



Setting up makerspaces in youth work organisations

A Guide

National Youth Council of Ireland

The National Youth Council of Ireland (NYCI) is the representative body for voluntary youth organisations in Ireland. We use our collective experience to act on issues that impact on young people.

This guide was produced as part of NYCI's STEM and Digital Youth Work programme. This programme aims to support the youth work sector to use STEAM and digital youth work to improve the lives of disadvantaged young people. The guide was produced with funding from the Science Foundation of Ireland.

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About this resource

This guide is for youth workers who are interested in setting up 'makerspaces' and including STEM¹ and maker education in youth work. This guide:

- introduces the 'Maker Movement'
- outlines how maker and STEM education can help to achieve youth work outcomes
- describes some of the key features of makerspaces and provides practical tips as to how they can be set up.

While there are many available resources out there on the Maker Movement, makerspaces and maker education, this guide focuses on the particular value, opportunities and challenges to setting up makerspaces within youth work organisations.

¹ STEM is science, technology, engineering, arts and maths. The terms STEM and maker are often used interchangeably. At NYCI we use 'STEM' where there is consideration of the scientific concepts that underpin particular activities and 'maker' when there is emphasis on processes of learning and youth work approaches that support this.

The Maker Movement, makerspaces and youth work

What is the Maker Movement?

The Maker Movement is a global, grassroots phenomenon that has proliferated over the last ten years. It refers broadly to the growing numbers of ‘makers’ who take part in the creative production of physical objects and who use physical and digital forums to share their work with other members of the maker community. The Maker Movement celebrates hands-on creation, experimentation, innovation and iterative and active learning through bringing people together to make things. Makers typically undertake projects that combine traditional arts and crafts (such as sewing, metalworking and woodworking) with technology (such as electronics, robotics and 3D printing).

The main tenets of the Movement² are highly complementary to those of youth work and encourage participants to make, share, give, learn, play, participate, support and change. The Movement’s open source spirit, which encourages makers to peer-produce and share resources, aligns with the resource needs of youth organisations, many of which operate ambitious projects on shoestring budgets. The Movement responds to the human need to create tactile objects and reacts to the over-consumption so characteristic of many of today’s societies. ‘Making’ encourages participants to embrace their creator identity through: coming up with a product idea; acquiring the skills, tools and resources needed to make it; and then to ahead and make it through a process of iteration.

The Movement is rapidly expanding across the world and bringing in new communities and organisations. While it began within informal groups of hobbyists, it increasingly includes science, arts and cultural museums, libraries, universities, schools and different types of community-based organisations such as youth work organisations. In Ireland, with generous funding from the Science Foundation of Ireland (2017 - 2019), the NYCI TechSpace STEM in Youth Work Maker project has provided wide-scale, systemic support to enable the youth sector to engage in the Maker Movement and to establish makerspaces to enhance their youth work. This has led to the emergence of a diverse range of makerspaces within Irish youth work organisations.

What is a makerspace?

The Maker Movement places emphasis on collaboration and development of ‘makerspaces’- communal workshops that bring communities of makers together to support and learn from each other, share tools and resources, and to create. A makerspace is not defined by where it is or how high-tech and sophisticated its tools are, but rather a collaborative culture of making, sharing, hands-on learning and experimentation.

² As laid out in the seminal book, *The Maker Manifesto* (Hatch, 2013), of which sample pages, can be seen at: www.boereneshovedstad.dk/media/1332/maker-movement-manifesto-sample-chapter.pdf

What is a maker education and how is it relevant to youth work?

For decades progressive educators have talked about the role of making in learning. Increasingly educational organisations such as museums, libraries, universities, schools and youth work organisations have been engaging in the Maker Movement, giving rise to the concept of 'maker education' (Halverson et al, 2014). This is in recognition of the contribution 'making' can make to a wide-range of educational outcomes and, in the case of youth work, its complementarity to the 'learning by doing' pedagogies which underpin youth work (Devlin, 2017).

