outcomes. Through Aistear and the new Primary Curriculum Framework, children are being encouraged to use play as a learning tool, to see integrated STEM or STEAM activities as part of their creative daily tasks and school work, and to imagine these disciplines as part of their own future lives. Within a European

context, there is a clear commitment at policy and practice levels to embedding STEM or STEAM opportunities within schools and communities, as well as creating a more supportive learning environment for teachers and parents, particularly for disadvantaged children. The community context is an important factor to be noted, in that the programme seeks to bridge gaps in exposure to STEAM activities through the school system.

Within this research, policy, community, and practice space, the Doodle STEAM Programme is clearly setting out to address these concerns and priorities. The recent evaluation research on the parental experience documented an extremely successful intervention that allowed parents to support their children's learning and encourage their STEAM habits and competences.

This evaluation report will examine the specific manner in which children are benefitting from the programme, if it all, and the range of supports that are allowing for their learning outcomes to emerge. As there has been no specific research undertaken to date in Ireland with regard to STEAM habits and competences acquisition at this point of children's formal education pathways, the evaluation has required the development of a bespoke outcomes framework that informs the data collection and analysis processes.

The next chapter outlines this step in developing a framework for how STEAM ideas and habits can be best understood from the perspective of children aged six to eight, and, in parallel, how a supportive environment can be co–facilitated by parents and teachers.

3 Evaluation Rationale and Methodology

This chapter builds on the previous contextual analysis to highlight how the evaluation study will respond to the key linked themes of curricular evolution, policy mandate for STEAM integration, and children's learning outcomes from the programme. The rationale for the evaluation is presented as a means to better understand how the Doodle STEAM Programme can promote STEAM habits and competences, while also developing a unique supportive environment that enables parents and teachers to co–facilitate learning spaces.

The chapter highlights six key STEAM ideas and habits that are connected to the new curriculum. These become the focal point for the research work. The questionnaires and focus group sessions are designed to elicit as much information as possible with regards to how the children initially view STEAM issues from the perspective of their own imaginations and considerations about inventions and future careers. The children are given the space to reflect on STEAM habits and consider their own.

3.1 KEY STEAM HABITS AND COMPETENCES

In order to examine the specific outcomes linked to children's access, engagement, learning, and experience of the programme, the context of the new Primary Curriculum Framework is important. As noted, this new framework has a specific strand that focuses on STEM and a draft set of learning outcomes. These are not yet fully elaborated and teachers are in the early stages of receiving training as well as standardised tools or resources to assist in focusing on these learning outcomes in their classrooms.

Therefore, for the purposes of this evaluation, the following competences and draft indicators are being used to assist the data–gathering steps and follow–up analysis. They are based on the STEM

strand described above in some detail, amended to also take into account the Arts dimension of the new curricular framework.

- **Being curious:** Developing a curious disposition

- **Developing new skills:** Developing, using and adapting STEAM skills

- **Understanding concepts:** Comprehending key science, technology, and engineering concepts and procedures

- **Solving problems creatively:** Using imagination and creativity to generate ideas, make discoveries, and explore solutions to problems; placing design at the core of problem–solving

- **Asking questions:** Being open–minded while questioning, discussing, and making judgements using evidence

- **Explaining STEAM ideas:** Applying science, technology, engineering and art/design language to communicate, evaluate, and reflect on learning experiences

A central feature of STEAM education is for children to understand that STEAM is bigger than the subjects the letters represent. Through this, they learn from an early age about practices, creative spark, and growth that can be gained from engaging in all of them simultaneously. As noted earlier in Chapter 2, the new Primary Curriculum Framework sets out proposals for the redevelopment of the primary curriculum that are connected to competences and capabilities children acquire through their early childhood education experiences with Aistear. For instance, the new Primary Mathematics Curriculum, published in September 2023, builds on mathematics learning in the home environment and learning through early childhood. While the new curriculum is being implemented and new resources are yet to be rolled out in relation to

some of these subject areas, it is clear that STEAM habits and competences are becoming more and more integral to the early childhood and primary school experience. An aim, then, of this evaluation is to better understand this context and how the specific competences investigated here can support and contribute to this wider context.

The evaluation approach is grounded in current and emerging research, assuring schools and funders, as key stakeholders, that the learning can serve to influence and shape an emerging curriculum. The STEAM habits and competences are relevant and can be equally applicable within the wider school environment. As is clear from above, all six competences under focus here are named in the new curriculum and can offer a wider constructive focus on children's skills, knowledge, dispositions, values, and attitudes. For instance, key competences linked to "being a digital learner" and "being mathematical" create a useful space in the primary curriculum that can prioritise or highlight a focus on making use of Doodle STEAM–related activities within all classrooms. These matters will be further discussed and returned to in a later chapter.

3.2 EMBEDDED IN ESTABLISHED LEARNING OUTCOMES

Learning outcomes are defined as expected learning and development for children at the end of a period of time. They tend to be subject–specific and complementary across curriculum areas, and are age appropriate. Learning outcomes are generally part of curriculum specifications and are used to inform assessment and progression. They ensure continuity and progression in children's learning across primary school years.

As noted above, due to the recent adoption and rollout of the new primary curriculum, the application of associated learning outcomes within STEAM subjects remains a work in progress for all schools. Aligned to the purposes of this evaluation, the six competences taken from the new national framework are central to the research work. The study aims to establish the extent to which the Doodle STEAM Programme is enhancing these competences and STEAM habits, if at all.

By rooting the evaluation in these broader curricular frameworks, this allows the Doodle STEAM Programme to locate itself within the learning outcomes articulated by the NCCA and Department guidelines. While the new curricular strands have larger ambitions and potential than the Doodle STEAM Programme with regard to their scale and learning outcome scope, the evaluation sets out to examine how (and if) the programme is shaping STEAM habits and how (and if) parents and teachers are creating a novel and sustainable supportive environment.

3.3 CO–FACILITATING THE SUPPORTIVE ENVIRONMENT

Doodle STEAM offers a unique approach, whereby the HSCL delivers the learning programme with parents, who are an integral part of the programme delivery. Over the eight weeks of programme delivery,[10] the teacher facilitates the parents' learning around a specific STEAM activity. As the children join the classroom or learning space, or the parents join the children in the classroom, the parents then take over the teaching duties, supporting their children to complete a specific STEAM–related activity. These are designed to be fun learning experiences, with a focus on play and "hands–on" work. The parents can work together and look for extra help from the HSCL/School Completion Project Worker/teacher and are encouraged to ask their children to take a lead in the activity.

[10] In some circumstances, the programme may be delivered in six to seven weeks, for example to align itself with the school calendar or to fit in with a pressurised school timetable.

Creating this supportive environment allows for STEAM learning to happen in a collaborative manner, where a parent can become the "expert". The research and policy lessons noted in Chapter 2 point to the importance of building this type of environment, especially within disadvantaged communities where role models working in STEAM disciplines may not always be to hand. The Doodle STEAM Programme suggests that parents can take these activities into the home and make use of them with these children as well as with siblings and other family members.

The evaluation attempts to understand how this supportive environment is created and co-managed by teachers and parents together. Through focus group discussions with both cohorts, the study seeks to gain insights into how such supports can enhance the acquisition of STEAM habits and competences.

3.4 METHODOLOGICAL CONSIDERATIONS FOR THE STUDY

As part of the development of the evaluation methodology framework, an application was submitted to the Tusla Independent Research Ethics Committee. This process required the research team to develop a set of questionnaires and interview guides with the support and sanction of this committee. All other required materials and documents were also provided to ensure alignment with the committee's requirements, for example, consent forms, information notes, vetting forms, etc. The CDI team worked closely with Nexus and Tusla to complete this step.

As the methodological tools and approach were being developed, the research team engaged with key experts in the field working in teacher training and STEAM-related projects to ensure that the research instruments were appropriate. For

instance, within the questionnaires for children, almost every page included questions visually aided by drawings. The approach was fine-tuned so that the programme facilitator and researcher would explain each task by reading the questions out loud and wait for everyone to answer. Furthermore, the approach was tested with primary school teachers to ensure that the survey questions were child-focused, age-appropriate, and not generic. This informal piloting process allowed for some further changes to the questions and the use of images and cartoons.

The proposed approach to gathering information placed a reliance on the use of pre- and post-programme surveys with the children, to be implemented during focus group sessions. The children received support as they completed the surveys, using written answers and pictures where necessary or applicable. The inclusion of open-ended, qualitative survey questions facilitated additional information. Focus groups with parents and guardians during the final phase of the evaluation were also critically important in better understanding how the children were supported in their learning.

The final research schedule involved the following key steps:

- pre-questionnaire session with children in four schools

- post-questionnaire session with children in four schools

- post-programme focus group with parents in four schools

- post-programme focus group with HSCLs from four schools

For each step, the researcher and teacher worked closely to create a safe and secure space for the sessions to take place. The original plan involved reaching out to a larger number of schools involved in implementation of the Doodle STEAM programme, but not all schools could participate. Reasons given included practical scheduling challenges and potential interruptions and disruptions to the school calendar for participating teachers and class groups. Ultimately, the four schools that agreed to engage represented a strong sample of the schools in the community of Tallaght.

The Doodle STEAM Programme works to complement the five STEAM disciplines that are already being taught within the classroom, more likely to children from older classes. However, the scope of the 8–week set of sessions amounts to 8 weekly engagements with up to 15 children over a 30–minute period, where they collaborate with their parents on a specific activity (e.g. messy play, nature walk, etc.). Therefore, there is a limited capacity for the programme to offer these six–to eight–year–old children an intensive immersion within a STEAM learning programme. Bearing this in mind, the evaluation activity, particularly from the perspective of the engagements with

the children, involves a process of gathering both baseline and comparative information at a later stage. Using the six competence areas, the survey process will focus on what is realistic and meaningful given the nature of the sessional work and its parallel aims of promoting stronger relationships between parents and children.

3.5 OVERVIEW OF FRAMEWORK

The following figure presents an overview of the Evaluation Framework being applied within this study. Through engagement with the children, the survey–based sessions are designed to allow the children to express their relationship with STEAM ideas, habits, and competences before and after the programme has been delivered. The children can explore these ideas through responding to images, writing answers, drawing pictures, and participating in walking debates, as well as through questioning the researcher and teachers. It was important that the framework could be simplified so that the children themselves could get an understanding as to the focus of the research and be able to offer their insights with this in mind.

While the six STEAM ideas and habits are linked to the curricular priorities, they are also connected to understanding the way in which the children view STEAM in an integrated, non–siloed manner and how they have experienced the Doodle STEAM Programme. Chapter Five presents a detailed breakdown of the children's feedback and insights with regard to the framework and the specific survey questions linked to unpacking these STEAM habits and ideas.

The supportive environment is then examined through discussions with parents and teachers, all with a focus on how the learning space is created in a safe and inclusive manner, as well as how the programme is delivered and co–facilitated by parents and teachers working together.

The next chapter now moves to presenting the evaluation implementation process as well as a profile of the research participants. The innovative methodology used to gather insights from such a young student cohort requires some explanation. This is important for understanding how the subsequent findings and conclusions were reached.

Figure 2: Doodle STEAM Programme Evaluation Framework

Evaluation Framework

SUPPORTIVE ENVIRONMENT

Explaining using STEAM ideas

Being curious

Developing new skills

CHILDREN ACQUIRING STEAM HABITS

Solving problems

Asking questions

Understanding concepts

PARENTAL INVOLVEMENT

TEACHER CO-FACILITATION
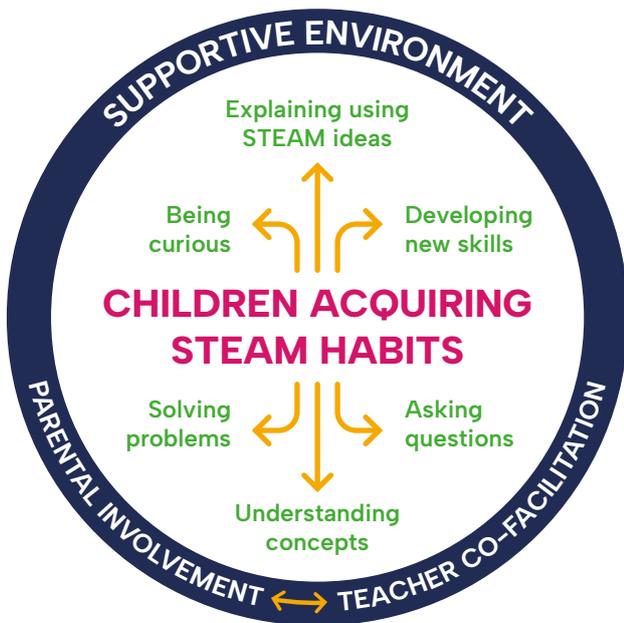
4 Evaluation
Implementation

This chapter presents an overview of the implementation of the research. It is useful to explain the detail of how the research phase was carried out in order to understand how the children were enabled to discuss the key STEAM-related themes and address the questions in a supportive manner.

This chapter also provides an overview of the participants, both children and adults.

4.1 OVERVIEW OF PARTICIPANTS

A total of four schools participated in the Doodle STEAM evaluation process:[11]

- A total of twenty-eight (28) children took part in the pre-programme survey and focus group session.

- Thirty-five (35) children from across the four schools participated in the post-programme survey and follow-up focus group session.

- A total of thirty-nine (39) children participated, with twenty-four (24) available to complete both pre- and post-programme surveys and participate in both focus group sessions.

- Nineteen (19) parents from across the four schools participated in the focus group session having completed their involvement in the Doodle STEAM Programme with their children.

- Four (4) HSCL teachers participated in a focus group following the completion of the programme in their schools.

Profile of Participants – Children

Of the 39 children, 23 were male and 16 female. Almost 80% of the children (31) were aged either 6 or 7 years (see Table 1). The largest cohort of girls were aged six (56%) and boys were aged seven (48%).

Table 1: Children by Age

Age	Number	Percentage
6	17	43.6
7	14	35.9
8	5	12.8
9	1	2.6
10	1	2.6
11	1	2.6
Total	**39**	**100.0**

Almost two-thirds of students were in First Class (26) when participating in the Doodle STEAM Programme. Some 68% of boys (16) and 62% of girls (10) were in First Class. Table 2 outlines the children by class.

Table 2: Children by Class

Age	Number	Percentage
Senior Infants	1	2.6
First	25	64.1
Second	11	28.2
Fourth	1	2.6
Fifth	1	2.6
Total	**39**	**100.0**

Profile of Participants – Parents

Parents were asked to complete a short profile questionnaire to assist with the research. Some 21 parents completed the questionnaire. Of these, 18 were female and 3 male. The average age of responding parents was 39 years, with the youngest parent being 27 years of age and the eldest aged 48 years. Some 8 parents were aged in their 30s, 11 in their 40s, and 1 parent was aged under 30. The age profile was evenly spread across all schools. Almost a third of parents were parenting alone.

The majority of parents were living in two–parent family households (71%), with the remainder being single parents living alone (19%) or single parents living with extended family (10%).

While the highest levels of education were spread evenly across all schools, there was a higher proportion of parents who had completed third–level education qualifications in one school. Table 3 outlines parental education level in detail.

Table 3: Profile of Parent by Highest Level of Education (Completion)

Highest level of education	Number	Percentage
Lower Secondary (up to Junior Cert)	2	10%
Higher Secondary (between Junior and Leaving Cert)	5	24%
Community or Further Education	8	38%
Third Level	6	28%
Total	21	100%

Some 20 responding parents were of a white Irish ethnicity, with one parent indicating that they were of Black or Black Irish ethnicity. No Traveller parents were recorded as participating in the programme, or, by extension, in the evaluation process.

4.2 SURVEY COMPLETION WITH CHILDREN

The focus group sessions with the children made use of an agreed questionnaire[12] that was developed with support from STEAM experts and teacher trainers. The main focus of the questions was to allow the children to examine STEAM ideas, habits, and competences. These surveys were completed during facilitated sessions which took the format of a focus group style.

Focus Group Discussions with Children

In advance of each school beginning their Doodle STEAM Programme of eight sessions, the HSCL supported the researcher in holding an in–person session with the children. The parents of each child had completed a consent form in advance.

Every effort was made to ensure that the maximum number of children participating in the programme would be in attendance, but not all children were able to attend this initial session, due to illness or missing school for other reasons on that day. Some 28 of the total group of 39 were present. A follow–up session was held with the children following their completion of the Doodle STEAM Programme. The same survey was completed once again, but with some additional questions. Due to time constraints, the full survey was not completed with the children in two schools. As with the initial session, not all children were present on the day of the focus group. Some 35 of the total group of 39 were available.

---

[12] See Appendix 1 and 2 for pre– and post–programme surveys

Table 4 presents a breakdown of the numbers of children attending the focus group discussions (FGDs) in each school.

Table 4: Schools Involved in the Research and Numbers of Participating Children

School	FGD 1	FGD 2	Total number of children involved in FGDs	Only attending FGD 1	Only attending FGD 2	Children attending both
School A	6	6	8	6	2	4
School B	7	10	11	7	4	6
School C	8	11	12	8	4	7
School D	7	8	8	7	1	7
Totals	**28**	**35**	**39**	**28**	**11**	**24**

Each session was facilitated within the school, typically in a parents' room or school library. The children were brought to the session from their classes by the HSCL and the teacher remained in situ for the duration of the sessions. Each session varied in length, but at a minimum took 30 minutes, with the longer sessions lasting up to 45 minutes.

The sessions were structured around the survey. The survey was developed as part of the earlier phase of work for the ethics application. Feedback from experts in STEAM pedagogies and child development had been involved in this development work to ensure that the methodology was suitable for the specific age profile. As a child outcomes evaluation had not happened previously, there was a focus on ensuring that the children would be able to fully engage with the questions. With this in mind, the survey document as completed by the children was replete with pictures to encourage full understanding.

Before the surveys were introduced, the children were asked to provide their assent for involvement in the research. A one-page document was given to each child with a series of simple questions indicating that they were aware as to the reason for their presence in the classroom, that their parents/guardians had already given their consent, and that they would be asked some questions about STEAM. All children were encouraged to ask questions at this stage to demonstrate that they understood why their involvement was important. In one school, one child decided not to assent to participate in the focus group, indicating no interest and a preference to return to class. The child's teacher brought them back to the class, and the remaining children signed the form to indicate their assent. All children in the other three schools completed the assent forms.

With each student in receipt of their own survey, both the researcher and the HSCL explained each question, both the logic of why it was being asked and how they were expected to answer. Each student initially provided their initials as a unique identifier, so that the researchers could compare the pre– and post–survey data. The children also provided information on age and their class. Doodle STEAM is designed for children between Senior Infants and Second Class. Two of the total group were from older classes, both in the one school. Both students have additional needs and

were included by the HSCL as it was considered that the students would benefit from involvement. Both fully participated and contributed in the group setting.

