



Curiosity, Self-efficacy & Informal Learning

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KEY FINDINGS

- **Informal learning provides unique and impactful opportunities to increase children's self-efficacy.**
- **Increasing facilitator's knowledge of self-efficacy helps increase the self-efficacy of children.**
- **Increased self-efficacy can be retained in children up to eight months after the initial experience of informal learning.**

IMPROVING SELF-EFFICACY OUTCOMES IN INFORMAL SETTINGS

Albert Einstein famously said:

“I have no special talents. I am only passionately curious.”

There is a consensus amongst policymakers, educators and industry that science, technology, engineering and mathematics (STEM) engagement amongst the general public is crucial for future economic and societal prosperity (European Commission, 2015). An engaged public feels confident to:

- Understand the role of STEM in our lives
- Can judge between competing STEM arguments / engage in informed debate on STEM issues
- Encourage young people to study and work in STEM
- Engage with STEM research (SFI, 2012).

THE FESTIVAL OF CURIOSITY

- Designated as the official legacy project of Dublin City being the European Capital of Science in 2012, the inaugural Festival of Curiosity took place in 2013 and is Dublin's annual international festival of science, arts, design & technology.
- From Playful Days (family programme) to Curious Nights (adult programme) we create, produce & curate unique, visual and interactive cultural experiences in Dublin that merge cutting-edge technology, design, arts and science in playful, immersive & curious ways.
- With over 45,000 attendees each year across 14 venues in Dublin City Centre, the festival is Ireland's annual celebration at the intersection of art, science, technology and design and has quickly grown to be one of the most exciting and innovative festivals of its kind in Europe.

Self-efficacy is a component in STEM engagement and it influences behaviour in children selecting STEM careers (Bandura, 1993; Bong & Skaalvik, 2003). Building self-efficacy in families is a key step to becoming more curious as it gives people the confidence to ask questions, explore and create new solutions to problems we face in everyday life. Informal settings are becoming more and more important to achieve the goal of an engaged and scientifically informed public as they are platforms to engage families outside of the educational system and opportunities to improve STEM self-efficacy in children.

In Ireland, there are numerous educational-focussed initiatives that attempt to increase STEM subject engagement and uptake by students in the educational system, for example BT Young Scientist Initiative, RDS Science Blast, and Smart Futures. The need in Ireland has become a focus on building broader STEM engagement, especially in informal settings.



Figure 23. STEAM environments at the Festival of Curiosity

Within this context, The Festival of Curiosity was created in 2013 and is Dublin's international festival of science, arts, design and technology. Over 45,000 peo-

ple attend every year from around the world and it has engaged over 210,000 people since it began in 2013. The festival aims to give people the confidence and the tools to explore and create the future. Through over 100+ events every year the festival aims to create a culture of curiosity in society for young and old, allowing people to engage with the latest research in science and technology and helping them to see their place in an ever changing and uncertain world.

The creation of the festival was informed by the latest research on learning and education, which highlights the importance of character traits like curiosity, determination and self-control (Tough, 2013). These character traits are non-cognitive and have a direct impact on learning but also have a positive impact on memory and life satisfaction as we grow older. For example, neuroscientists at the University of California, Davis, conducted a study to test curiosity as a motivator of learning and to see what happens in the brain when curiosity is piqued. They found that people are more likely to learn and retain information when curious.

The key challenge at the festival is creating environments where young people can engage with Science, Technology, Engineering, Arts and Mathematics (STEAM) and build their self-efficacy beyond the festival. As the festival only takes place across a few days every year, the engagement time with audiences is limited. The challenge for the festival was to look at new ways to improve self-efficacy by improving the quality of the engagement with children and families.

INCREASING SELF-EFFICACY THROUGH QUALITY ENGAGEMENT

To understand the quality of engagement at the festival, an analysis of the audience journey was undertaken, especially for children. One of the major factors identified in the successful engagement of families was the interaction with the festival volunteers at our major events, such as the Curiosity Carnival. The Curiosity Carnival is an interactive science playground for all the family with over 4,000 families attending every year. The approach at the Curiosity Carnival is one of free play where children are encouraged to interact with installations and activities they wish to play with. The festival volunteers at the Curiosity Carnival act as facilitators helping guide the families through the experience. Improving the ability of volunteers to help identify and increase the self-efficacy of children would have a direct positive impact on those children.