Maker education is underpinned by constructionism - Papert's theory of learning that deals with the ways in which people assimilate knowledge through constructive experiences, which it places at the core of effective learning (as opposed to experiences where information about the world is passively received). Constructing, creating and making things allow people to reconstruct and evaluate the learning process. In makerspaces people can pick up objects, combine them to make new objects, incorporate new technologies, use them to solve problems and share them, and how they were made, with others for additional senses of achievement. Creativity and innovation are fostered and learning is motivated through activity. Constructionism, in turn, has its basis in Deweyan constructivism, which frames learning as the product of play, experimentation, and authentic inquiry (Feighery, Nea, & Tierney, 2018; Halverson, et al, 2014).

The NYCI TechSpace STEM in Youth Work Maker project, has been heavily influenced by internationally renowned projects that are based on the learning theories of constructionism such as the International Computer Clubhouse programmes (Feighery, J., Nea, B. & Tierney, H., 2018).

STEM and maker education offers huge potential in terms of the relational and process outcomes of youth work, such as those linked with social, emotional and mental wellbeing. Preliminary findings from the evaluation of the NYCI TechSpace STEM in Youth Work Maker Project show that it enhances young people's creativity, problem-solving, critical thinking and team working. It provides them with opportunities for self-expression and changes their perceptions about STEM by providing them with enjoyable, hands-on experiences of it. For youth workers themselves, emerging findings indicate that most of those who engage in the Maker Movement really enjoy the experience, want to continue to develop their practice in the area, and to have access to support (Feighery, Nea, & Tierney, 2018).

Setting up a makerspace in a youth work organisation

This section focuses on the practicalities of setting up a makerspace in your youth work organisation.

Space and accessibility

You will need suitable space - is there a space in your youth work organisation that could be easily adapted to offer the chance for low-stakes creative maker activities and for bigger group projects too?

Young people will need good sized spaces to work in and move around while they are designing, creating, producing and collaborating. Large tables encourage creative thinking and innovation as young people have enough room to spread out materials and equipment and to work comfortably. Space and furniture should be arranged to allow young people to move to and from equipment and to those that they want to collaborate with.

Young people need easy access to electrical sockets so that they can plug in equipment such as laptops, soldering irons and glue guns. Extension cords are an option but remember that too many can be a hazard.

Think about accessibility too. Inclusion and equality are key values within both the Maker Movement and youth work. For example, is there enough space for a wheelchair user to move around easily?

Due to resource limitations and the wide range of activities that typically go on in youth work organisations, the space you use for maker activities will probably be multi-functional. If so, chose tables, chairs and storage units for materials and projects that can be moved and stacked easily to make room for other youth groups that will also be using the space.

Your notes and ideas



Storage

Makerspaces have the potential to become very disorganised and cluttered. You'll need decent storage and clear labelling for materials, equipment and young people's projects. Storage should be accessible to young people so that they can get what they need without help. As young people need sufficient, clear space to work and move creatively in, hanging storage of for bags and coats are helpful.

Making can also be messy! As young people work through the design process, they will be continually reiterating their designs, so have some big open mouth bins handy with good recycling options. Making provides lots of opportunities to discuss the environment, sustainability and so on.

Your notes and ideas



Equipment, tools and materials

The equipment, materials and tools that you will need will depend on your budget, networks and young people's ideas. A makerspace doesn't have to include lots of expensive equipment like 3D printers, laser cutters and tablets. Lego, blocks, duct tape and recyclable materials can be used creatively. A makerspace is primarily about building a culture that supports experimentation and hands-on, creative learning and making, rather than the tools or resources which it includes. Typically, the resources a makerspace acquires and uses, changes as it develops. Set your makerspace in motion by starting with straightforward and affordable tools ahead of advanced and costly ones.

The youth work sector is often under-resourced but this shouldn't be a limitation. Youth workers should plan to tap into external resources such as:

- subsidised training and equipment grants provided by organisations like NYCI.
- inexpensive materials from organisations like Recreate.
- local communities and businesses, which can be asked for donations (cash, materials, equipment and expertise).
- local public amenities (e.g. libraries and STEM and cultural institutions may have staff with outreach roles that could provide expertise or equipment and facilities which could be shared with youth work organisations).

Encourage young people and local families to donate old battery-operated toys, for example, that can be recycled for parts such as motors and made into something new. Use this as an opportunity for learning about the environment and sustainability also.