The students worked on and answered the survey questions sequentially as each was explained to the group. Any queries were taken, with some students requiring extra supports. With these supports being provided and questions being constantly encouraged, there was a satisfactorily high quality of data provided within the questionnaires.

The questions had a mix of pictorial elements, tick boxes, and open-ended options for responses. Students had the option of drawing their answers if they so wished. For example, two questions sought to better understand their propensity for creativity and new ideas, by asking about something that they had made or designed, as well as something they would like to invent. This allowed for the children to both write or draw responses and led to some level of discussion.

Once the children had completed these sections, a walking debate was facilitated. It was explained to the children that they had three options as to how they could respond to a particular statement (agree, disagree, don't know/not sure). There were three designated areas in the room, each containing a large emoticon/symbol on paper, placed beside a teddy bear or another toy from the library or parents' room. As each statement was read out and explained, the children would think about their response and then bring their Post-it notes to the relevant area and stick it to the page with that emoticon (see Figure 3).

Figure 3: Emoticons within the Walking Debate

Each statement had been developed in relation to STEAM habits that are typically of importance in considering STEAM–related attributes as well as key features of the Doodle STEAM Programme.

This exercise within the focus group required children to leave their seats and move around the room. While it may have led to some initial confusion with the children, they were able to quickly organise themselves and use the opportunity of the walking debate to reflect on their answers as they were moving to and fro.

The pre–programme session also involved a step where the elements to be used in some STEAM–related activities were presented to the groups. These included the spaghetti, marshmallow, and string components of the *Doodle STEAM Session 4 Engineering*, as well as the ingredients of play dough that were to be used in *Doodle STEAM Session 1 Introduction*, and the materials for making a stethoscope in *Doodle STEAM Session 2 Science*. Given that the students had yet to begin the programme, there was an opportunity for them to examine these components and materials and consider what they could be used for. As the students offered their feedback and ideas, notes were taken by the facilitator. This then concluded the pre–programme session.

The post–programme session took the same format as the pre–programme session, but also concluded with a reflection by the children on how the programme had gone for them. Again, they were encouraged to draw or write about their highlights, as well as to think about how they might explain STEAM to their friends. Once they had completed this final exercise, they returned to their classes.

The aim of both elements of the session (facilitated completion of survey and walking debate) was to encourage the children to discuss their favourite STEAM–related activities, career interests, and design and invention ideas, all allowing them the scope to reflect on how STEAM subjects have impinged on their lives to date.

4.3 IMPLEMENTATION OF FOCUS GROUP SESSIONS (INTERVIEW–BASED)

The focus groups with the adults, both the parents and teachers, were based on an agreed interview schedule (and linked focus group guide)[13] designed to encourage a discussion on how a supportive environment for the programme was co–facilitated.

[13] See Appendix 1 and 2 for Pre and Post Programme Surveys

Focus Group Discussions with Parents

Following on from the completion of the Doodle STEAM Programme in each school, parents were invited to participate in a focus group. A set of questions was developed through the initial evaluation framework and the ethics application. The questions covered how parents heard about the programme, their experiences in participating, and their perceived impacts for themselves and their children and from a school perspective. In three schools, it was possible to schedule the focus group session to coincide with the final Doodle STEAM workshop. This ensured that there was a high turnout of parents. In one school, this was not possible, and the focus group was not linked to a specific Doodle STEAM event, making it more challenging for parents to attend.

The timing of the session in another school was in the weeks before Christmas 2024, which again made it difficult for parents to participate. Participation numbers are outlined in Table 5.

Table 5: Schools and Parents Involved in FGD

School	Parents in FGD	Male	Female
School A	7	1	6
School B	5	1	4
School C	2	0	2
School D	5	1	4
Totals	19	3	16

The focus group discussions were audio–recorded and the questions were covered with input from all parents.

Focus Group Discussions with HSCLs

The final part of the research involved a focus group session with the Doodle STEAM facilitators/ HSCLs. This allowed for a formal conclusion to the evaluation work with input from all four HSCLs. The discussion was audio–recorded, and, as with the parents' session, the discussion guide was prepared in advance and agreed within the evaluation framework and ethics application. The questions focused on how they became involved in the programme, the level of support received, how they found the delivery of the sessions with parents and students, and the impacts. They also spoke about the extent to which the programme supported their work as HSCLs.

4.4 SUMMARY

The research approach involved working closely with four DEIS schools in Tallaght, requiring the support and engagement of the HSCL in each school. This support was offered readily and allowed for a series of eight engaging focus group sessions with the 39 children. Due to the nature of the busy school day, alongside routine and planned absences, the researcher was only able to work with those children present for each session. These were often time–limited sessions due to set school times, breaks and home–time deadlines. This meant that it was challenging to ensure that the same children were available for both pre– and post–survey focus groups. This also meant that there were sessions that overran in certain sections of the survey or had to be curtailed in others as the bell rang. Similar challenges existed in accessing the full cohort of parents for the focus groups. Every effort was made to have as many available as possible, but circumstances often meant that numbers were restricted.

As explained through this chapter, the research results are based on the rich feedback provided through the survey work and the focus group discussions. The following chapter presents the perspective of the children and looks at their insights about their world of STEAM, both before the programme takes place and following on from its completion.

Because of the challenges noted in accessing the same groups of children for the pre– and post– sessions, as well as the limited time available with the groups, the following chapter presents the feedback from the children in a sequenced manner, i.e. the results of the initial and then the follow–up sessions, followed by the comparative analysis. It is important for the reader to bear in mind that these methodological limitations prevent a standard evaluation of the impact of an intervention over two points in time, based on an initial baseline level. Notwithstanding, the fascinating feedback gleaned from these sessions can be seen as a medley of qualitative stories and insights, set within a quantitative evaluative backdrop, of their evolving relationship with STEAM ideas and habits, all connected to their experiences of participating in the Doodle STEAM programme with their parents.

5 Results from the Children's Survey-Based Sessions

This chapter presents the findings from the research with the children in each school, looking at their understanding and interests in STEAM activities, both before and after their participation in the Doodle STEAM Programme. Children discussed their favourite STEAM–related activities, career interests, and design and invention ideas, all allowing them the scope to reflect on how STEAM subjects have impinged on their lives to date. The research sessions also provided a space for the children to participate in a walking debate, where they could indicate their levels of agreement with statements about STEAM habits.

While it was a subset (62%) of the total numbers of children (24 of 39) that were able to participate in both research sessions, there is significant evidence available from both session 1 (28 participants) and session 2 (35 participants) to demonstrate their engagement levels with the themes and subject matter as well as to highlight outcomes of the Doodle STEAM Programme on their confidence levels. The importance of the involvement of parents and guardians, as well as the support of their teachers, is also made clear by the children through these research sessions.

A combination of the quantitative and qualitative data reveals that children exhibit strong awareness and interest in various STEAM disciplines, with their habit acquisition aligning closely with de–velopmental stages. Their natural curiosity, prob–lem–solving skills, and conceptual understanding are actively nurtured both at school and at home, as shown in the initial focus group. Participation in the Doodle STEAM Programme has further strengthened these competencies, as evidenced by post–programme focus group feedback.

This chapter presents results from both pre–programme and post–programme research sessions. The final section looks to bring these together in a systematic manner, linking to the evaluation framework indicators.

5.1 PRE–PROGRAMME RESULTS

Having provided background information on age and class, children were asked to identify their favourite STEAM–related activity. Each activity was presented as a picture and they could tick a box beside their preferred option. If they had a different preferred activity, they could indicate this in a different box on the page. They could write their answer or follow the format of the images and draw their own activity. Table 6 outlines children's responses.

Table 6: Favourite STEAM–Related Activities (Before Doodle STEAM participation)

Favourite Activity	Number of children	Percentage of total
Drawing or painting	5	17.9
Building with blocks	4	14.3
Playing with science kits	10	35.7
Using computers	5	17.9
Other	4	14.3
Total	28	100.0

Before the Doodle STEAM Programme had started, it was very encouraging to note that over one third of the children found "playing with science kits" as an activity that they especially enjoyed and looked forward to. This may have been related to their prior knowledge of the programme that they were about to begin and the links with science. But it also demonstrates that there is a keen awareness of science within their day–to–day school life. This interest was spread equally between those children in the First and Second Classes.

Other activities that were valued by the children were use of computers and iPads, drawing and painting, and building with blocks. Other activities of greater interest included sports such as football and gymnastics. Some children named playing Minecraft and helping their mother.

Students were then asked to consider the type of career or profession that they would desire. Again, there were images of the STEAM-related areas and they could place a tick beside their choice or add their own ideas. Table 7 outlines children's responses to this item.

Table 7: Desired Careers (Before Doodle STEAM participation)

Desired Career Option	Number of children	Percentage of total
Scientist	5	17.9
Engineer	2	7.1
Programmer/IT	0	0.0
Teacher	2	7.1
Doctor/Nurse	2	7.1
Artist	3	10.7
Astronaut	1	3.6
Other	13	46.4
Total	28	100.0

Some 5 children of the 10 whose preferred STEAM-related activity was playing with science kits also indicated that they would like to pursue a career as a scientist. These 5 were all boys and from 3 different schools. Some 4 of the 13 girls (31%) stated their desired career as a doctor or nurse or teacher. Another added their desire to be a vet in the "other" category. Girls also opted more strongly for creative sector careers, such as artists (3) and in the named other category as actors (2), a movie-maker (1), a dancer (1), and a singer (1). The boys were focused on other STEAM areas, including engineering (2), pilots (2), astronaut (1), and archaeologist (1). The remainder were interested in sports (2), restaurant work (1) or "any job" (1).

Students were asked to think of something that they had made/designed or been involved in that they are proud of. They were encouraged to think of something STEAM related in terms of using their imagination and creativity either at home, in school, or within a club or group outside of school. Table 8 outlines children's responses to this question.

Table 8: Major Achievements by Gender (Before Doodle STEAM participation)

Female	Male
Artwork (painting, drawing, 3D design) (7)	Building activities (using Lego, castle, gun, robot) (6)
Building activities (Lego, building a house) (3)	Artwork (drawing, clay work, making a costume) (3)
Carrying out a project (2)	Sports related (I scored 10 goals, I won a race) (2)
Winning a prize at a camp (1)	Cookery (cake-making) (1)
	Doing an experiment (1)
	Minecraft (1)
Total	28

The children focused on a range of artefacts that they had built or created. This ranged from completing a Lego set or their own Lego creations as well as robot kits or castles (9). Other creative activities were linked to producing their own artworks, including paintings, drawings, and other artistic endeavours (10). For the other children, they were most proud of prizes, sports achievements, completing projects, making a cake, building their own Minecraft world, and doing an experiment. Girls were more likely to focus on an artistic creation (7 from 13) compared to the boys (3 from 14), while the boys were more likely to name a building activity (6 from 14) compared to the girls (3 from 13).

On a similar theme, students were asked to think of something that they would like to invent. They could draw this as well as write it on the available page. The researcher and HSCL were available to assist them in their spelling or phrasing of their invention.

The full list of possible inventions is included here to give an insight into the creative minds of the children. While the imaginations became very expansive, the boys, among other considerations, thought sports, space, computer games, war, and guns. The girls identified ideas linked to rollercoasters, rainbows, and robots (see Table 9).

Table 9: Design Ideas or Possible Inventions by Gender (Before Doodle STEAM participation)

Female	Male
Rainbow shoes	Football boots that last forever
Rollercoaster	Magic hat
Climbing frame	Fast football boots
Slide	Tree house and flying machine
Finding rainbows	Tall castle to the sky
Secret tower	Bridge across sea
Robot with special buttons	A new type of game
Invent a strawberry cake	Computer game
A rollercoaster	Halloween sweets
Special type of TV	A machine that can bring me into the Minecraft world
Rainbow catcher	Special gun that can shoot through trees
A car–plane	Ladder that can go into space
A robot	A plane that can fight in wars and can go through water
	Pretty much an Alexa, with a body. It would be called the Handy Helper ™

Children were asked as to whether they had previously participated in camps or groups linked to art or science. Some 16 of the 28 children indicated that they had participated in such camps or groups (57%). Of these children, half were female. Some 14 of these 16 camps were run by their school during the summer holidays or in some instances linked to an afterschool programme.

The walking debate section of the focus group allowed the children to consider a series of 10 statements and indicate their agreement levels with these statements linked to STEAM habits. Chart 1 gives an overview of how the children responded to these statements.

Chart 1: Agreement Levels with STEAM Habit Statements (Before Doodle STEAM participation)
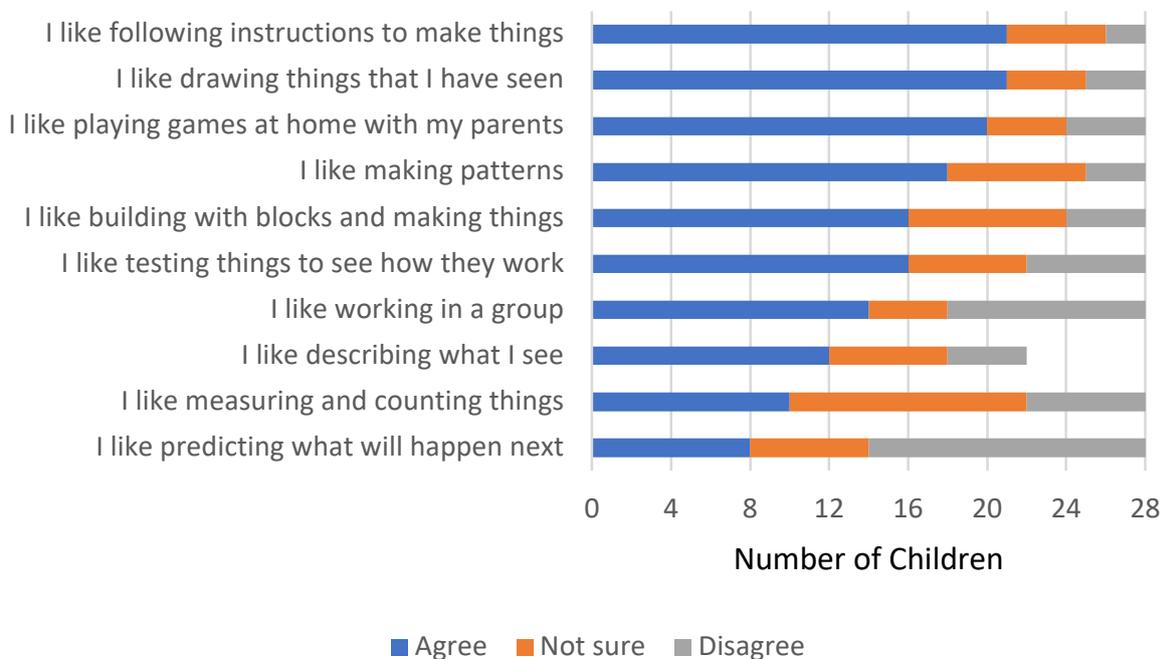
While there was often a high degree of consensus across each school and age group in relation to the most agreed-upon statements, the girls were more inclined to agreement. While the majority of the children indicated that they enjoyed following instructions, drawing, and making patterns, the girls were more positive towards these statements.

The following charts (Chart 2 and 3) present these results according to gender.

Chart 2: Agreement Levels with STEAM Habit Statements – Boys (Before Doodle STEAM participation)
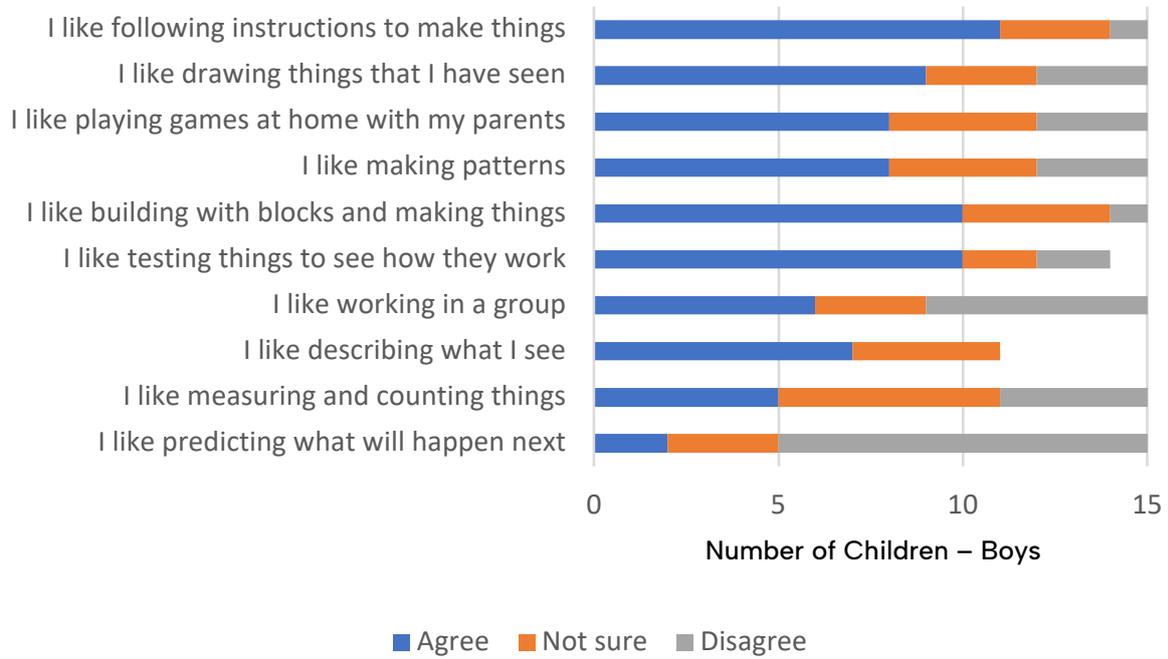
There are some key gender differences to note. Whereas 8 of the 15 boys (53%) enjoyed playing games at home with their parents, some 12 of the 13 girls (92%) indicated the same level of agreement. Boys had a slightly higher level of agreement with building with blocks and testing things, whereas girls preferred working in groups and making patterns.
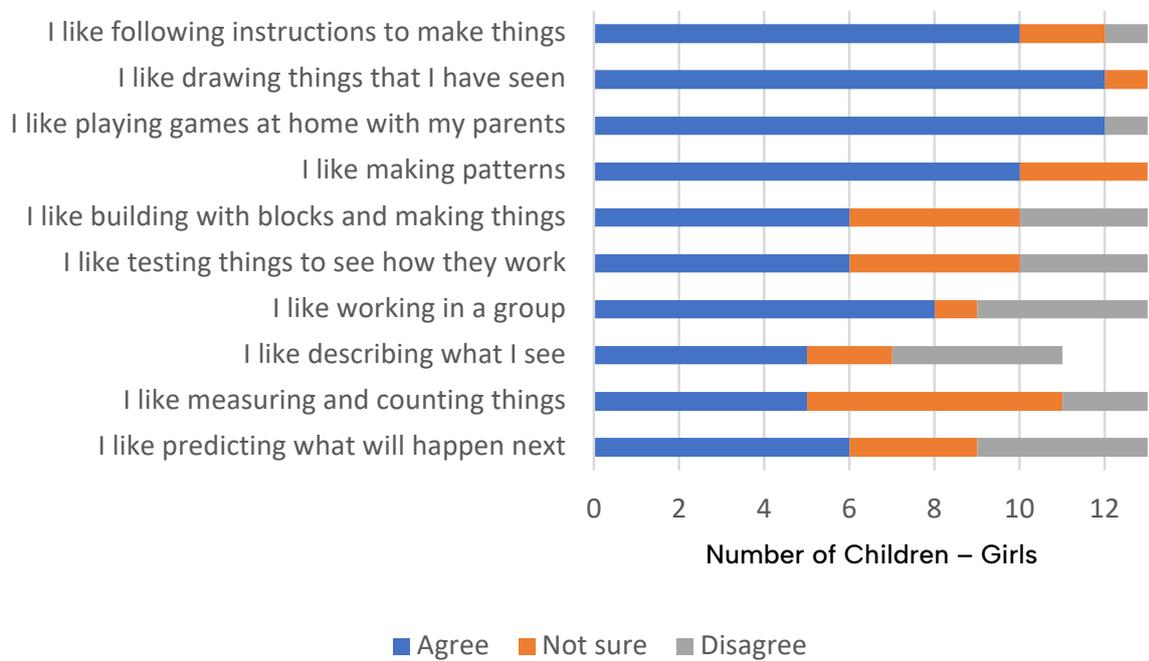
At the level of disagreement with the statements, both girls and boys indicated that they did not like predicting things or measuring and counting.