Therefore, for the STEAM4U project The Festival of Curiosity decided to promote children's self-efficacy in STEAM through the improvement of volunteer interactions with families at the festival. We created a volunteer training video introducing volunteers to the concept of self-efficacy, helping them identify opportunities to increase self-efficacy at the festival and encouraging them to document observations each day of the festival.



Figure 24. Volunteers at The Festival of Curiosity

Parents are seen as direct influencers on children's self-efficacy and two extra actions were identified to help increase parents' ability to influence their children's self-efficacy at home. The first 'STEAM4U/Inspiration' is an online collection of photos that inspires families to see learning as fun and enjoyable and to increase their confidence to continue STEAM learning outside the classroom.

The second entitled 'STEAM4U/Home' is an infographic aimed directly at parents to inform them about the importance of self-efficacy and identify means to increase self-efficacy in the home.

Finally, to understand the nature of the impact of these actions on our target audiences, questions were integrated into the festival evaluation that helped understand the outcomes of the festival on the self-efficacy of families and volunteers. The evaluation took place during the festival, just after people attended events, and eight months after the festival to understand the longer-term impact of attendance on our audience.

ASSESSING THE IMPACT OF SELF-EFFICACY TRAINING IN INFORMAL SETTINGS - METHODOLOGY

There were two main audiences for the Self-Efficacy Action Plan undertaken by The Festival of Curiosity – festival volunteers and families attending the events - and the methodologies utilised to assess on the impact of the Action Plan are outlined below:

Volunteer Diaries

An online diary was provided to volunteers which allowed them to answer a short number of questions helping to identify when a child's self-efficacy had being positively influenced and what actions the volunteer took to increase the child's self-efficacy. The questions are listed below:

- Write down a positive memory from your time at the event today
- Write about any instances where you saw someone's confidence/self-efficacy positively impacted.
- Why do you think it increased their confidence/self-efficacy?
- From your perspective what do you think worked when you interacted with families?

The data was collected using the Survey Monkey and analysed one month after the festival.

Family Surveys

An evaluation of the festival is undertaken every year by Hope Stone Research, who work with a range of clients including The Gates Foundation, BBC Learning and the Museum of London.

Hope Stone Research undertook an evaluation in 2017 that analysed the impact of the festival on attendees in two stages:

Stage 1: Festival visitor survey

Festival volunteers conducted a survey of visitors (N = 150) across all days of the festival, 20th-23rd July 2017, using a printed questionnaire. The questionnaire asked:

- How visitors found out about the festival and whether they had visited before.
- Reasons for visiting.

- Attitudes towards science.
- The impact of attendance on attitudes to and understanding of science.
- Propensity to recommend to others (Net promoter score).
- Demographics .

Stage 2: Follow-up visitor survey

During March 2018 an invitation to complete an online survey was sent to visitors who had booked tickets online and had consented to be re-contacted. The follow-up survey aimed to identify the longer-term impact of festival attendance on adult and child visitors. It asked about recall of the festival and whether visitors had done anything different as a result of attending; for example reading more on the topics covered at the festival, attended other similar exhibitions, such as a science museum, or even started a course. It was available for completion between 26th March – 13th April 2018 and was completed by N= 151 people.

A key question was to understand the change in their self-efficacy or confidence at the event and also eight months after the festival.

ASSESSING THE IMPACT OF SELF-EFFICACY TRAINING IN INFORMAL SETTINGS - RESULTS

Festival of Curiosity 2017 Parent - “Attending the festival triggered an interest in my sons in how science and technology applies to everyday life after seeing it in action.”

Volunteers

The key finding from volunteers was how important a positive and supportive attitude helped in increasing a child’s confidence as they engaged with STEAM activities for example “I saw someone’s confidence positively impacted when I told them about the things that he was very good at”.

Secondly the facilitation of STEAM activities was important in allowing children to fail and re-try challenges and thereby giving them the confidence to explore on their own – “By giving initial instructions, leaving them to do the task themselves and then giving help when needed.”