The resource section below includes lists of organisations that will help you in choosing and sourcing the equipment that you will need to get your makerspace going.

Some youth work organisations have 3D printers, which are excellent making tools that allow young people to design and prototype products. Here are some introductory tips to including 3D printers in your makerspace³:

- Invest in 3D design or modelling software that is easy to use - ideally young people will be able to learn the software independently and to start designing quickly.
- Choose the right printer for your young people - for beginners, start off with something that is low tech to make initial prints easier. Would a small printer be enough to deliver on the young people's ideas, or do you need something that would accommodate bigger projects? What is your budget, bearing in mind there are costs related to energy and materials as well as the printer itself?

³ These tips are a summary of those included in 'Top 12 tips for setting up a school Makerspace' by Makersempire at www.makersempire.com/top-12-tips-for-setting-up-a-school-makerspace/

- Choose quality 3D printer filament - this is the part that your designs will be printed with. Make sure you choose quality, safe filament and store your printer in a dry area. Low-quality filament is responsible for many, many 3D printer issues.

Your notes and ideas



Health and safety

Every youth organisation should have a health and safety policy, a first aid kit and a youth worker trained in first aid. When makerspaces are being set up, these should be reviewed. As with any new activity a youth work organisation is introducing, a risk assessment is needed with necessary precautions taken. Minor injuries are sometimes part of the making process and it is important to be prepared.

Your notes and ideas



Evaluation

Capturing evidence of the benefits of youth work is very important, yet very difficult. More and more, youth work programmes and initiatives are expected to be evidence-based. We have not identified any resources specifically related to the evaluation of makerspaces in youth work. However, NYCI has produced a very useful tool, 'Capturing Magic', for evaluating outcomes in youth arts projects that could be easily adapted and used to evaluation makerspaces in youth work organisations⁴. Further details about the tool, 'Capturing Magic', are included in the resources section below.

Your notes and ideas



⁴ NYCI Youth Arts Programme (2017). *Capturing Magic. A tool for evaluating outcomes in youth arts projects.* www.youth.ie/nyci/Capturing-Magic-Tool-Evaluating-Outcomes-Youth-Arts-Projects.

Research

The internet is full of excellent resources that will help you begin to develop, then advance your makerspace. There is a myriad of project ideas for young people of all ages and levels of experience that could adapt and used to support youth work. Follow maker enthusiasts on social media for inspiration and ideas.

A range of resources that are specific to youth work have also been produced through the NYCI TechSpace STEM in Youth Work Maker project, including project guides, logic models, equipment lists. To find out more contact the NYCI's STEM in Youth Work Coordinator, Barbara Nea, at barbara@nyci.ie.

Your notes and ideas



Networking and peer learning

The Maker Movement is rapidly growing and engaging new types of organisations - schools, museums, libraries and different types of not-for-profit sector organisations. In Ireland the youth work sector is increasingly engaging in the Maker Movement with a number of organisations such as YMCA Cork, Ballymun Regional Youth Resource and SWICN (South West Inner City Network), which have been engaged for years, now delivering cutting-edge practice. For inspiration and ideas arrange to visit youth work organisation with well established makerspaces and attend events and festivals (such as the Dublin Maker Festival). Remember a major part of maker culture is about collaboration and youth work organisations with established makerspaces are usually very open to visits and questions.

Your notes and ideas



Training and support

There are a range of training and support options out there for youth workers interested in setting up makerspaces and including STEM within their youth work. These range from basic training days (to introduce youth workers to maker activities and to help them set up simple makerspaces) to level 7 and 8 certs and Masters (to enable youth workers to specialise in maker education in youth work). See the resources section for further information about what's available. While some of those included target Irish youth workers, many don't.

Your notes and ideas



Human resources

Youth workers who have engaged in the Maker Movement with support from the NYCI TechSpace STEM in Youth Work Maker project are diverse and come with various levels of experience. Many who have had no previous relevant experience whatsoever have set up the most innovative makerspaces and gone on to help young people deliver amazing projects. Much more important than a youth worker's experience, is their curiosity, openness to experimentation and innovation, and passion for providing young people with creative learning opportunities.