Items from the Doodle STEAM kit were then placed on the tables in front of the children. These included stethoscope materials (funnel, balloons, and tape) and play dough materials (flour, oil, plastic bowl, food colouring). The students were then asked to consider what they thought these materials could be used for.

When reviewing the play dough materials, the children were relatively close to the actual plans for the materials, guessing that they could be used to make "squishy substances", "liquids that can change", "slime", or maybe more wishful thinking "cakes and donuts". In reviewing the stethoscope materials, the balloons and funnels offered some ideas in relation to "water balloons and blimps", "a volcano using the funnel and tape at the bottom", or a "sound speaker" or "musical instrument".

5.2 POST–PROGRAMME RESULTS

This section looks at the results from the focus group survey session that was carried out following the completion of the Doodle STEAM Programme in each school. The session took place very close to their final engagement with the programme, so it was fresh in the minds of the children. The session was very similar to the initial one, so the children who had previously participated were familiar with the range of questions and the walking debate idea.

Of the 28 children who were available for the first session, some 24 were present for the follow-up. As well as these, there were an extra 11 children. Even though not all children were able to participate in both research sessions, all 39 children had participated within the Doodle STEAM Programme with their parents/guardians. Of the 35 participants in the follow-up session, some 21 (60%) were male and 14 (40%) were female. Some 24 were in First Class, with 9 in Second Class, and a further 2 from older classes.

The follow-up session mirrored the first so that the researcher and HSCL explained the research plan for the session and all children indicated that they understood this rationale and were happy to proceed. As with the initial session, children were asked to identify their favourite STEAM-related activity. They could again write their answer or follow the format of the images and draw their own activity. Responses are outlined in Table 10.

Table 10: Favourite STEAM-Related Activities (After Doodle STEAM participation)

Favourite Activity	Number of children	Percentage of total
Drawing or painting	3	8.6
Building with blocks	4	11.4
Playing with science kits	9	25.7
Using computers	10	28.6
Solving puzzles	2	5.7
Other	7	20.0
Total	35	100.0

The STEAM-related activities most favoured by the children in the second session were using computers and playing with science kits. The highest number of girls (4 of 14) indicated that playing with science kits was their favourite activity. The highest preference for the boys (7 of 21) was using computers. The "other" interests were linked to sporting activities including football, Karate, dancing, and swimming. One of the boys specifically named Minecraft. One of the girls referenced being with and helping her mother as her preferred activity.

Students were then asked to consider the type of career or profession that they would desire (Table 11).

Table 11: Desired Career (After Doodle STEAM participation)

Desired Career	Number of children	Percentage of total
Scientist	7	20.0
Engineer	1	2.9
Programmer	1	2.9
Teacher	4	11.4
Doctor/Nurse	2	5.7
Artist	3	8.6
Other	17	48.6
Total	35	100.0

The highest preference for any of the career options was for scientist. However, while one-third of all boys would like to be a scientist, none of the girls had this as their preferred career choice. The girls' main choice was for teacher, with some 29% choosing this option. Some 17 children indicated that they had a preference for "other" career options. These are outlined in Table 12.

Table 12: Desired Career (Other) by Gender (After Doodle STEAM participation)

Male	Female
Footballer (3)	Actor (2)
YouTuber (2)	Gymnast
Dancer	Shopworker
Mechanic	Mother
Tester	Dancer
World Traveller	
Pilot	
Film-maker	

These students referenced careers linked to sports including football, gymnastics, and dance (6), YouTuber roles (2), acting and film-making (3). Other more specific roles were highlighted including a shopworker, mechanic, pilot, and tester.

One boy had an interest in being a world traveller and one of the girls would like to be a mother.

As with the first session, students were asked to think of something that they had made/designed or been involved in that they are proud of. They were encouraged to think of something STEAM related.

Table 13: Major Achievements by Gender (After Doodle STEAM participation)

Female	Male
Lego related (house, castle, boat) (5)	Lego related (castle, house, building, car, ship) (8)
Carrying out a project (carpet design, robot, tower) (3)	Carrying out a project (robot, rocket, tower, making a present) (8)
Winning a prize/medal/success in sports (3)	Gold medal in sports
Artwork (drawing, 3D design) (2)	Making a design

These achievements cover a similar range of art, design, and building areas, from artworks and Lego building to specific projects to do with robots, towers, and rockets. Others considered a proud achievement for them something linked to sports or winning a prize.

Once again on this similar theme, students were asked to think of something that they would like to invent. The children were encouraged to again feel free to draw or write down whatever was in their minds. Table 14 gives an overview of what their imaginations came up with.

Table 14: Inventions by Gender (After Doodle STEAM participation)

Female	Male
Teddy with special love heart	Robot, robot dog, robot gun, robot with spinning arms (5)
Spaceship	Rockets in space (2)
Special trees with sweets (2)	Time machine (2)
Sweetshop	Time robot machine
Unicorn tower	Football related (new stadium, special football boots, invisible football) (3)
Swimming horse	A chair that flies
A cleaning robot	Special teddy
A tree house for my brothers, sister, cousin	A machine that can bring you into the world of Minecraft
A rollercoaster that can go under water	Play dough
Medicine	An Alexa but with a body, The Handy Helper
Flying car that you can drive	A Santa for giving presents
Playdough	

Asked again about the levels of participation in camps or groups linked to art or science, some 18 of these 35 indicated that they had attended. Of these children, some 8 were female and 10 were male. They had either attended summer camps in their school or community or participated in activities linked to an afterschool programme. Three of the children had attended a Lego Camp or Club.

During the follow-up sessions, because of time constraints, it was not possible to facilitate the walking debate in two of the four schools. Therefore only 14 children (11 male and 3 female) were able to provide information on the statements linked to STEAM habits and their agreement levels (see Chart 4).

Chart 4: Agreement Levels with STEAM Habit Statements – All (After Doodle STEAM participation)

Number of Children

■ Agree   ■ Not sure   ■ Disagree
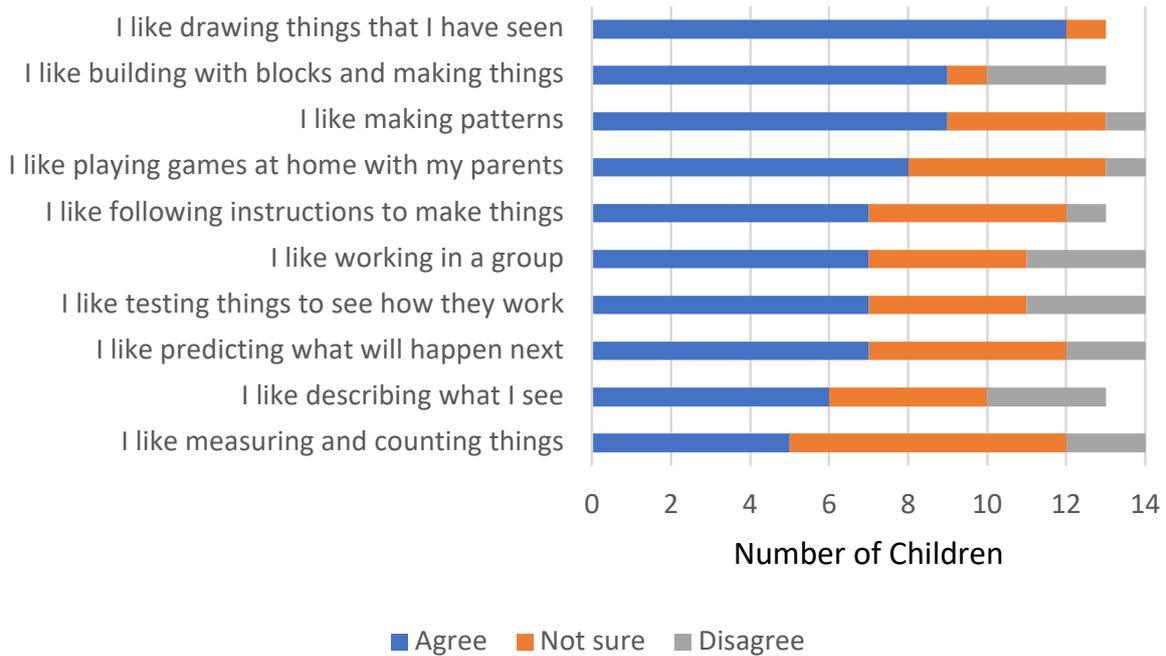
Of the STEAM habits reviewed within the walking debates, the most agreement was linked to an enjoyment of drawing, building, and making patterns. The children also indicated that they enjoyed playing games at home with their parents, with all 3 girls (100%) and 5 of the 11 boys (45%) giving their approval for this statement. Breakdown of responses for boys is outlined in Chart 5.
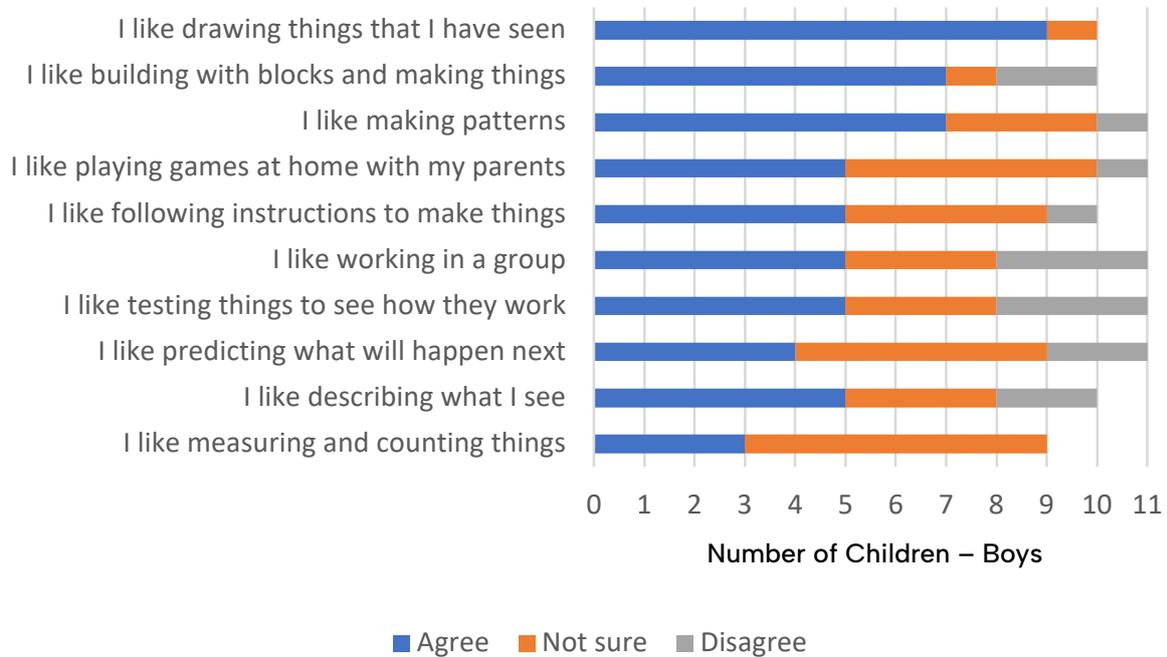
While the numbers were low for the girls input to these walking debates, all three did offer their approval for statements linked to drawing things that they had seen, playing games at home with parents, and also predicting what will happen next. The boys were less convinced by these statements, with only four of 11 (36%) indicating that they liked making predictions.

As the second focus group session took place following the completion of the programme, students were asked extra questions related to their experiences of the programme and how they now felt about explaining new concepts or ideas. Initially, children were asked to review their experience of Doodle STEAM from the perspective of their confidence in explaining STEAM to their friends or peers.

- Some 47% indicated that they would be confident (16 in total; eight male; eight female)

- Some 9% did not feel confident (three in total; two male; one female)

- Some 44% indicated that they were not sure (15 in total; 11 male; four female)

When asked how they would explain STEAM to their friends, the answers tended to link to their specific Doodle STEAM sessions, hence the references to slime, spaghetti, and marshmallows by three of the children. Of the 16 children who responded, 9 focused on highlighting some of the letters for which STEAM is linked. The remaining four students explained the experience of being involved in the programme, by mentioning how much "fun" it was or how "cool" it had been to be part of it.

Table 15: Explaining STEAM to Friends, by Gender (After Doodle STEAM participation)

Female	Male
Steam is a club, it is fun	Spaghetti
Technology	So fun
Science	Eating marshmallows
Slime	So fun, engineering
S is for science, T is for technology	Sort of just going off to the library and messing with stuff
You can do art	So cool
S is for science, t is for technology, e is for engineering	T is for technology
Science	T is for technology

Based on their experiences of the programme, the students were asked to think about what STEAM ideas they might like to add to their current classroom activities. Table 16 gives a breakdown of their responses.

Table 16: STEAM Subjects to Be Added to Class Activities (After Doodle STEAM participation)

Add to class activities	Number of children	Percentage of total
Computers	8	24.2
Robots	7	21.2
More art and design	7	21.2
Science experiments	6	18.2
Building and inventing	1	3.0
Other	4	12.1
Total	33	100.0

Echoing the earlier interests, students focused on adding computers, robots, design, and science experiments, almost in equal measure. While the boys were more likely to suggest computers and robots, the girls were more likely to include art and design and science experiments. Two of the children suggested adding STEAM–related maths as part of their class activities.

The students were finally asked to consider their favourite aspect of the programme (see Table 17).

Table 17: Favourite Part of the Programme by Gender (After Doodle STEAM participation)

Female	Male
The Mentos and Coke experiment (3)	Marshmallows and spaghetti building (4)
Making the play dough (2)	Making the slime (3)
The maths day (2)	Making the play dough (2)
Spaghetti tower	The Mentos and Coke experiment (2)
Making art	Robots
Being with my Mum, Mrs. Lane, Mr. Looney	The bug hunt
Going outside with Mam	Art and painting
It is fun	Doing maths
Loved it	Learning about science
	Spending time with my friends
	Cool
	It's fun, just in general
	Working together
	Having Mammy there

There was a mix of responses from the children about their favourite elements. Over half of the students named specific experiments as the most memorable elements, with the Mentos and Coke volcano explosion, the spaghetti and marshmallow tower, and the slime and playdough experiences all registering as key moments for the children. Many children remembered the specific theme of the session as a favourite, including maths (3), art and painting (2) science. Other children were specifically focused on the fact of their parents being present, in these cases having their mother with them in school (3). Others noted the overall feeling of the programme being "fun" or "cool" or that they "loved it". One student mentioned that they particularly enjoyed the experience of working together in a group.

The students presented very positive feedback through these engagements within the four schools, with a very welcoming response to the researcher and the evaluation asks. They displayed a patience and desire to learn that allowed for a fruitful experience for all.

5.3 ANALYSIS OF RESULTS

There are some key lessons emerging from the survey work with regards to the children's ongoing acquisition of STEAM habits. These will be explored here, linked to the evaluation framework and its specific focus on the six areas in question.[14]

It is important to note that due to circumstances beyond the control of the schools, some 24 of the 39 children (61.5%) were present for both focus group sessions. For the purposes of this section, all data will be used rather than just those participating in both sessions. This means that while there will be a like-for-like comparison used with regards to some datasets, for the most part, the analysis will include the results from all 39 children.

As noted above, the findings indicate that the children are displaying a high level of engagement and enthusiasm for STEAM subjects, with their developing habits reflecting age-appropriate learning stages. Their curiosity, problem-solving abilities, and grasp of foundational concepts are supported through both school and home environments, as demonstrated in the initial focus group, where they are particularly engaged by drawing or painting, building with blocks, and playing with science kits as favoured activities. Even before the Doodle STEAM Programme, the children are showing an awareness of science within their lives. These same interests are highlighted in the follow-up session, as are interests linked to computing.

As highlighted above in Chapter Two, children at this age are typically developing foundational skills through play, curiosity-driven exploration, and hands-on activities such as their examples of building with blocks or carrying out science experiments. Through these activities, they are developing STEAM habits linked to observing, questioning, and experimenting in unstructured ways. Their creativity and desire for problem-solving can also be seen in how the children considered major achievements that they were proud of. Both girls and boys focused on building activities, mostly linked to using Lego. They also were proud of projects that they had completed, again linked to building activities, such as building a robot or tower.

When asked about desired career options, there are a wide range of preferences in the initial session, with scientist the highest ranking, but also teachers, engineers, pilots, and an archaeologist featuring. The creative sectors are also well represented with actors, artists, and film-makers included. In the follow-up session, again scientist received the highest preference. This was

---

[14] Six areas within evaluation framework: (1) Being curious; (2) Developing new skills; (3) Understanding concepts; (4) Solving problems creatively; (5) Asking questions; (6) Explaining STEAM ideas

specifically an option decided by the boys, with the girls choosing teacher as their favourite option.