The qualitative findings of the volunteers' experiences support the literature on self-efficacy and highlights the importance of creating self-efficacy training opportunities for volunteers. The training of festival volunteers allows them to become part of a child's self-efficacy journey and positively impacts their confidence.

Families

As seen from the data below the positive effects of attending the festival has seen a substantial increase in attendee's self-efficacy and this impact was retained eight months after the festival.

IMMEDIATE IMPACT (AT THE FESTIVAL N= 150)

- **Relevant:** 89 percent of visitors agreed that the event made them feel that science is relevant to their life.
- **Curious:** 93 percent agreed that the event they attended made them more curious about science and technology.
- **Confident:** 79 percent agreed that attendance made them more confident to further explore science and technology issues and activities.

The follow-up survey provided evidence that many visitors went on to do something as a result of attendance.

- 80 percent talked to someone about their experience and 70 percent went on to find out more about the topic.
- 56 percent attended another STEM related event.
- 21 percent said they'd contacted an education institution about a course.
- Most of those in the follow-up survey who had accompanying children reported that their children had done something as a result of attending. 75 percent talked about their experience while 72 percent tried an experiment or similar.

LONG-TERM IMPACT (8 MONTHS AFTER THE FESTIVAL N=151)

- **Relevant:** 85 percent agreed that attendance had made them think science is relevant to their lives
- **Curious:** 90 percent strongly agreed that attendance had made them more curious about science and technology.
- **Confident:** 80 percent agreed that attendance had led to them being more confident talking about science and technology.

From the open ended questions in the post-festival survey, the different answers were collated into general actions and it was found that the festival also:

- Inspired children to do things, ask question, share experiences.
- Inspired parents to undertake activities with their children.
- Inspired and stimulated adults to do something new.
- Made science more relatable by seeing it in action in everyday life scenarios.
- Raised awareness of particular topics and stimulating conversation.



Figure 25. Parents and children learning together

CONCLUSIONS

Festival of Curiosity 2017 Parent - “[The Festival] Helped enflame an even stronger desire in my girls to follow careers in engineering and science.”

Self-efficacy is a useful concept to help increase STEAM engagement with children in informal settings. It helps create action-oriented plans that can be implemented and assessed to help improve the positive outcomes of STEAM initiatives.

KEY MESSAGES FOR EDUCATORS

- **Create playful environments for positive STEAM engagement for all**
- **Provide children with the tools not the answers**
- **Give children the confidence to try and the confidence to fail**

From the experience of The Festival of Curiosity it can be seen immediately that informal learning experiences have positive outcomes on children's self-efficacy. These outcomes can last for a long period after the initial experience and it is important for policymakers to see the role that informal settings can play in science education strategies.

The simple self-efficacy training provided to volunteers at The Festival of Curiosity helped them to become more self-aware of their actions and identify opportunities to improve self-efficacy as they interacted with children and their parents. The training can be developed with feedback from users to continuously improve the outcomes on volunteers and ultimately the children they engage with.

Looking at how families engage with STEAM in informal settings, volunteers/facilitators have a crucial role to play in creating opportunities to increase attendees' self-efficacy. The use of online training means that a large number of volunteers/facilitators can be trained without a large cost and it allows educators to create bespoke training for their particular initiative.

The challenge for all of us is to create positive and supportive environments for everyone to engage with STEAM and gives them the tools to succeed in STEAM and in life.

FUTURE STEPS

For educators in the formal and informal sectors, looking to replicate the impact of the STEAM volunteer training and improved self-efficacy on their initiative, they should look to ensure that the design of their engagement is structured around improving the self-efficacy of attendees, with a key focus on the needs and interests of the audience.

Educators could start collecting simple feedback on the elements that have the largest positive effect on self-efficacy and then look to begin training for volunteers/facilitators on the concept and application of self-efficacy in informal settings.

Once the initial pilot is complete they could expand the training and data collection to look at the longer-term impact of the initiative and build a robust understanding of how their STEAM initiative connects with other initiatives in the local ecosystem, so that audiences can be guided to other STEAM opportunities, building STEAM engagement across the broader community.

TO KNOW MORE

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