Invite outside speakers in when you feel you need some help to advance your makerspace and projects. There are many types of organisations which could help including academic institutions, museums, industry bodies, informal hobby groups etc. Establishing such relationships can also provide opportunities for the progression of young people that are particularly talented and interested in STEM.

Your notes and ideas



Instruction/youth work facilitation

Bringing maker and STEM education to youth work requires youth workers to emphasize inquiry-based and constructionist learning models within their youth work practice. While, some may already do this, for some youth workers there is some discomfort in taking a step back, in limiting instruction, in taking on a more nuanced facilitation role, and in allowing young people to make, experiment, explore, encounter problems and solve them. A youth worker's role in a makerspace is less about leading young people or explicitly telling them what to do, and more about assisting them in their endeavors, aiming their efforts towards the general goal of innovation, and providing them with constructive feedback so that they can iterate and develop their work. This may be an area that youth workers who are developing makerspaces may need to focus on in their own practice development. There are a number of training and supports referenced in the resources section focused on facilitation skills in maker and STEM education that will be useful here.

Your notes and ideas



Establishing makerspaces to support youth work outcomes

Makerspace activities within youth work organisations should connect to youth work outcomes. Unstructured makerspaces, where materials are left out for young people to independently manipulate, will build upon young people's natural curiosity and creativity. However, youth workers should also strive to incorporate maker projects within their generic youth work programmes, such as in youth justice, development education and health programmes. This will ensure the sustainability of your makerspace within your organisation, make it easier to get buy-in from managers and colleagues, and ensure that the makerspace is enhancing your youth work rather than being a distraction!

Your notes and ideas



Addressing resistant mindsets

Even though the use of STEM and maker education is growing within youth work, some youth workers and managers are still quite resistant. Some do not see its relevance to youth work, while others feel they do not have the correct skill set and resources or may be worried about the risks of using technology with young people. When setting up your makerspace, you may have to spend time convincing colleagues and managers of the value of it within youth work. Arm yourself with evidence as to how it can support the engagement of young people and the achievement of youth work outcomes; use case studies so colleagues can easily see how it works in practice.

Your notes and ideas



We wish you well!

While starting a makerspace may seem like a daunting task, you can rest easy knowing that maker culture encourages you to approach it in your own way, to be creative, to take risks and not to be afraid to fail. By trying different things, you can narrow down what does and doesn't work regarding design elements, facilitation styles, tools and materials. Through this process of experimentation, you will be able to refine your makerspace until it becomes the successful innovation generating machine it's supposed to be.

Resources to help you set up a makerspace in your youth work organisation

Equipment and material

[Recreate](#) is a Dublin-based charity that makes art materials and educational supplies accessible and affordable to every sector of the Irish community for all kinds of creative purposes. Recreate works with businesses to collect unwanted and surplus items to redistribute. This helps local businesses produce less waste, helps schools and community organisations to stretch their budgets, and helps the environment by reducing waste and our carbon footprints. There may be similar charities that supply materials needed for makerspaces available at reduced prices around country. Find out more at <https://recreate.ie/>

Equipment can be purchased from companies such as [Velleman](http://www.velleman.eu/about/) (www.velleman.eu/about/), [Kitronik](http://www.kitronik.co.uk/) (www.kitronik.co.uk/) and [Irish Electronics](http://irishelectronics.ie/) (irishelectronics.ie/). Products include maker kits for young people and entry-level hobbyists. Staff are available to answer questions and provide support in choosing the right equipment for your makerspace.

Training, support, resources and organisations

The [STEM in Youth Work Maker project](#) (a partnership project between the National Youth Council of Ireland and Camara Education Ireland) is supporting youth workers to inspire young people to create, invent and make with STEM. As well as receiving a day of hands-on training, youth workers receive a grant for STEM equipment. The project also provides youth workers with follow-up support, resources, lists of equipment and suppliers, a community of practice and more. Young people have the opportunity to showcase their work at regional and national events. Find out more at <http://www.youth.ie/stem>.

The [CoderDojo](#) movement believes that an understanding of programming languages is increasingly important in the modern world, that it is easier and better to learn these skills at an early age, and that nobody should be denied the opportunity to do so. CoderDojo has built a global network of free, volunteer-led, community-based programming clubs for young people. There are Dojo's sprinkled around Ireland, with many located in school and college settings and a number based in youth organisations alongside developing makerspaces. CoderDojo deliver training on setting up Dojos for youth organisations Find out more at <https://coderdojo.com/about/>.