Children were asked to let their imagination go wild and think of an invention that they would like to come up with or a design idea that they might have. Plenty of time was allocated to this within the focus group sessions and the children were supported to best explain what they were thinking. Some drew their response and the full lists of ideas from both sessions are detailed above. It is clear that the children are demonstrating a range of STEAM ideas and habits in both sessions, as they come up with fascinating thoughts and concepts. While some are linking it to specific interests, such as football boots that make you go faster or a machine that can bring you into your Minecraft

creations, there are a range of inventive ideas that can be seen as becoming more STEAM specific in the second session, with more references to scientific ideas such as robots, time machines, or rockets. Play dough also features as an idea for future development, linking to one of the Doodle STEAM sessions.

Comparison between Focus Group Sessions

The children took part in a walking debate in both sessions and were offered a series of statements linked to their STEAM ideas and habits. Charts 6 and 7 together show the results from the 11 individual respondents that participated in this aspect of both focus groups, indicating the overall responses from the full group.

Chart 6: Agreement Levels with STEAM Habit Statements – All Children (n = 11) (Before Doodle STEAM participation)
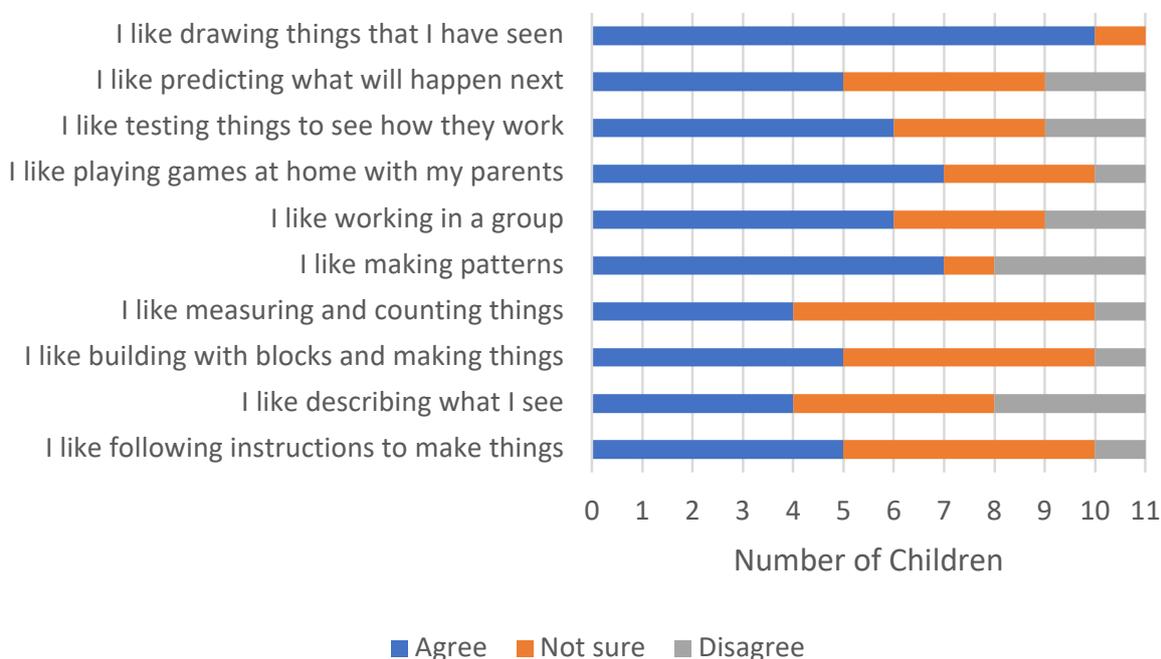
While the children are initially less favourable to statements linked to a desire to build, measure and count, and describe, they tend to favour

creative ideas and habits such as drawing and following patterns. Another favoured habit is that of following instructions.

Chart 7: Agreement Levels with STEAM Habit Statements – All Children (n=11) (After Doodle STEAM participation)

Number of Children

■ Agree   ■ Not sure   ■ Disagree

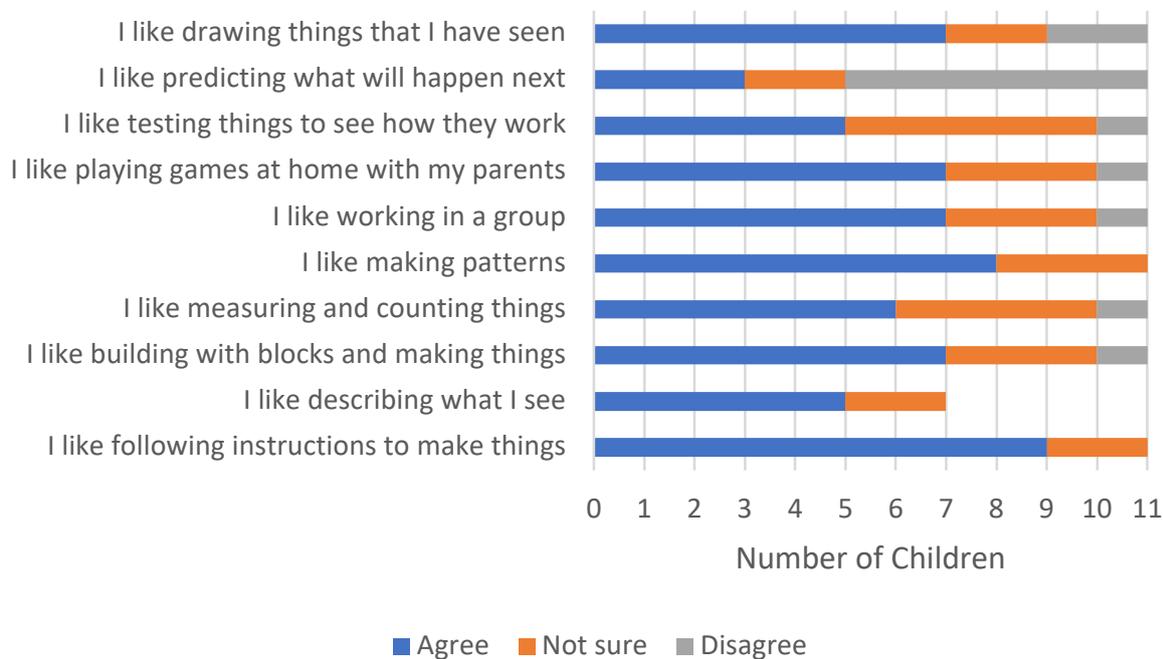The children noted in both sessions that they are used to following instructions when using Lego or other types of games requiring assembly or building. While many of these trends are very similar to those indicated in both focus group sessions, there are some shifts that can be noticed following on from their participation in the programme. Post-programme, the children tend to favour more the creative and constructive habits and ideas such as building, drawing, and making patterns.

The children are consistent in certain habits, such as that related to testing things to see how they work, a STEAM habit closely linked to the understanding of concepts and problem-solving. Their most favoured habit shifts from drawing to following instructions to make things. This can indicate that during the programme, there was a concerted effort by teachers and parents alike to follow a plan for each session, with the parents acting as facilitators and leaders. The children were also consistent before and after the programme about how much they enjoyed playing

games at home with their parents and the extent to which they enjoyed working in groups. As the children are accustomed to working in groups throughout their school day, this can allow for an understanding as to how such habits may be formed and sustained during the wider school day.

Children also discussed within these sessions how they had managed a range of tasks where it was up to them to navigate their way through the activity. In one instance, they were required to complete a series of photographs of common items to be found around the school, including footballs, a cat, and someone smiling. The children from different schools came up with creative solutions to address these challenges by going to the sports equipment shed to photograph a football rather than hoping to see one in the yard, photographing a cat from a library book, and asking one of their teachers to smile so that they could take the photo opportunity. These responses highlighted a creative means by which the children could problem-solve their way through an activity.

Almost half of the children (47%) indicated that following on from their experience of the Doodle STEAM Programme they would be confident to explain STEAM ideas to their peers or friends. Only 9% felt that they would not be confident, with the remaining 44% unsure. This confidence was echoed within the focus group discussions, as children were happy to name each letter in the STEAM acronym and chant the associated discipline or subject. At the initial focus group, the most common description of STEAM was that it "came out of a kettle".

The children were asked to consider what STEAM ideas they would like to bring back to the classroom based on their experiences of Doodle STEAM. Again, their STEAM ideas and habits were evident in highlighting a range of topics linked to computing, robotics, and science, as well as art and design.

The children were also asked to consider their favourite aspect of the Doodle STEAM Programme. The majority focused on specific memorable activities or experiments, mostly linked to fun and enjoyable experiences, shared with parents. Some children specifically named the collaborative experience and sharing of time with parents and friends. Children also consistently noted the fun element to the programme as they reviewed their time. This highly positive feedback speaks highly of their ability to engage and feel supported and included through these engagements within the four schools. The specific assistance from their teachers was evident throughout.

5.4 SUMMARY

Returning to the evaluation framework and the six key STEAM ideas and habits that were explained to the children allows for a review as to whether the data demonstrate that the children are acquiring these habits. The analysis of the data above indicated that the Doodle STEAM

Programme operated in an efficient and effective manner to bring young children together in a safe and inclusive space to be facilitated by parents and teachers to explore STEAM subjects. As noted above, the time is limited in terms of the children's exposure to the subjects themselves. The main focus of the programme is to allow the children to work with their parents to share a set of fun and enjoyable STEAM learning experiences. The children indicated overwhelmingly positive feedback about how the programme was implemented and how the sessions were delivered. They received an introduction to each of the STEAM disciplines and undertook a practical hands–on experiment or activity associated with each. Given the limited scope for achievement of specific learning outcomes linked to the new curriculum, the evaluation framework was designed to take the curricular priorities into account, but also to reflect the reality of the potential impact of the programme on the children.

This led to the development of a structured pre– and post–programme focus group survey that allowed the children to express some age–appropriate ideas about their understanding of STEAM ideas, their interests, and possible future career ideas in this regard. The contact time with the children allowed for walking debates and discussions on STEAM habits and a reflection on the implementation of the programme. While some trends are evident within the focus group results, especially with regard to the acquisition of certain STEAM habits such as an increased desire to build, measure, count, and describe, the ability to compare responses is hampered both by the number of children that were available at both stages, e.g. only 24 of the 39 children participated in both sessions and within this cohort, not all completed each stage of the research work, and the limited nature of the overall exposure to the STEAM disciplines, e.g. some children participated for 15–30 minutes once per week over 6–7 weeks. Therefore, the main focus of this research work

shifted from a quantitative comparison of the pre- and post-programme data to allowing the insights and feedback gained from the children through these sessions to inform how they have participated and benefitted from their experiences.

However, given these challenges in relation to the data-gathering and the relatively limited scope of the children's time engaged with the STEAM activities, the data presented here highlight that the children exhibit high levels of awareness and interest in many STEAM ideas and disciplines in both focus group sessions. They also demonstrate that their acquisition of STEAM habits is indicative of their stage of childhood, a stage where curiosity, problem-solving, questioning, skill acquisition, and understanding of concepts are

being supported within their school environment, as demonstrated by the initial survey work and then further enhanced by participation in the Doodle STEAM programme, evidenced by the post-programme focus group discussions.

This chapter has outlined in some detail this feedback and highlighted the results in relation to how the children have been supported to acquire and sustain new ideas and habits. These ideas and habits are central to the new Primary Curriculum Framework and the programme clearly is successfully contributing to the children's ongoing development and acquisition of these habits and associated competences.

Figure 4: Evaluation Framework and Key STEAM Habits
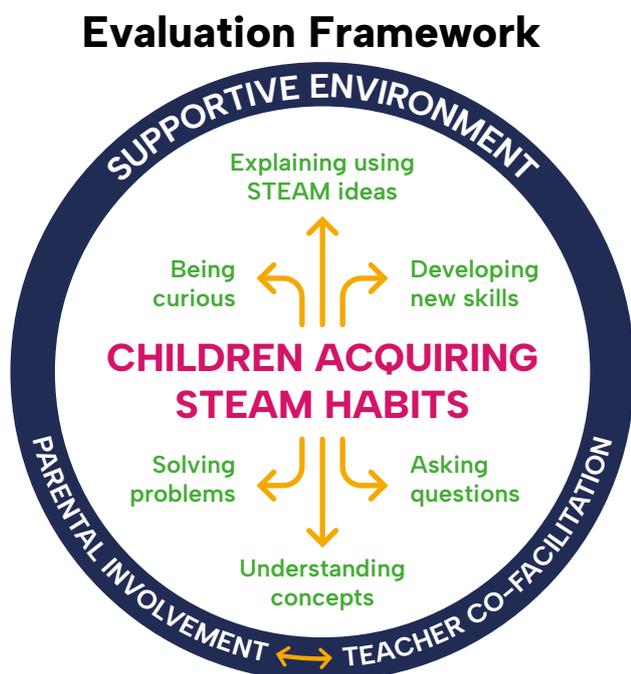
Evaluation Framework

Six key STEAM habits:

1. Being curious about what is in front of us

2. Developing skills, by learning through play and experiments

3. Dealing with new concepts and ideas

4. Solving problems with imagination and creativity

5. Trying to think like scientists, working out what might happen if we do this

6. Sharing and explaining using some simple STEAM words or ideas

Links to STEAM Policy and Literature

The children's imaginative inventions (flying cars, game portals, robots) exemplify and demonstrate an active curiosity, a core disposition in the new Primary Curriculum Framework. The Framework emphasises nurturing children's curiosity as a key aspect of learning and encourages exploration, questioning, and a sense of wonder to foster a love of learning and a desire to understand the world. This framework aims to develop children's thinking skills, encourage them to form and test ideas and see themselves as active learners and thinkers. As noted above, this new framework builds on the principles of Aistear: the Early Childhood Curriculum Framework, which also emphasises learning through play and exploration.

This also aligns with the STEM Education Policy Statement 2017–2026,[15] which prioritises nurturing "natural curiosity" as foundational for inquiry–based learning. Literature emphasises that curiosity drives intrinsic motivation and deeper engagement (Engel, 2015), while "possibility thinking" (Craft, 2000) observed in the children's speculative ideas is recognised as critical for innovation. The programme's success in eliciting such responses demonstrates how open–ended STEAM tasks can bring such curriculum goals to life by creating spaces for children to question and reimagine their world.

STEAM habits in general

Children's **hands–on engagement** in tasks like building stethoscopes or creating play dough also embodies the new framework's pedagogical pillar of learning through play. Play is recognised here, not just as a recreational activity but as a powerful tool for learning and development, supporting children in becoming confident, competent, and engaged learners. The children highlighted how play and fun elements were important to them

in their reflections on the programme. One of the most approved of statements related to their enjoyment of playing games with their parents.

The tasks requiring the children to grapple with unfamiliar concepts like engineering foundations or dealing with surveying minibeasts helps to develop competencies linked to **active learning**, while the spaghetti tower activity exemplifies authentic **problem–based learning**, strategies advocated in the STEM literature and the new Science Curriculum. The extent to which the children indicate that they are enjoying making patterns, building, and measuring can contribute to their engaging positively with identity development and potentially acting as young engineers or young scientists.

The children's resourceful solutions during the photography scavenger hunt challenge (e.g. using library books for a "cat" image) demonstrate **creative thinking and adaptive problem–solving**, again core competencies linked to the new framework, where such creativity is regarded as essential for navigating complexity.

The **culture of questioning**, observed during walking debates and promoted during the programme, highlights how the "Being a Communicator" competency is supported by the programme and fits well with the inquiry–based approach mandated across the new curriculum. The children were empowered to enquire freely as part of the programme and in turn were comfortable engaging with the research process.

Children's confidence in **articulating STEAM concepts** (e.g. describing an engineer's work or being able to explain STEAM to a friend) demonstrates an emerging science literacy amongst the children. Explaining concepts to peers requires a new level of domain–specific

---

[15]   https://assets.gov.ie/static/documents/stem–education–implementation–plan–to–2026.pdf

vocabulary ("scientist," "engineer") and represents a crucial foundational level for sustained engagement. The low percentage (9%) lacking confidence suggests the programme successfully built children's communicative agency within STEAM, addressing a common barrier in disadvantaged settings where academic language exposure may be limited.

The preference for **structured building** (Lego) and creative activities aligns perfectly with the integrated, playful, and competency–based approach of the new framework. Valuing games with parents also supports the recognition of family as the primary educator. The focus on building and pattern–making connects as well as their stated enjoyment of creative activities reinforces and aligns with research cited above on the positive impact of arts integration on STEM engagement

These results point clearly to how Doodle STEAM sessions have stimulated the children's **imagination and curiosity**. The children have embraced experimentation, making slime and play dough, hunting for bugs, and documenting and photographing specific aspects of their school. The children demonstrated imaginative responses to questions and were able to use STEAM concepts and words to describe their ideas and experiences, specifically in explaining STEAM to peers and friends. While they did not necessarily all indicate a desire to always work in groups, preferring the idea of working alone, during Doodle STEAM they worked collaboratively with their peers and their parents. The research highlighted in Chapter Two points to the importance of STEAM habits and ideas being supported from an early age in order to spark future interests in STEAM subjects and disciplines. According to data presented in this chapter, the Doodle STEAM Programme has ignited these ideas and interests for these children and has supported their acquisition of STEAM habits.

The next chapter looks to the supports that were required to scaffold this learning for the children. The innovative manner in which parents and teachers co–facilitated the programme within these DEIS schools represents an approach that has been mandated by Irish and EU policymakers, whereby parents are being very effectively included in their children's learning, with a specific focus on STEAM disciplines. It focuses on parents and teachers explaining how they worked together within the home and the school space to create such a supportive environment for the ongoing acquisition of these STEAM ideas and habits.

6 Creating a Supportive Environment

This chapter examines the manner in which the adults, both parents and teachers, worked independently and together to create and sustain a supportive environment in which the children could best acquire STEAM ideas, habits, and competences.

Some 19 parents participated in the focus groups across the four schools, with 3 fathers and 16 mothers involved. The sessions followed a standard schedule that allowed the parents to describe how they became involved, their rationale, and their experiences. They then provided some insights into the range of outcomes that they saw for their children, as well as for themselves.

The four HSCL teachers took part in a separate focus group, where they could reflect on their experiences of delivering this cycle of Doodle STEAM as well as previous work in this area. They also highlighted the manner in which the programme has operated in their schools, and the range of supports that they have put in place for both parents and the participating children.

The key conclusions from these sessions focus on the importance of the following means of creating a supportive environment:

- Building a group dynamic for parents and children that allows for a safe and inclusive space, with a focus on fun and enjoyable experiences for all

- Engaging parents from harder to reach "target" families as well as those volunteering to participate

- Structuring the sessions to allow parents to take a lead in the teaching role, with opportunities for child voices to be heard

- Bringing STEAM to life through practical experiences that are relatable and can be replicated at home

- Creating ongoing opportunities for parent–child one–to–one relationship building

- Building foundations for the acquisition of STEAM habits

- Raising awareness of the role of STEAM within the curriculum.

The remainder of the chapter presents this feedback, making extensive use of the insights and words of the parents and teachers themselves.

6.1 PARENTS AND DOODLE STEAM

Parents Getting Involved

All focus groups were audio–recorded and transcribed. The transcriptions were then analysed, with themes identified and extracted, before being compared across each school community.

Parents were generally made aware of Doodle STEAM through the schools' online communication methods. Others were approached by the HSCL or their children's teacher.

> *"Word got out on the street. It was also advertised on the Class dojo."*

The Parents' Association also promoted the opportunity in the schools, with members of the groups getting involved themselves. These associations often have links with the HSCL and often have their own internal WhatsApp group.

> *"The Parents' Group has been going a long time. It's kept with the HSCL. The HSCL calls a meeting, if there's an activity coming up, so we come in, brainstorm and come up some ideas and then we see who's available on the day. Whoever can help, can help. So for maths week, Halloween, Christmas, whenever*

something is coming up. Science week, going into the classrooms and doing experiments. Coding week as well. The majority are in the Parents' Group. The STEAM was through this as well."

Parents described their motivation for getting involved in the programme. A father explained that it was a great opportunity for time with his son.

"I'm not in the parents' club, but I am one of these guys who can't say no once I am approached. It's a great opportunity for me to get a bit of play time with my son, because he goes to an after school and by the time he gets home and after dinner, … getting ready for bed and bedtime routine, there's not much time. It gives me an opportunity while I'm out of work to spend time, a quality hour with him and enjoy looking at him developing and learning new skills and me too."

Other parents pointed to a similar reason for participating.

"I do work full-time and so does her Dad and we wouldn't be very involved. So, this gave me the opportunity to actually come in and be involved where usually I'm just doing drop offs."

"I can see that she actually likes school, she just didn't like the transitions. For me it just gave me that little bit of an opportunity to come in and spend a bit of time with her outside of the home setting."

Parents also noted that they could participate in the school in a novel and positive manner.

"Popped up on Aladdin, we saw that it was something that we could be involved in with the kids. It's not often that we get that opportunity. They see you in the school environment where they don't normally, usually it's only the teachers. Also, certain subjects that they wouldn't normally be exposed to as well until secondary. Art as well, they get to explore creative and academic ideas."

"Every time you are working with your kids around school at home, it is homework, where with this, it is all positive and enjoyable."

The idea of exploring STEAM subjects was appealing as a specific reason to be involved.

"I was hearing about this STEAM idea and I was looking to find somewhere for my kid, so when I heard that it was in school, I was delighted. My daughter will be back next year. She prefers dancing, but my son loves maths and science, so it has been excellent for him."

"It is a massive opportunity, free extra course for the kids. You would nearly pay for it."

Parents described how the Doodle STEAM group was different to the Parents' Association.

"The STEAM group was brilliant, because it wasn't just the Parents' Group, it was great because there were some Daddies. We don't get a lot of Dads involved. It was great that they could come in and it was great to see them with the kids."

Parents reflected on how busy they might be and the challenges of finding time.

"I have a four-year-old as well, so it's nice to be able to give her a bit of time."

"You can get isolated unless you're invited to birthday parties. It's hard to get time, especially when you're working."

"Everyone is coming and going differently. Everyone has different experiences."

Building a Group Dynamic

The Doodle STEAM parent groups got to know each other over the course of the programme. Having new parents participate who are not usually involved in parent activities ensured that a new group dynamic formed.

"Doodle STEAM was great because normally when something goes out, it's usually the same group of people but this one seemed to take everyone's interests. It was lovely to have some new faces involved. I don't think anyone didn't enjoy it. Everyone had good craic at it. Parents included; it wasn't just the kids."

"It is great to have new people, because often we sign people up at the start of the year and then they never get involved. Everyone's busy, but if you have the time to do it, it's great. Even if it is to just come in and chat while your kids are in school."

Any initial fears were worked through as the parents got to know each other.

"I thought that it might be intimidating, not knowing anyone, but the group are very friendly and outgoing. We just joined in with the banter and the group made us feel very welcome."

Parents noted the benefits for their children, as they saw their parents in the school on a regular basis.

"Your own kids as well. They love seeing you like that as well, they love seeing you in the school, when they spot you. Or when they know you're up here and they get the teacher to send a message up to you about something."

Parents highlighted how they had been mistaken for teachers or school leaders.

"It's great helping out and then some of kids see you outside school and call you teachers."

Parents indicated that they felt more connected to school activities. Their participation in Doodle STEAM assisted in building these relationships.

"The kids now see the parents as part of the school."

As well as a group dynamic forming with the parents, the children created their own group that led to them acknowledging each other outside of Doodle STEAM.

"The kids got to know each other as well. They are all different yard times and classes, so they get to know one another outside of their own classes. It's great to get an older kid saying hello to a younger one in the yard or in the corridor. Overall, it was fantastic."

The children were allowed to bring their products from the sessions back to their classroom. This allowed them to feel part of a Doodle STEAM group.

"When the kids are going back to their classes with the goodies, the other kids not involved are giving out to their parents as to why they didn't sign up."

Programme Activities and Results

Parents described the activities and experiments as engaging and enjoyable, "learning by doing".

"My favourite week was the spaghetti tower. The giggles out of everyone, because it was collapsing and then it wasn't, the laughs. It was brilliant. I started with a bridge and then we just kept adding. And then he thought he was bringing it home. One of the Mammies did try and bring it home, but by the time she got out to the car, it was like a fishing rod. It was brilliant."

"Making play dough, I couldn't believe how easy it is to make. Just mixing up some flour. Very interesting few weeks. All the kids really enjoyed it, great idea for the kids, getting out of the classroom settings, getting involved in something like this. It's good for their confidence, good for their development."

The children were excited on a weekly basis, knowing that their parents would be joining them in the school for the session.

"Even looking at my child on the mornings when it was on, seeing the delight in his face. That just makes your day. He's happy to see you there, it really does make your day. It's good the way that it's broken up, we got a few little outdoor activities as well. That broke it up as well instead of always being stuck to the table. It was great getting to run around, taking photos, finding the worms, getting hands dirty."

Parents were curious about STEAM subjects and how their children might take to them. Some parents had participated in the programme before and had an idea as to how this would work, but for others, it was completely new. While children had tried different activities outside school, few had experience of STEAM subjects.

"My little lad is in Second Class, he's tried football, he's been in the boxing. He's number three. He's the baby. I was like, what are we going to get him to do, what is he into? But now we know, he likes all the coding and the science. So, when that message went out, I knew I was getting him into that. We have Citywise locally, but you have to be eight to join. He will be eight soon, so he is counting down until he can start there. His older brother and sister play football but this is more what he is into. Now he still likes to climb trees, play with sticks and digging holes, but he likes the coding and science stuff. So, this was right up his street. He loved it and the messier the better."

"My child is in First Class. All he wants to do is Irish dancing and sing. So, this is completely different for him. He has cars and action figures. But all he is interested is in dancing. So, this is completely different and he completely loved it. He would go home then and play with the play dough or do painting. It was great to see him doing something different."

Making the play dough was considered a success, with many of the children bringing it home or sharing it with their friends. These activities have led to an increased level of curiosity about "how things are made" and the types of ingredients that are involved.

"My fella played with the play dough for the whole week at home. It gave him a new idea and he ran with it. It's kind of the way he is normally. If he gets something new, he will find it entertaining."

"My son gave out all his play dough when he went back to the class. He was delighted, telling all his pals that he made it. You can have a bit and you can have a bit. He was thrilled. Instead of a bought packet. It's just so simple."

"She might pick up on something and then she might be like mum can we make that at home now, you know, so now we know how can we make it at home."

The messy play worked well according to parents, as they were supported to deal with the mess.

"I can't do messy play, they are all different, some parents and some kids were loving it and others were not really getting involved. It was all over some, in their hair, they really were getting stuck in. You can coax them in and then they love it. I had to get used to the mess. Although anything but glitter. But they love it."

Parents enjoyed the elements of the programmes that allowed for an element of competition between them, as they could work as a team with their children.

"The competitive part of the spaghetti building. Everyone's competitive nature came out."

Parents highlighted how both they and their children appreciated "small learning moments", as they were described.

"The stethoscope week was brilliant. The little ideas. It really worked. It's clever."

Parents felt that the programme as a whole was a success and they would be happy to participate for a second round with their children.

"But I would definitely recommend it for other schools and if it was being run again, I would do it again. Looking around the room, I think that they all really enjoyed it."

"I wouldn't have thought that digging for creatures was anything to do with it, but it was only when the teacher was explaining it that I went Oh Yeah, that makes sense. I think that it was fantastic. I don't think that anyone would go in and say that isn't for me."

"The parents had as much fun as the kids."

"It's like a school day every day."

Outcomes for the Children

Parents highlighted how children were making extra connections with STEAM ideas.

"There are definitely sparks going on. I know that my son was definitely thinking that I will doing experiments. I will have the glasses on and the white coat. That's what he thought we would be doing; we'd all be wearing these white jackets. He was making the connection."

"When they are playing with blocks at home and building or with Minecraft, they can see that this is like what we were doing in Doodle STEAM."

The programme activities allowed for the children to often become the leaders. Parents noted this and were happy to see this take place.

"I can see my daughter had the confidence to do certain things, so I could take a back seat. Letting them use their imagination and think about things themselves."

"When we had to take pictures of different things, he knew where to go and he directed me. Why don't we go to the library and take a picture of a cat in a book? We'll never find a real cat outside. That's his little brain working. We need a photo of someone smiling. He asked a teacher who was on the roof to smile. It was great to see the confidence because he had to do it."

"They really want to get stuck in straight away, they didn't want to wait around and listen to us talking. It is good that we did the work first, so we knew then what to expect."

Parents noted increased levels of curiosity and their children asking more questions.

"She's asking different questions that she hasn't before. When I come from work, she's asking Dad, do you know how that is made. It feels like she's looking at stuff in a different way."

"My daughter is finding that she sees herself as clever now. She always liked these subjects, but now sees herself as clever in a different way. She's telling everyone that me and Mammy did this and we did this."

"We did one activity with the stethoscopes. That was her favourite, she was asking loads of questions. It's great to be able to grab that time. It's so important. It's a really special little time for them."

Parents noted that some daughters were becoming more interested in maths in relation to both schoolwork and practical matters linked to sports and scoring.

"My daughter is mad for maths. Always asking for harder sums."

"My daughter can see maths in helping with darts. She watches me and is working out my countdowns."

Confidence Among Parents

Parents spoke of their own increased confidence with STEAM subjects and understanding of how the curriculum is structured for their children in relation to science subjects. Those with older children noted how the Doodle STEAM experience had acted as a foundation for their children to explore areas such as coding and science at second level and in local youth projects.

"As they get nearer to secondary, it will be great to be gearing in those directions. There was none of that when I was younger, so I don't know how it works and how to help. This was a great eye opener for me."

Other school–based initiatives and programmes can further support these interests.

"Coding week here gives them some ideas. With the iPads and in groups."

Parents noted that they feel more able to help with homework.

"I would feel that I can help you with your maths. I can give it a bash. I can help you with the homework. Even if it's wrong, try it. Confidence, I don't know. I will give it a shot."

Helping with homework is seen as a challenge for some.

"When I have been trying to help with maths homework with an older kid, it's just very different to what I did, so I am looking at how can I get upskilled. For myself, the kids come home and expect Mammy and Daddy to know the answer to everything. I don't want to be lost. I'm saying that I can't help you with that."

A parent described the importance of learning life skills and suggested that the Doodle STEAM Programme offered ways for children to develop these.

"But with the STEAM, the way they have to think of if you're building something, you need the foundations, they need the materials, stuff like that is just life. These are important life skills that the curriculum in school should be teaching more. Learning how to go on the bus, work out your fare, dealing with these things going to the shop, simple life tasks. Once you realise about maths, to see how much it is used and where in your life."

Now that the children have completed the programme, the parents have seen that they are missing it already.

"It's all he looks forward to every week. Everyday, he asks am I going to the club. When he heard that last day was the last session, his little heart was broken. He really enjoyed it and I enjoyed it myself. It's a really good programme."

"There is the devastation that they are now finished it. They loved it."

For some children, knowing that their parents would be involved in their school day helped with their attendance.

"She's been great coming into school in the morning. Gave me that security."

A mother highlighted how her son now sees her differently.

"We got confident in what we were doing. My son didn't expect me to be doing it. He thinks that Daddy is the brains of the operation. He said "Well Mam, you know this stuff". Great to see that they see their mothers' involved."

Parents reflected on the changes from their time in school and what this means for their children and how they can relate.

"I found that when I was in school, we were just looking at the board all the time and having to learn that way. It never worked for me and I was brutal. School passed me by. But with some teachers, they did make a difference. But now it is more about group work and learning from each other as opposed to just learning from the board. The importance of social skills is really important with their peers."

Career Ideas

Some parents felt that the programme offered some important supports, but might not trigger an interest in a specific career.

"My lad is only six. I'm more looking at it and seeing what he is good at or interested in at the moment. Instead of saying I'm crap at maths or I'm crap at this, it's better to see that everyone can do a bit of everything. You mightn't be the best in the world at it, but once you can have a go and get the basics."

Other parents had seen that their children were talking about new STEAM ideas and habits.

"My daughter will be an artist. She sees herself for sure that is what she wants."

"My child wants to be an astronaut. She is sure as well."

"My daughter would like to be a teacher. It's hard to imagine when you look at her now. They're so young."

"Before this, my daughter wouldn't have picked up a bug. She is happy to do it now and has one at home and has named it and wants to get a family of them."

Parents whose children had previously participated in Doodle STEAM could point to progression pathways.

"My daughter went on from learning about this years ago, she has loved it since and has learned coding outside school. Only for Doodle STEAM, she would never have had these experiences, because I am not involved in this type of work at all."

Parents also highlighted how "STEAM lightbulbs" were going on with their children.

"It opens up their minds to the other side of things, to the technical or science side, where it's normally just books when they're in their normal school class. Instead of it being completely separate, it works really well."

A variety of options and opportunities linked to STEAM were noted.

"Exposure to all the different strands allows some kids to like different areas. This is the beauty of STEAM. It allows for lots of opportunities to come up, generate an interest at a young age. Especially when there are not a lot of scientists or engineers around. There is then less of a fear about it. It becomes a lot easier and more comfortable to be around it."

Parents with no experience of STEAM disciplines felt that promoting these topics at a young age can ignite or spark new ways of thinking for their children.

"Having this STEAM knowledge at this early age makes you think that this is possible, maybe even easy. I can follow this process and even when I am in third class, I can then be more confident about it. Then they can think that they can do anything with science. They can go anywhere to any science field. Before, this was really not in my head."

Their experience in Doodle STEAM may lead to further outcomes as they move into the senior cycle, linked to the STEAM ideas and habits to which they were exposed.

"We learned that science kicks off later in third class, but this exposure helps to get confidence around science. Especially, for some of the girls, they don't know or mightn't have seen a female engineer or scientist."

6.2 HSCLS AND DOODLE STEAM

The HSCLs consider Doodle STEAM as a key element of their work in engaging and supporting their target families, as well as promoting wider parental involvement in school life. Through building the programme over their five years in the role, they can foster strong partnerships with parents. Within the focus group session, the four HSCLs described the manner in which the programme operates in their schools and how it has assisted in their work to create a supportive environment for STEAM subjects and for their students to engage with the programme.

Background and Motivation

While for three of the HSCLs,[16] the programme had been running in their schools before they had begun their HSCL role, one of the teachers was running Doodle STEAM for the first time. There had been an ambition to introduce it earlier, but the challenging and changing nature of the role had prevented this in previous years. As an integral part of the wider Doodle programmes, it was seen as a natural step to access the training and then roll it out with the parents and children.

For other HSCLs, the programme was well established. They had received training in previous years and were now confident in implementing it. The initial feedback within the school had been positive.

"The previous HSCL advised that this was the most attractive of all the Doodle family. There was a great buzz about it, the parents really enjoy it and are eager to sign up for it. Big buzz in the school about it. It was a no brainer. The parents talk and there was a very positive vibe around it in our school."

Getting Parents on Board

HSCLs all noted that it can be challenging to recruit parents into any programmes that they might be running within the school. They all used a range of strategies to reach out to the parents. In some instances, they linked in with parents who were already aware of the programme. This allowed for an initial group that could then be expanded.

"It's always a challenge in our school to get parents in for something, as it is in all DEIS schools. I was able to get two of the parents who did it last year to come on board and they were great chatters as well. Everything is a challenge, but this is probably an easier one to sell."

"All schools are different, but I don't think people realise how hard it is to get parents to engage with an eight-week course. There are no waiting lists here. It's working really hard to get people in. Approaching parents, going through the teachers, the students, working the different routes, even then, you might only have eight parents signed up. So, to have some parents who would do a second year of it was really helpful. It helped me to get the kind of numbers that I need to be able to run the course. If we just sent out a notice, we would probably have got two people."

---

[16] The Home School Community Liaison (HSCL) Coordinator position is designed to be rotated among eligible staff every five years. This ensures that all eligible staff have the opportunity to gain experience in the role and understand the challenges of educational disadvantage first-hand. After a five-year tenure, the HSCL Coordinator typically returns to the classroom as teacher for a year group.

While some parents may have been unfamiliar or unaware of STEAM subjects and might find it daunting to participate, the teachers felt that they could use this as a way of empowering the parents to learn new ideas.

"Sometimes it's very hard to get new parents involved and sign up to new things. But this is different to other things that parents engage in within the school. Maybe they don't know people involved in the science sector, so it can open their minds up to new ideas."

Another appealing factor for parents was the ability to spend time with their children within the school setting.

"It's a confidence thing as well. But once they get past the first week and see the craic that they are having, that's when it really works best. When you do parent–child activities, that's where you get the buy–in. It's less daunting when your child is there with other children. Sometimes if you come to parents only stuff, there is a fear of judgement. At first there were a few of them quite nervous."

The school–based parents' groups and associations were also useful means of promoting the programme and getting buy–in.

"Some of the parents were part of the PTA, but a few new ones came along as well and they absolutely loved it. The kids really got a bit of momentum from it as well. I will be recommending to my follow–up HSCL that they use this as a starting point. Because the base is there and some of those parents will still be there next year. They talk as well, so if the parents have had

a positive experience, they will tell other parents. After they did the first session, they realised that it's not so scary. That really helped their self–confidence."

"I used the parents association as well to help get people interested. They are always a good group to use to get things out."

Engaging Harder to Reach Families

HSCLs work with a range of families within their school community, including those that might be dealing with specific challenges in their home lives. This possibly leads to school absences. In these DEIS schools, this can constitute up to 10% of the school community. The teachers spoke of their desire to include target families within the Doodle STEAM group, but it was not always easy to have them sign up.

"I have been trying to get this parent for years. She has signed up for everything but never comes. But because the child was there, the bit of pester power helped as well. But they loved it. I was really able to build up the relationship with them over the weeks in a real fun environment. It wasn't in a "why is your child not in school?" way. It was proper quality time and now I have that bond with the parent as well because of Doodle STEAM."

"The engagement is substantial. For them to come back again and again and again, something is working. One of my target families came every week, another missed the first two weeks and I thought that is the end of that. But she came in week three and didn't miss another one. She must have heard from the others. They all talk and she must have heard good things."

The HSCLs were able to support the parents, while promoting the idea of them getting to spend one–to–one time with their children.

"On the bond idea, there are some parents that you need to target more. There is one parent that I try to work closely with but often struggle to get them involved in anything that I am running. If it was a parenting course, I wouldn't have a hope. They signed up for Doodle STEAM last year, but didn't go at all. Fair enough. Signed up again this year, but didn't come to the first session or two. They came to the third, absolutely loved it, brilliant bond made with their child over the five weeks left. It was really remarkable. In comparison to other courses, it's really hard to get people to come back. They will always find a reason not to be there. But for this, they want to be back for their child."

Other HSCLs referred to the manner in which the Doodle STEAM Programme supported the ability to build a supportive environment for target families.

"Most definitely, we have a better relationship with the families as a result. Get our target families in. If we can get one of these into Doodle STEAM, it can really help. Every time you meet a parent, it builds trust, builds confidence for them to be able to talk to you. Also with Doodle STEAM, you are not dealing with them on "official" business. It's something nice to do. You can talk about something different. It can also break down barriers. Sometimes you might have that one difficult parent. The child wants to do Doodle STEAM and then that parent ends up coming in and you get talking to them and they are more engaged and this is great for our job."

Relationship with Curriculum

As well as delivering the course, the HSCLs could use each session as a means of explaining to the parents how the curriculum works and how their children will be learning about STEAM subjects. They could also reference the new Primary School Curriculum. Many parents are unaware of this background to their children's time in primary education.

"You're trying to tell them that this is the science or maths curriculum and here is how it works. That's a big eye opener for them. You're using Doodle STEAM as a means of teaching them what their children are going to be taught. They might have gone to school in a totally different environment where science was something very different indeed or maybe was not on the curriculum."

"The fear factor was definitely there at the start when people don't know what to expect. They also think that it is much more advanced than it actually is. A lot of the parents in our school are not Irish originally and don't know what the curriculum is at all."

"We were able to talk about the new curriculum and the idea of learning through play. We will be doing a lot more of this in the classroom. So, I suppose it made them feel a lot more comfortable with the curriculum and what their kids will be doing in class."

The programme allows for the parents to learn new ideas about STEAM disciplines on a weekly basis. This approach works to allow for an incremental appreciation of the subjects, some of which might have seemed intimidating at first.

"This was similar in our school in that some parents didn't know about science and Doodle STEAM helped to bridge the gap and it gave them confidence. This is a big part of the course, giving the parents confidence to engage with their kids. A lot of parents were scared to engage with science and after the course, they were more open to it and ready to help their kids work with science and all STEAM."

Initial Support for the HSCLs

All HSCLs delivering Doodle STEAM receive training through CDI in relation to the implementation of the programme. All complimented this training experience in setting them up to run the programme. As the Doodle STEAM Programme is centred on a hands–on set of activities and experiments, it was considered important that the training allowed for the teachers to experience these themselves.

"Training was excellent for us. The move away from chalk and talk to the more practical stuff, this really engages our parents. A lot of my parents wouldn't have high literacy skills, so it helped a lot. Within the training it was all hands–on practical work, so we ended up doing the whole course within a day."

The importance of allowing the HSCLs to work together as a group within the training also ensured that they bought into the programme.

"Probably one of the best trainings that I have been at for anything. Any of those sessions when you get to link in with other professionals in the job are beneficial as well. It was a really well–run style of training. We have often been at trainings, where it could have been done in an email or a meeting."

"They could have easily stood there and told us how to do it, but the training was completely hands–on. This gives you more confidence as a facilitator as a result to bring it back and run it."

Delivering the Programme

The training had ensured that the teachers were prepared for the sessions to take place.

"The planning was absolutely excellent in that everything was ready to go. Sometimes we run programmes where you have to do two hours prep before the class. With Doodle STEAM, you had all the stuff online or the Handbook would help. It really made my life a lot easier to teach it. The materials were ready to go. It was already done. Sometimes the prep is the hardest part."

The resources and materials required to deliver each session were outlined in the Handbook or available as slides.

"The book is very clean. Sometimes there are other training materials and there is just too much information. This one had just the right amount that we need and the parents need. You're under time constraints."

"The slides are very good. Everything here is ready to go. But the planning is done for you and the Handbook is a great model for other courses."

The only session that involved extra work beyond what was specified in the Handbook was in relation to the Maths Day. In this instance, each HSCL added extra content to ensure that the time could be fully used.

"For me the maths one wasn't enough. I had to bulk that out with other activities. That was the only fault that I had."

"I brought some dice in. Just also need to be aware of ensuring that everything is culturally appropriate. For instance, for some with cardplaying, it might not be. With Doodle STEAM everything is great that way."

"I brought in Snakes and Ladders and other games for the Maths week, to bulk it out."

Outcomes – Bonding between Children and Parents

The teachers could point to some important outcomes over the course of the programme. All focused on the importance of the relationship between parent and child and how the programme supported this development.

"While the confidence with the subjects was so important, it was also the bond being made with the children. Also probably got rid of the fear. There was an awful lot of parents in my group that had a terrible time with maths when they were in school. But the real thing was watching the bond grow with the parents as they were spending time with the kids."

"But the bond is huge. Some of the kids come from big families and that might be the only one-to-one time that they get. For that child to have his Mam or Dad with them was amazing."

This factor was considered as the "glue" that held the programme together and led to parental buy-in.

"I think that they really got an insight into knowing that everything that is in that book, their children are learning in school, so they have more confidence around that now. But I think that bond and the fact that they kept on coming back over the eight weeks, week after week, showed that the interest was sustained. I had 14 sign up and 11 come back consistently. That's very good. There were three that were only able to dip in and out with what was going on in their lives at the time. But for the other 11, it was every week. It's probably the most successful thing that I have ever ran (over my five years). That and Lego clubs. I have waiting lists."

The HSCLs all noted that there was an engagement from fathers that they do not see with other programmes.

"I actually had four Dads on the course. I have never had that before. And they were having the craic themselves. That was phenomenal."

"I would back that up on both courses that I ran. I have had more Dads involved in my school as well. Maybe it seems a bit meatier and more attractive to some men than other things the fact that it's got science or engineering involved. These are people who would not come to other courses. That was lovely."

The content of the programme allowed for the children and parents to enjoy their collaborative experiences. As the group got to know each other better, there was potential for camaraderie and some of the activities had an element of competition. This was particularly the case for the engineering day and the spaghetti and marshmallow tower-building.

"Hugely competitive and friendly competitive between the parents and the kids, great craic and banter between them all. As the weeks went on, they got more and more comfortable with each other. The first week was just everybody looking at each other – what the hell is this going to be? But by week eight, all the kids and all the parents knew each other."

All teachers spoke about this aspect of the programme, where there were high levels of enjoyment and "craic".

"There is a craic element to this as well. In other courses, it might have to be very strict at all times. There is instructions in this, but in my room, there is a more laid–back atmosphere with Doodle STEAM than there is with other similar courses."

The teachers felt that once the parents had been exposed to this aspect of the "fun" nature of the programme, they would be more likely to continue to attend. All highlighted the high levels of attendance at their sessions.

"The kids would be asking if Doodle STEAM is on today, so they could see their parents. It was so special for them. The point that once they were there once, that they always came back. That is really prevalent with my group."

The contact time between parent and child can be even more impactful for children in target families.

"To get that one–to–one time is massive. There may be busy or chaotic houses. So this time in Doodle STEAM can be so important."

Outcomes – STEAM Awareness

The HSCLs witnessed how the children began to get more curious about the STEAM topics and subject areas. This also extended to talking about future careers.

"It definitely opened up discussions at home with the kids about careers, especially in our school, because not a lot of children would have thought about job opportunities in the STEAM sector. I suppose it was the fear and if the parents didn't know what it was, they wouldn't talk about it a lot. By engaging in the course, they are more opening up to new job opportunities in STEAM. That's a good way to show that the confidence is there. The parents now feel that they know about science, so for them to be having discussions is major. It really gives them confidence. Now they have a bit of an idea. Subconsciously, they are letting the kids think differently about their futures."

Parents also brought the learning home and shared this from week to week.

"The sessions broke down barriers about science. A good few of them went home and made the slime or play dough at home. They brought it back for the siblings to show them."

Once the parents have signed up to the programme, there was still a need to ensure that parents would come along for each of the eight sessions.

Outcomes – Effective and Inclusive Pedagogical Approach

The training programme for the teachers had allowed them to become confident in their abilities to present the STEAM subject matter. But there was a clear sense that the programme was centred on a co–facilitative approach, with the parents and children each playing a role.

> *"I would let them know that I don't have a clue about engineering. I really don't. We're all learning. The kids teaching the parents about things as well. That was brilliant. It felt great. It's the best course for getting engagement and then keeping it. And for opening up their eyes, it's brilliant. And the feelings of success when they did build the towers out of spaghetti, making the play dough. One of the mothers took over with a better recipe and it was great. She could take the lead."*

The parents were able to embrace their role as educators and co–facilitators, bonding with each other as well as with their children.

> *"I explained to the parents first and when the kids came in, they became the teachers. I was just making cups of tea. The parents took over. They enjoyed coming in. There was great craic and atmosphere. They would sometimes come in early for the chats."*

The HSCLs referred to a flexibility that could apply to ensure that each session would engage the group.

> *"Yes, we have a manual, we have a flexibility to allow things to work their own way. We did the funnels and then we did the Mentos and Coke experiment. It wasn't in the manual but it was about science, we talked about predicting and reactions and the concepts."*

The HSCLs highlighted how there was a range of abilities within their groups and how the course worked well for all.

> *"It's so inclusive as well in terms of engaging children with additional needs. It's interactive as well. They are not sitting still the whole time. They can get up and walk around or run around. I had a child with ADHD and he was bouncing off the walls. The parents were worried, but I said let him. This is a safe environment. So it really was inclusive."*

> *"I had two children with autism and three others with additional needs. They might need a little extra support, but I am there, their parents are there."*

The sessions were very different in terms of their content and the types of activities, allowing for the children and parents to be always ready for the unexpected.

> *"The mix of indoor and outdoor is great. The kids love that."*

Outcomes – Progression

Teachers considered that the Doodle STEAM Programme created a "springboard" for them to build initial relationships with parents and children. This would then allow for further work to take place or for new opportunities to continue to engage with the family.

> *"Doodle Families is a harder sell, but because I had the group from Doodle STEAM, they are looking to get involved again, really participating. And then from*

that, I can get the Book Club. There are always the connections to be made."

In one school, because of the participation of a father in the programme, he is now involved with the parents' association in the school.

"Like that I have a Dad from the Doodle STEAM and he is now on the Parents' Association. He was in the library last week for Book Week running the show."

The increased confidence levels from the children has allowed for their interests to be continued in new ways within their schools.

"We had Science Blast and one of the teachers is organising a Science Club and he was worried that no one would show up or whether they were too young. But all of the Doodle STEAM group showed up. It definitely allows them to think that I could do that."

Outcomes – Integration within School

Doodle STEAM operates for one hour per week for the children and their parents. In the school community, the HSCLs see a positivity towards the programme. The teachers of the participating children recognise the benefits accruing to their students.

"Sometimes I couldn't send them back to the class with what they made as they were too excited. They were ecstatic going back. They were allowed to talk about what they had done. Their teachers are delighted to have them learning in this way. It's not disruptive for them. Teachers are so used to children coming and going as well. It's not a big deal. Getting a spark from such a young age and what it can be. That they (STEAM) are not just big words, when

you break it down, you can work from a young age."

The school principal in one school also recognised how the programme is working and its impacts.

"My principal sees the number of parents who keep coming back. Especially the Dads. We never see Dads. To have four coming back week after week was unheard of. Two of them are single Dads and were having a hard time of it. I was working closely with them; I knew that they would like it if I could get them in the door. The other two, it might have been the subject matter. It was really visible. A lot of the teachers were pointing it out about the number of Dads involved. But the craic and the laughter, it would go back through the school. There was a buzz."

The programme has now become embedded in the school schedule.

"It is kind of part of the expectation now in our school. If you are in First Class or Second Class, that is one of the options. If we pulled it, people would comment."

The HSCLs also get to know a range of students within the First and Second Classes.

"There is a knock on, getting to know the kids. I wouldn't have much interaction with some of the classes. It was great to get to work with these classes and get to know these kids."

The HSCLs consider that a follow-up programme would work well as the children get into the senior cycle of the primary system.

"Definitely similar programme for older ages. The older kids would love this. Keep this for first and Second and then a more advanced or check–in continuation, could be more project–type work. Probably a brand new programme. It would be lovely. It's been so positive, so if they were looking to expand it, it would be a no brainer. It's really engaging."

6.3 SUMMARY

This chapter has allowed for the voice of the parents and teachers to highlight the value placed in the programme and the extent to which they took advantage of an opportunity to support their children's STEAM learning.

Parents highlighted their increased confidence in relation to STEAM and supporting the STEAM learning of their young children. Many examples were given as to how they have a better understanding of STEAM subjects and how they can support their children's interests and answer their questions. While they now have an increased capacity to carry out STEAM activities at home and help with homework, they placed the most significant value on how this time together allowed for more cohesive and stronger bonds. Parents gave examples of children with a greater confidence to deal with STEAM ideas and how STEAM habits were taking shape. Children were asking more questions, looking at the materials or ingredients in everyday items. Children had indicated more of an interest in subjects such as maths or science. School–based activities and groups relating to STEAM were being attended. While the children are very young to be considering careers in STEAM disciplines, parents felt that the programme had put in place useful foundations and had sparked new interests.

Critically, parents indicated that the programme had contributed to improved relationships with their children. The value placed on one–to–one time with children, and being able to share the teaching role, was identified by both parents and the HSCLs.

Links to STEAM Policy and Literature

The DEIS (Delivering Equality of Opportunity in Schools) Plan 2017[17] emphasises the crucial role of parents as partners in their children's education, particularly within **schools facing disadvantage**. The plan aims to improve educational outcomes for students in DEIS schools by fostering a collaborative relationship between schools, parents, and the wider community. It views parental involvement as a cornerstone of educational success for students in DEIS schools. As exemplified by the comments and insights provided by parents above, the Doodle STEAM programme presents a model as to how to build such a partnership approach. Parental appreciation is presented for bonding time and increased confidence in supporting learning. The programme acts as a "family learning" opportunity (cf. Brooks et al.),[18] building parental capital and bridging the home–school gap, particularly vital where parents lack STEAM experience.

Teachers described a very effective programme that forms a **bond between parent and child**, a programme that attracts more fathers than any other course that they can provide. Doodle STEAM allows them to work with both target families and parents that are actively involved in school activities. The teachers created a sustaining group dynamic that had higher levels of continued attendance than other parent–focused programmes. The course content was enjoyable and well–structured to allow for the parents to have fun while they spent valuable time with

[17]   https://assets.gov.ie/static/documents/deis–plan–2017.pdf
[18]   https://assets.publishing.service.gov.uk/media/5a7957a940f0b63d72fc4f95/12–1238–evidence–benefits–of–family–learning–scoping.pdf

their children. The children could be exposed to **new STEAM ideas and habits**, bring them back to their classroom and bring them home. These habits were primarily focused on becoming more curious, questioning, and confident about STEAM subjects. The teachers presented a programme that has been fully integrated into their school communities and can deliver important outcomes for parent–school relationships as well as for stimulating young minds in relation to STEAM ideas and habits.

As noted above, HSCLs are central to the DEIS Strategy and the HSCL scheme's mission to fostering **home–school–community links**, with engaging target families one of their core functions. The feedback from the HSCLs highlights the programme's alignment with HSCL best practices, especially that of building relationships and facilitating access. The success in attracting fathers addresses a known challenge of the HSCL scheme in parental engagement, potentially linked to the perceived gender–neutral appeal of STEAM and proactive HSCL outreach.

Through the commentary in this chapter, two cross cutting themes can be noted, those of **gender** and **social disadvantage**. While both were not specifically addressed by the children or parents as part of the focus group discussions, the themes emerged through some gendered invention ideas (unicorns/rainbows vs rockets/robots) that can be seen to reflect pervasive societal stereotypes influencing STEAM identity formation from a young age. This underscores the critical need for such programmes to consciously design inclusive activities that challenge stereotypes and broaden children's perceptions of and participation in STEAM fields.

Another theme that is an important focus for the DEIS programme and HSCL scheme relates to the **lack of parental STEAM exposure** as a key equity barrier targeted by these policies. The Doodle STEAM programme offers a countermeasure to the absence of such exposure by engaging with parents and children from an early age. The finding that parents lacked lived STEAM experience highlights science capital deficits (Archer et al., 2012) in disadvantaged communities, limiting children's aspirations and sense of belonging in STEAM. The Doodle STEAM programme's value lies in providing shared, positive STEAM experiences, building foundational capital for both children and parents, directly countering disadvantage by demystifying STEAM, and aligning with the new curriculum framework.

Both parents and HSCLs highlight above, as do the children in the previous chapter, the extent to which the programme's observed outcomes resonate deeply with the pedagogical principles and equity goals of Ireland's evolving primary curriculum and broader educational policies, while being strongly supported by international research on effective STEAM education, parental engagement, and addressing disadvantage.

7 Conclusions and Recommendations

The evaluation plan that informed this research into the impact of the Doodle STEAM programme on children's outcomes, as delivered in four Tallaght schools in 2024 to 2025, focused on a number of phases.

Initially, the evaluation required the development of a framework that would allow for the children to examine their attitudes to STEAM ideas and reflect on how their own STEAM habits had been supported or sustained through participation in the programme. The evaluation also required the framework to investigate the role of parents and HSCLs in creating a supportive environment for the delivery of the programme.
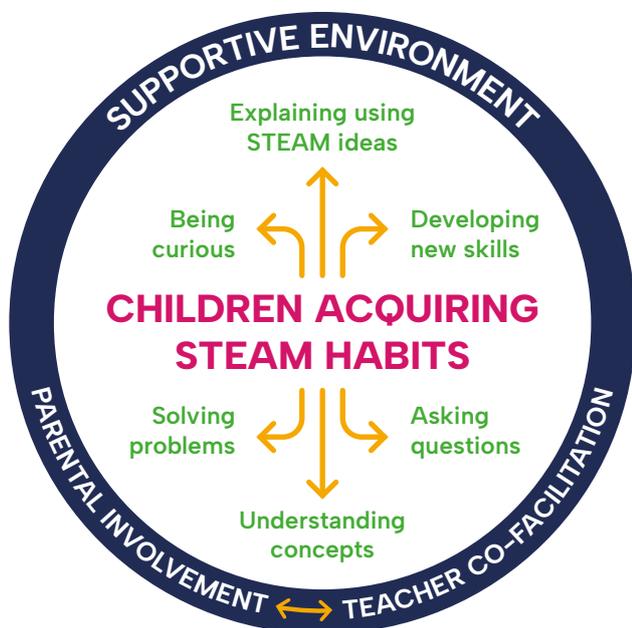
The main phase of the evaluation involved the application of bespoke pre–programme and post–programme surveys within focus group sessions with the children and a series of focus groups with the parents and HSCLs to investigate the support environment for the programme. The final phase of the evaluation involved the collation of the datasets and production of the evaluation report.

7.1 CONCLUSIONS

The framework focused on six STEAM habits that are closely linked to the new primary school curriculum across the STEM and Arts strands. The children were given opportunities during the research sessions to look at these habits and describe how they relate to their young lives.

Figure 5: Evaluation Framework and Key STEAM Habits

Evaluation Framework

SUPPORTIVE ENVIRONMENT
PARENTAL INVOLVEMENT
TEACHER CO-FACILITATION

Explaining using STEAM ideas
Being curious
Developing new skills
CHILDREN ACQUIRING STEAM HABITS
Solving problems
Asking questions
Understanding concepts

Six key STEAM habits:

1. Being curious about what is in front of us
2. Developing skills, by learning through play and experiments
3. Dealing with new concepts and Ideas
4. Solving problems, with imagination and creativity
5. Trying to think like scientists, working out what might happen if we do this
6. Sharing and explaining using some simple STEAM words or ideas

Chapters 5 and 6 relate the manner in which the findings are situated within the research in the field, as well as the policy and curricular context discussed earlier in the report. In summary, these relate to the importance of the programme in supporting the new Primary Curriculum Framework and its commitment to STEM and Arts. The key competencies associated with being an active learner, being mathematical, creative, and a communicator are all underscored within the Doodle STEAM activities. Gender stereotypes are discussed and science capital is promoted through enabling parents to act as role models in relation to the STEAM disciplines. The key aims of both DEIS and HSCL schemes are supported as the HSCLs build new connections with target families and the wider school community.

As well as linking the research findings to these wider policy and curricular contexts, the primary focus of the evaluation was on the children's learning and the following presents some key insights as offered by the children:

Demonstrating curiosity

Children within the study were consistently applying their imagination to the subject areas. In looking to new inventions or ideas, the range of suggestions included flying cars, machines that can allow us to enter computer games, new types of rollercoasters, and a range of different types of robots that can assist in day–to–day activities.

Development of new skills

The children took on each task and activity willingly within the programme sessions. They were challenged to build stethoscopes, make play dough from scratch, and complete maths puzzles using tangrams. In each of these tasks, the children were working collaboratively both with each other and with their parents. Parents reported that they were delighted to see their children completing these activities in a fun and enjoyable manner. Parents and teachers also reported

that the programme activities gave the children extra confidence to take on their schoolwork and homework.

Understanding concepts

Children were challenged in the sessions to consider aspects of STEAM disciplines that were very new to them. They were required to look at engineering tasks and think about how materials can be used to form foundations. Some children had to go outside their comfort zone to think about ecology and to examine and then record the minibeasts living under pots and bricks in the schoolyard. The engineering activity required the children to build a tower from the spaghetti and marshmallows provided. This exercise provoked some of the most extensive feedback from the children in their assessment of favourite moments from the programme, as they explained how they were energised to compete with each other as to who could build the tallest free–standing structure. This required the children to try different ideas, see them fail, and try something different. The parents also commented on the success of this specific task, as they witnessed their children act as young engineers.

Solving problems

Children discussed how they had managed a range of tasks where it was up to them to navigate their way through the activity. A range of examples are provided in Chapter 5 as to how the children used their creative problem–solving skills. In one instance, they were required to complete a series of photographs of common items to be found around the school, including footballs, a cat, and someone smiling. The children from different schools came up with creative solutions to address these challenges by going to the sports equipment shed to photograph a football rather than hoping to see one in the yard, photographing a cat from a library book, and asking one of their teachers to smile so that they could take the photo opportunity.

Asking questions

Children were encouraged throughout the Doodle STEAM Programme to always ask questions when they were unsure of something. This was especially the case during the focus group sessions. During the walking debates about STEAM habits, each statement was questioned and discussed until there was absolute clarity on its meaning. It was clear that the children in each school were accustomed to this type of questioning behaviour and that their teachers promoting this type of engagement. Children were empowered to enquire freely in a way that might not be possible within the usual classroom.

Explaining using STEAM ideas

When the children were asked to explain what STEAM means in the post–programme session, they displayed a confidence in discussing some of the STEAM disciplines that would be unusual for six– and seven–year–old children. They could point to the work of an engineer or scientist and give examples of the type of work that these might carry out. Only 9% of the children indicated that they would not feel confident in explaining STEAM to a friend. Within the pre–programme session, the children were less aware of the nature of these STEAM disciplines.

STEAM habits in general

The children discussed a series of statements about STEAM–related habits in both pre– and post–programme sessions. Certain trends were evident at both stages, with the most highly valued and liked statements linked to following instructions to build something, with a marked increase in support at the post–programme stage. This links to the children's age profile and their use of Lego both at home and in Lego clubs in school. Other important STEAM habits that they valued were creative activities relating to drawing, making patterns, and building blocks. They also valued playing games at home with their parents.

The secondary element of the evaluation was to better understand how a supportive STEAM environment can be created and sustained by the schools, HSCLs, and parents.

Role of parents

Parents expressed an incredible appreciation of having been involved in the programme. Their main focus was on the time that they got to spend with their child and the bond that they could share. They were very happy that their children were being exposed to new STEAM ideas and habits and they felt more confident themselves about these subject areas, especially with regard to being able to help more with homework.

Role of HSCLs

The HSCLs were primarily satisfied with the relationships that they developed with the parents and children, especially those of their target families. They could see the learning outcomes being achieved by the children in relation to increased confidence and a new interest in STEAM subjects. The HSCLs also noted that there were a higher–than–normal number of fathers participating in the programme, relative to other programmes that they offer. They felt that this was down to the background work that they were doing with the parents, but also possibly because the subject matter was attractive to some of the fathers.

Recent research in this domain emphasises the need to maximise fathers' inclusion in their children's education, as they can be a significant source of support and motivation.[19] Advancing father–inclusive practices in DEIS schools and promoting low–barrier, activity–based programmes (such as Doodle STEAM), can build on fathers'

---

[19] https://www.cdi.ie/app/uploads/2024/07/Engaging–Fathers–in–Early–Childhood–Integrative–Report.pdf

child-centred motivations for participation, as well as effectively align with fathers' preferences for practical, non-stigmatised participation.

Throughout the evaluation work and summarised in Chapter 6, there were a number of horizontal themes that cut across the research phases. Two such themes are related to gender and disadvantage.

Gender

There were gender differentials at times as the children discussed STEAM habits and ideas. When considering inventions, many of the girls were imagining rainbow- and unicorn-related themes. The boys were more likely to want to invent rockets, robots, or in some cases sports-related ideas such as football boots that make you go faster.

The Doodle STEAM Programme's success in fostering equitable engagement, particularly through its hands-on, gender-neutral activities like collaborative tower-building and creative problem-solving, demonstrates the potential of intentionally designed interventions to disrupt stereotypes. However, the observed gender divides in children's invention ideas (e.g. girls' unicorn-themed creations vs boys' robotics focus) underscore the critical need for such programmes to embed inclusive design principles that actively challenge gendered perceptions of STEAM fields.

As noted above, this aligns with Ireland's STEM Education Policy Statement 2017–2026, which explicitly calls for initiatives to "break down stereotypes" and ensure "all learners see themselves as potential scientists, engineers, or artists". By integrating activities that deliberately diversify role models (e.g. female engineers or male designers), normalise cross-gender collaboration, and highlight the creative-social dimensions of STEAM (e.g. art-infused coding or community-focused projects), programmes like

Doodle STEAM can operationalise national policy goals while broadening children's participation.

Disadvantage

During the focus group sessions with the parents, the majority indicated that they had no lived experience of STEAM subjects in relation to their studies or work lives. This meant that there was a limited chance that their children would be exposed to engineers, scientists, artists or technologists in their lives. This lack of exposure can stymie a child's relationship with these disciplines, so being able to participate together in the programme allowed both children and parents the opportunity to discuss STEAM ideas and reflect on how these might be supported into the future. The programme was also an opportunity for the parents to better understand the new curriculum and how it related to their children's learning stages.

The Doodle STEAM Programme's findings reveal how socio-economic disadvantage can create significant barriers to effective STEAM engagement in DEIS schools. As above, many participating parents reported having no prior exposure to STEAM fields in their own education or careers, limiting their ability to model or reinforce these disciplines at home, a critical gap given that family influence heavily shapes children's aspirations. This lack of intergenerational science capital can exacerbate inequities, as children in disadvantaged communities often enter school with narrower perceptions of STEAM careers and fewer opportunities for enrichment (e.g. coding or computer camps). The programme's success in sparking interest, through low-cost, accessible activities like play dough, chemistry, or outdoor ecology surveys, highlights how resource constraints in DEIS schools can be mitigated by pedagogies that prioritise hands-on, everyday materials.

7.2 EVALUATION RECOMMENDATIONS

7.2.1 Refreshing Doodle STEAM Programme

Full inclusion of children within sessions

The 2023 evaluation of the Doodle STEAM Programme identified little that could be improved in future iterations of the programme and proposed some minor recommendations with regard to increasing the programme's availability and allowing for longer sessions and more resources for parents to take home. These all remain relevant based on the feedback from the stakeholders involved. However, the final recommendation from the previous study is critical and requires some further update based on the current evaluation. This relates to the idea of full inclusion of children in all sessions of the programme. All children placed a high value on being with their parents in the classroom, to the extent that some parents were noticing changes in behaviour associated with school time in the morning on the days of Doodle STEAM, such as constant questions as to whether Doodle STEAM was happening on that particular day.

Earlier iterations of the programme focused primarily on the parents. Given the time constraints and reality of a packed school day and imposing curriculum, even at this young age, a key learning from this evaluation is the value placed by the children on every minute spent with their parent in the school. This one–to–one time was also highly valued by the parents in their feedback.

Based on this extensive feedback, the Doodle STEAM Programme guide could insist on consistency, with children spending 50% of session time with parents. Linked to this, the programme could be enhanced to examine and promote opportunities for children to share leading some sessions with parents.

Ensure alignment with ongoing curricular developments

As the new Primary School Curriculum is rolled out further, it is likely that a series of new resources and supports in relation to both STEM and Art strands will be offered to teachers. It would be useful to examine any such specific standardised resources to maximise alignment of learning objectives and minimise any contradictory language, and also utilise any benchmarks or indicators in programme monitoring. At a more specific level, as new resources are made available, these might be included as extra activities for the maths week of the Doodle STEAM programme to complement the tangram activity.

Build in end of cycle review

As each eight–week cycle concludes, the HSCL can use part of the final session as an opportunity to check in with children and parents using a simple review template which can be included in facilitators' resources. This feedback can be communicated to CDI and shared within the local cluster or Community of Practice. Such a session can also focus on how parents can best follow up, potentially by connecting with or introducing parents to local community–based projects offering STEAM activities.

7.2.2 Embedding Local Linkages (with youth and community organisations)

Parents referred regularly to the work of a local youth organisation and centre (Citywise) that offers STEAM–related supports to young people in the area, once they have turned eight years old. It would be useful to create linkages between schools and any other such centres locally to encourage follow–up engagement with STEAM opportunities for those interested. Such linkages with local youth organisations that offer coding or STEAM–related activities can potentially support under–resourced schools that can struggle to provide specialist STEAM facilities (e.g. robotics

labs). The Doodle STEAM model demonstrates that when programmes intentionally design culturally responsive STEAM experiences (e.g. linking projects to local community needs) and empower parents as co–learners, they can disrupt cycles of exclusion.

A number of ideas were suggested which would assist with the further embedding of Doodle STEAM within school calendars. HSCLs suggested actions to ensure that all materials are easily available, for example buying in bulk within a school cluster and then sharing kits among schools. This could also assist in relation to the prizes that are offered to children or creating a final pack for the last session. While HSCLs are already connected to each other locally through their cluster, the expansion of a STEAM–focused Community of Practice might be useful, to run beyond the eight–week programme duration.

7.2.3 Expanding the Doodle STEAM Programme

Investigate opportunity for Early Years Doodle STEAM and Senior Doodle STEAM

The programme could be extended to the early years sector within the community. Through the CDI connections with early years practitioners and experts, a new programme could be developed based on the Aistear approach and model. This could complement the Doodle STEAM programme currently available to those 6– to 8–year olds.

Similarly, a Doodle STEAM programme that is available within the senior cycle of primary schools would ensure greater continuity of the emerging STEAM habits and ideas and could be delivered with a more project–based approach. Such a programme could work with Third- and Fourth-Class children to build on their earlier engagement with STEAM ideas, while monitoring a parent engagement component.

Promote Doodle STEAM beyond local level

As the programme is rolled out at a regional or national level, it might be possible to promote leadership opportunities for both parents and HSCLs who would like to act as Doodle STEAM ambassadors. Such practitioners could promote this evaluation framework for better understanding of STEAM habits from the perspective of parents and teachers. A training programme based on their experiences could be developed for other schools as they take on Doodle STEAM. Such a training programme could also be offered within an online platform and supported by these ambassadors.

Make further connections to European programmes

With possible funding opportunities available through ErasmusPlus, it may be possible to promote the programme and influence European educators, policymakers, and other STEAM stakeholders.

7.2.4 Increasing Parental Engagement and Leadership

The greater participation of fathers in Doodle STEAM compared to other HSCL activities should be further examined, and the programme iterations could be utilised as a stepping stone for introducing fathers into the school environment.

Furthermore, given the perceived improvements in confidence regarding STEAM among parents and children and the value placed by both on one–to–one time and parents' presence in the school, the Doodle STEAM outcomes framework as it further evolves should include mechanisms to capture these aspects of parental engagement and leadership.

7.3 CONCLUDING REMARKS

The report has focused on how young children have acted extensively as game–players, group–workers, predictors, measurers, testers, pattern makers, engineers, artists, and describers. The research allowed for the participating children to describe how this range of STEAM habits is being acquired and sustained through their participation in the programme, as well as how the adults are creating a supportive environment in which these ideas and habits can thrive.

The evaluation has demonstrated how these foundational elements that are integral to primary school teaching in the areas of STEM and Arts education are being promoted efficiently and effectively within a cohort of children in disadvantaged settings. Many of these children have had limited exposure to STEAM subjects and ideas outside of their classroom activities. The evaluation highlights that this spark for STEAM is very real for this cohort of children and they are developing these habits and forming new perspectives and positive attitudes towards these potential career areas. Data from pre– and post–programme surveys and the focus groups demonstrate these impacts.

Furthermore, they are developing stronger bonds with their parents through the programme, based on investigating, being curious, testing and trying new concepts, and being as creative as possible. Their teachers and HSCLs are reaping the reward. The programme is limited in time offered to the children and parents, but it is creating outcomes for both that highlight a very important and innovative way of working.

As a champion of this programme, CDI has played a hugely significant role in promoting Doodle STEAM as an innovative intervention for local children and families. As the programme moves to a national focus, it now offers a massive opportunity to allow more and more children acquire and sustain STEAM habits and ideas, within a uniquely supportive environment that brings parents and teachers together in a collaborative and meaningful manner.

BIBLIOGRAPHY

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2012). Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science. *American Educational Research Journal, 49*(5), 881–908. https://doi.org/10.3102/0002831211433290

Brooks, G., Pahl, K., Pollard, A., & Rees, F. (2008). *Effective and inclusive practices in family literacy, language and numeracy: A review of programmes and practice in the UK and internationally.* CfBT Education Trust.

Carter, C., Barnett, H., Burns, K., Cohen, N., Durall Gazulla, E., Nack, F., Newman, A., & Ussher, S. (2021). Defining STEAM approaches for higher education. *European Journal of STEM Education, 6*(1), 1–16.

Cian, H., Dou, R., Castro, S., Palma-D'Souza, E., & Martinez, A. (2022). Facilitating marginalized youths' identification with STEM through everyday science talk: The critical role of parental caregivers. *Science Education, 106*(1), 57–87. https://doi.org/10.1002/sce.21688

Commission. (2025a). *Communication from the Commission on the Action Plan on Basic Skills.* European Commission, Brussels, 5.3.2025; COM (2025) 88 final.

Commission. (2025b). *STEM education strategic plan: Skills for competitiveness and innovation.* https://education.ec.europa.eu/sites/default/files/2025-03/STEM-Communication-graphic-version-updated_0.pdf

Craft, A. (2000). *Creativity across the primary curriculum: Framing and developing practice.* Routledge.

Crowley, K., Callanan, M. A., Jipson, J. L., Galco, J., Topping, K., & Shrager, J. (2001). Shared scientific thinking in everyday parent–child activity. *Science Education, 85*(6), 712–732. https://doi.org/10.1002/sce.1035

Department of Children, Equality, Disability, Integration and Youth. (2023). *First 5 annual implementation report.* The Stationery Office: Dublin. https://www.gov.ie/pdf/?file=https://assets.gov.ie/298012/3f7c279f-b4b4-4dda-985e-7973a1cf5e1d.pdf

Department of Education and Skills. (2020). *STEM education 2020: Reporting on practice in early learning and care, primary and post-primary contexts.* Department of Education and Skills.

Department of Education and Skills. (2011). *Literacy and numeracy for life: The national strategy to improve literacy and numeracy among children and young people 2011–2020.* Dublin: Department of Education and Skills.

Department of Education and Skills. (2017a). *STEM education implementation plan 2017–2019.* Department of Education and Skills.

Department of Education and Skills. (2017b). *STEM education consultation report 2017.* Department of Education and Skills.

Engel, S. (2015). *The hungry mind: The origins of curiosity in childhood.* Harvard University Press.

Flanagan, S. M., Greenfield, S., & Coad, J. (2015). An exploration of the data collection methods utilised with children, teenagers and young people (CTYPs). *BMC Research Notes, 8*, 61. https://doi.org/10.1186/s13104-015-1018-y

Fredricks, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs through childhood and adolescence: Growth trajectories in two male-sex-typed domains. *Developmental Psychology, 38*(4), 519–533. https://doi.org/10.1037/0012-1649.38.4.519

Gilligan, T., Lovett, J., McLoughlin, E., Murphy, C., Finlayson, O., Corriveau, K., & McNally, S. (2020). "We practise every day": Parents' attitudes towards early science learning and education among a sample of urban families in Ireland. *European Early Childhood Education Research Journal, 28*(6), 898–910. https://doi.org/10.1080/1350293X.2020.18365

Government of Ireland. (1999). *Primary school curriculum: Science.* The Stationery Office: Dublin.

Hadani, H., & Rood, E. (2018). *The roots of STEM success: Changing early learning experiences to build lifelong thinking skills.* Bay Area Discovery Museum.

Jamil, F. M., Linder, S. M., & Stegelin, D. A. (2017). Early childhood teacher beliefs about STEAM education after a professional development conference. *Early Childhood Education Journal, 46*(4), 409-417. https://doi.org/10.1007/s10643-017-0875-5

Leitão, C. (2022). *Engaging fathers in early childhood: An overview of best practice, policy and insights from the island of Ireland.* Childhood Development Initiative.

McClure, E. R., Guernsey, L., Clements, D. H., Bales, S., Nichols, J., Kendall–Taylor, N., & Levine, M. H. (2017). *STEM starts early: Grounding science, technology, engineering, and math education in early childhood.* The Joan Ganz Cooney Centre.

McNally, S., Gillic, C., O'Reilly, N., & Dobrus, H. (2022). *Parents as facilitators of STEAM learning in early childhood: A literature review.* Childhood Development Initiative.

Murphy, S., MacDonald, A., Danaia, L., & Wang, C. (2019). An analysis of Australian STEM education strategies. *Policy Futures in Education, 17*(2), 122–139.

National Council for Curriculum and Assessment. (2009). *Aistear: The early childhood curriculum framework.* NCCA.

National Council for Curriculum and Assessment. (2020). *Draft primary curriculum framework for consultation.* NCCA.

OECD (2021). *Strengthening early childhood education and care in Ireland: Review on sector quality.* OECD Publishing. https://doi.org/10.1787/72fab7d1–en

O'Neill, S., Gillic, C., & O'Reilly, N. (2023). Hungry for more: Early childhood educators' perspectives on STEM education, teaching and professional development. *Irish Educational Studies, 42*(4), 971–993.

Patrick, H., Mantzicopoulos, P., Samarapungavan, A., & French, B. F. (2008). Patterns of young children's motivation for science and teacher–child relationships. *The Journal of Experimental Education, 76*(2), 121–144. https://doi.org/10.3200/JEXE.76.2.121–144

Pattison, S. A., & Dierking, L. D. (2019). Early childhood science interest development: Variation in interest patterns and parent–child interactions among low–income families. *Science Education, 103*(2), 362–388. https://doi.org/10.1002/sce.21486

Shumba, J., Quinn, M., Nic Carthaigh, C., & Leitão, C. (2021). *Over the fence: Perspectives on and experiences of child poverty in Tallaght.* Childhood Development Initiative.

Silander, M., Grindal, T., Hupert, N., Garcia, E., Anderson, K., Vahey, P., & Pasnik, S. (2018). *What parents talk about when they talk about learning: A national survey about young children and science.* Education Development Center & SRI International.

Simoncini, K. (2017). *Guide to the early childhood STEM habits of mind.* University of Canberra. https://serc.edu.au/wp-content/uploads/2019/10/Vic-Ed-STEM-ECStem-HabitBooklet-070419-1.pdf

Sousa, D. A., & Pilecki, T. (2022). *From STEM to STEAM: Brain-compatible strategies and lessons that integrate the arts* (2nd ed.). https://doi.org/10.4135/9781544357393

Spaepen, E., Bowman, B., Day, C. B., Chen, J.-Q., Cunningham, C., Donohue, C., Espinosa, L., Gartzman, M., Greenfield, D., Leslie, D., Levine, S., McCray, J., Schauble, L., & Worth, K. (2017). *Early STEM matters: Providing high-quality STEM experiences for all young learners.* University of Chicago Childhood STEM Working Group. https://d3lwefg3pyezlb.cloudfront.net/docs/Early_STEM_Matters_FINAL.pdf

Wan, Z., Jiang, Y., & Zhan, Y. (2021). STEM education in early childhood: A review of empirical studies. *Early Education and Development, 32*(7), 940–962. https://doi.org/10.1080/10409289.2020.1814986

Wan, Z. H., English, L., & So, W. W. M. (2023). STEM integration in primary schools: Theory, implementation and impact. *International Journal of Science and Mathematics Education, 21*(Suppl 1), 1–9.

Wu, X., Yang, Y., & Zhou, X. (2024). A meta-analysis of interdisciplinary teaching abilities among elementary and secondary school STEM teachers. *International Journal of STEM Education, 11*, 38. https://doi.org/10.1186/s40594-024-00456-7

Yang, W., Du, Y., & Wu, R. (2022). Development and validation of the children's STEM habits of mind questionnaire (Version 1). *Research Square.* https://doi.org/10.21203/rs.3.rs-2110705/v1

Yim, I. H. Y., Su, J., & Wegerif, R. (2024). STEAM in practice and research in primary schools: A systematic literature review. *Research in Science & Technological Education*, 1–25.

APPENDIX 1: PRE–PROGRAMME SURVEY

Doodle STEAM Evaluation
Pre–Programme Survey for Children

ABOUT ME

Unique Identifier: _____

1. I am:

☐ Male   ☐ Female   ☐ Other   ☐ Prefer not to answer

2. I am aged:

☐ _____

3. I am in:

☐ Senior Infants   ☐ First Class   ☐ Second Class

MY UNDERSTANDING AND INTEREST IN STEAM ACTIVITIES

4. Which of these activities do you like the most?

	Drawing or painting

	Building with blocks, like Duplo or Lego

	Playing with science kits (like making volcanoes or slime)

	Using computers, iPads or using apps

	Solving puzzles, doing jigsaws or brainteasers

	I like to do something else more: **You can draw it here if you like**

5. Which of these people would you like to be when you grow up? (Choose one)

☐ Scientist

☐ Engineer

☐ Computer programmer

☐ Teacher

☐ Doctor or nurse

☐ Artist or designer

☐ Astronaut

☐ Other
You can draw it here if you like

6. What's something you've made or designed that you're really proud of?

You can draw it here if you like

7. If you could invent anything, what would it be and why?
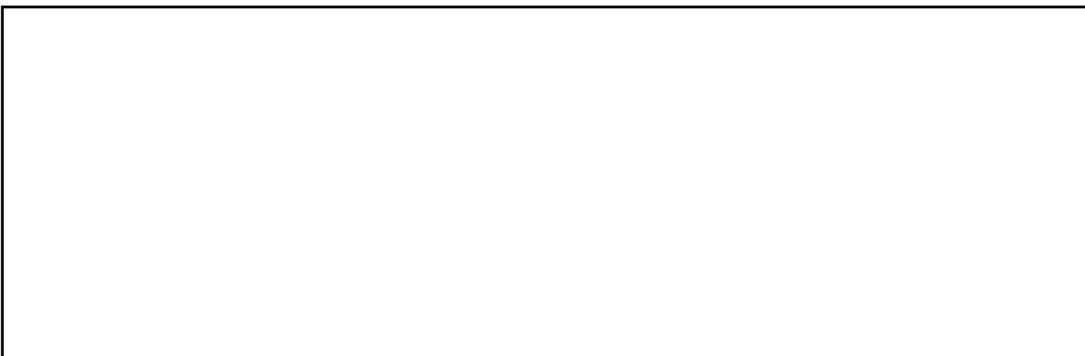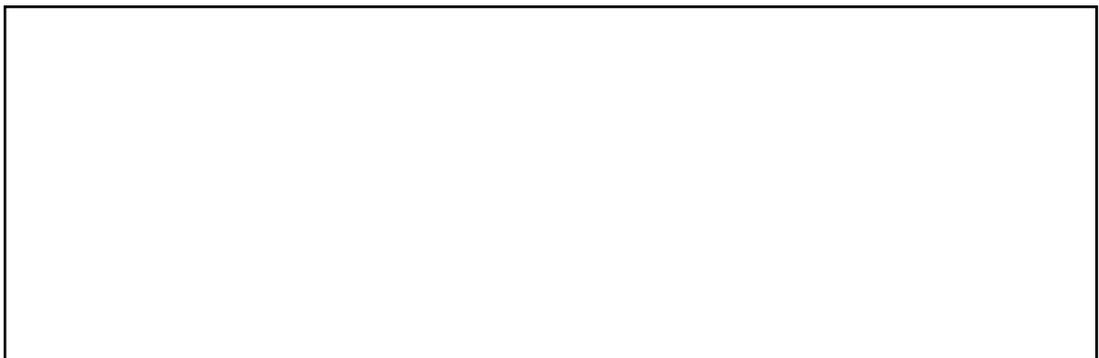
You can draw it here if you like

8. Have you ever been part of any camps or groups outside of school about Art or Science?

☐ Yes   ☐ No   ☐ I'm not sure

If yes, tell me more about the club or group

WALKING DEBATE – MOVING OPINIONS

Each of the scale responses and associated emoticons (1 = Yes, thumbs up; 2 = I'm not sure, expressionless face; 3 = No, thumbs down) will be placed clearly in a part of the room.

Each child will have 10 Post–it notes, containing their unique identifier (initials and school abbreviation).

The statements will be read out one by one (and explained if necessary).

The children will then be asked to place a Post–it note (that has their unique identifier on it) on their selected response.

1. **I like playing games at home with my parents**

2. **I like working in a group**

3. **I like predicting what will happen next**

4. **I like measuring and counting things**

5. **I like testing things to see how they work**

6. **I like making patterns**

7. **I like building with blocks and making things**

8. **I like following instructions to make things**

9. **I like drawing things that I have seen**

10. **I like describing what I see**

RESPONDING TO STEAM KIT ITEMS

Three items of Doodle STEAM kit will be placed on the table in front of the children. (Stethoscope materials; spaghetti and marshmallow materials; play dough materials)

The following question will be asked and notes will be kept by the facilitators on the children's responses.

What do you think that you might be able to do or make with these things?

THANK YOU

Thank you once again for taking the time to complete this survey.
Your input is really appreciated.

APPENDIX 2: POST–PROGRAMME SURVEY

Doodle STEAM Evaluation
Post–Programme Survey for Children

ABOUT ME

Unique Identifier: _____

1. I am:

☐ Male　　☐ Female　　☐ Other　　☐ Prefer not to answer

2. I am aged:

☐

3. I am in:

☐ Senior Infants　　☐ First Class　　☐ Second Class

MY UNDERSTANDING AND INTEREST IN STEAM ACTIVITIES

4. Which of these activities do you like the most?

☐ Drawing or painting

☐ Building with blocks, like Duplo or Lego

☐ Playing with science kits (like making volcanoes or slime)

☐ Using computers, iPads or using apps

☐ Solving puzzles, doing jigsaws or brainteasers

☐ I like to do something else more:
You can draw it here if you like

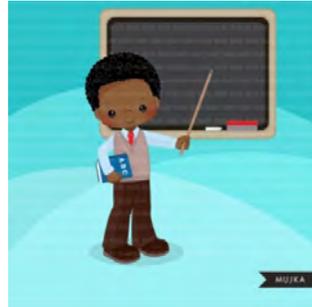**5. Which of these people would you like to be when you grow up? (Choose one)**

☐ Scientist

☐ Engineer

☐ Computer programmer

☐ Teacher
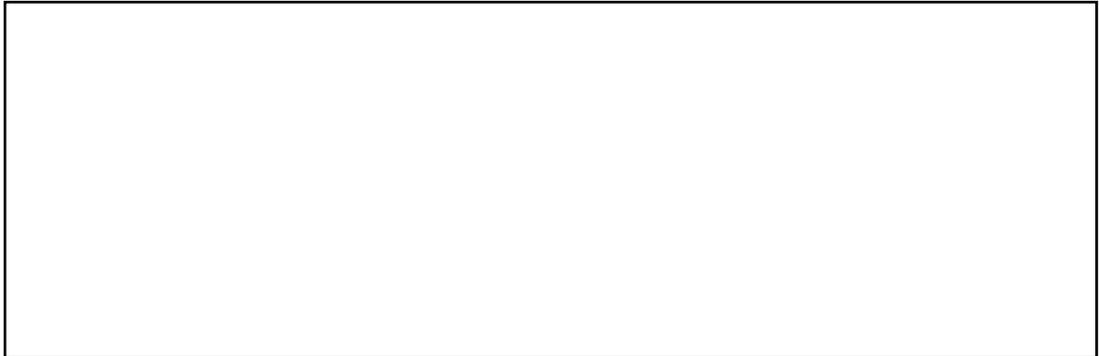
☐ Doctor or nurse

☐ Artist or designer

☐ Astronaut

☐ Other
You can draw it here if you like

6. What's something you've made or designed that you're really proud of?

You can draw it here if you like

```
[empty box]
```

7. If you could invent anything, what would it be and why?

You can draw it here if you like

```
[empty box]
```

8. Have you ever been part of any camps or groups outside of school about Art or Science?

☐ Yes   ☐ No   ☐ I'm not sure

If yes, tell me more about the club or group

```
[empty box]
```

WALKING DEBATE – MOVING OPINIONS

Each of the scale responses and associated emoticons (1 = Yes, thumbs up; 2 = I'm not sure, expressionless face; 3 = No, thumbs down) will be placed clearly in a part of the room.

Each child will have 10 Post–it notes, containing their unique identifier (initials and school abbreviation).

The statements will be read out one by one (and explained if necessary).

The children will then be asked to place a Post–it note (that has their unique identifier on it) on their selected response.

1. **I like playing games at home with my parents**

2. **I like working in a group**

3. **I like predicting what will happen next**

4. **I like measuring and counting things**

5. **I like testing things to see how they work**

6. **I like making patterns**

7. **I like building with blocks and making things**

8. **I like following instructions to make things**

9. **I like drawing things that I have seen**

10. **I like describing what I see**

FOR THE POST– PROGRAMME SURVEY ONLY EXPLAINING STEAM TO OTHERS AND REVIEWING

1. Do you feel confident about explaining about STEAM subjects to your friends?

☐ Yes   ☐ No   ☐ I'm not sure

2. How would you describe STEAM subjects to your friends?

☐

3. If you could add any of these to your school day, what would it be?

☐ Working with computers

☐ Robots

☐ More art and design classes

☐ Science experiments

☐ Building and inventing things

☐ Other: _____

4. What did you enjoy most about the STEAM sessions in your school?

You can draw it here if you like

THANK YOU

Thank you once again for taking the time to complete this survey.
Your input is really appreciated.

APPENDIX 3: INTERVIEW SCHEDULE – HSCL

BACKGROUND

Motivation for participation in programme

Levels of knowledge and confidence in supporting parents/carers to engage in STEAM learning

SUPPORT IN SET–UP

Experience of training, supports, and resources used in programme preparation

DELIVERY

Experience of the delivery of Doodle STEAM Programme across the 8 sessions

Describe the HSCL role and a typical programme session

MOST SIGNIFICANT IMPACTS FOR THE PARTICIPANTS

(a) Parents' perspective

- Extent to which Parents/Carers valued the programme and the opportunity to understand how to support their children's STEAM learning

- Extent to which Parents/Carers increased their confidence in relation to STEAM and supporting the STEAM learning of their young children:

  o Indicators/examples linked to understanding the simplicity of doing STEAM

  o STEAM is part of their everyday lives

  o Supporting children's STEAM learning could be done cheaply by working with everyday items in the shops

  o Simple things like asking children questions enhances their learning

  o Understanding the importance of parents supporting their children to do STEAM activities rather than doing the activities for them

- Improved relationships

- Cohesion among parents/carers

- Capacity of parents/carers to carry out activities at home

(b) Children's Perspective

- Value that the children placed on participation in the programme

- New learning outcomes for the children in relation to what STEAM is and how it relates to their everyday school and home lives

- Confidence in being able to deal with STEAM concepts

- Contribution to age–related ideas of digital literacy and numeracy

- View of STEAM activities as fun and playful experiences

- Improved relationships with parents/carers

- Interest in continuing to participate in such activities at home with parents/carers

HSCL PRACTICE

Influence of Doodle STEAM on their practice as educators

Confidence into the future in supporting STEAM learning

Engaging and building relationships with parents/carers

Is there any learning from Doodle STEAM that can influence your provision of supports to parents in other areas of learning?

POLICY AND FUTURE ROLLOUT

How the programme operates within the school environment

Doodle STEAM for classroom teachers

Timing of delivery

Activity choice and practical concerns

Value of providing Doodle STEAM and taking a wider approach across the school (older ages, etc.)

Improvements that would offer more and better support to parents when working with their children's STEAM learning at home

ANY OTHER COMMENTS TO ADD

APPENDIX 4: INTERVIEW SCHEDULE – PARENTS

BACKGROUND

How they heard about Doodle STEAM

Reasons for taking part in the programme

Expectations for themselves and their children

PARTICIPATION IN THE PROGRAMME

Experience of the delivery of Doodle STEAM Programme across the 8 sessions

Highlights from the sessions

MOST SIGNIFICANT IMPACTS

- Do they feel that they now place a higher value on STEAM learning?

- Do they now better understand how to support their children's STEAM learning?

- Do they feel more confident around STEAM subjects?

- Do they feel that they have the capacity to take on the activities themselves into the future (including getting hold of everyday items, working with their children at home, helping them with homework, answering questions about STEAM, knowing where to go for finding answers, and working with their children rather than doing the activities for them)?

- Do they feel that they have improved relationships with their children as a result of their participation in the programme?

- Do they think that their children now see a value in STEAM learning or even as having new ideas for possible careers/jobs?

- Do they think that their children are more confident in being able to deal with STEAM concepts?

- Did their children enjoy the STEAM activities as fun and playful experiences?

- Do their children view them any differently as educators or teachers?

- Do their children have an interest in continuing to participate in such activities at home?

SCHOOL PERSPECTIVE

How the programme operates within the school – any changes to make it work better

Doodle STEAM for classroom teachers – better with teachers or HSCLs

Timing of delivery and practical concerns – any ideas as to how it could be made more accessible to other parents

ANY OTHER COMMENTS TO ADD