[Science Gallery Dublin](#) bridges art and science, unleashing their combined creative potential and encouraging young people to learn through digging deeper into their interests. Science Gallery delivers a range of workshops and supports to different types of educators on makerspaces and maker education. At the time of writing, Science Gallery is involved in a range of relevant projects including:

- Work to integrate art and science as a means of broadening participation in STEM learning. Find out more at <https://dublin.sciencegallery.com/research>.
- ‘[Tinkering: Contemporary Education for the Innovators of Tomorrow](#)’ (complete) and [Tinkering EU: Building Science Capital for All](#) (ongoing). Find out more at www.up2europe.eu/european/projects/tinkering-contemporary-education-for-the-innovators-of-tomorrow_105066.html.

There are science galleries in a number of different cities around the world with a wide range of inspirational projects being delv. Find out more at <https://dublin.sciencegallery.com/>.

The [Digital Hub](#) in Dublin 8 is a collaborative space for digital companies to scale and grow. Populated by innovative, digital companies, The Digital Hub fosters an atmosphere of creativity and support. It also provides a range of community-based STEM-related learning opportunities for local young people and youth organisations. Find out more at <https://www.thedigitalhub.com/>.

[Science Foundation Ireland](#) (SFI) believes in the potential for STEM to effect positive change in the world and drive a sustainable international economy. SFI’s Discover programme works to develop capacity for STEM education and outreach in Ireland through various funding opportunities. SFI produces a regular and useful e-bulletin including details of their work, STEM events and more. Find out more at <http://www.sfi.ie/>.

The [National Youth Council of Ireland](#) (NYCI) has a range of resources available to youth workers, including training and online resources, to help them use technology in their youth work. NYCI’s [Screenagers: Digital Youth Work Guidelines \(2016\)](#) were developed in response to recommendations from a comprehensive international research project – the Screenagers International research project (<http://www.youth.ie/digital-youth-work-guidelines>). They accompany a Screenagers workshop with policy makers and youth work organisations and explore: an Introduction to digital youth work; using digital media and technology safely and effectively in youth work settings; using social media in youth work settings; and, training and resources for digital youth work. NYCI has developed these guidelines with members of the North/South ICT in Youth Work Group. Find out more at <http://www.youth.ie/screenagers>.

[NYCI’s Youth Arts Programme](#) provides a range of training, support and toolkits for youth work organisations that want to deliver varied arts projects with young people that are of relevance to maker and STEM in youth work. Toolkits cover topics such as ‘12 Tips for Embedding the Arts in Your Youth Work’, ‘How to get funding to work with an artist’ and ‘Capturing Magic: A tool for Evaluating Outcomes in Youth Arts Projects’. NYCI’s Youth Arts Programme also delivers an NUI (National University of Ireland) Certificate in Youth Arts. This is a part time Level 7 programme of study in youth arts practice, which takes place over 100 contact hours. Find out more at www.youtharts.ie

The global charitable foundation [Wellcome](#) has a history of investing in science learning and education in a variety of settings and believes that young people should have the opportunity

to access, engage with and participate in science in a way that is relevant to them. Wellcome has conducted research on science education in non-formal settings and produced a number of resources that youth workers seeking to develop their STEM in youth work practice may find useful. Find out more at <https://wellcome.org/what-we-do/our-work/increasing-informal-science-learning>. In partnership with BBC Children in Need, in 2017 Wellcome launched *Curiosity* - a £2 million grant fund, targeted at the youth sector, for science activities aimed at children and young people experiencing disadvantage in the UK. Find out more at <https://wellcome.ac.uk/news/wellcome-and-bbc-children-need-launch-curiosity>.

The [Ark](http://www.ark.ie), Dublin, regularly delivers and hosts workshops of relevance to youth workers seeking to develop their STEM in youth work practice. The Ark is a dedicated cultural centre for children. The Ark creates opportunities for children, their families, their friends and their schools to discover and love art. Find out more at www.ark.ie.

[TechSpace](http://www.techspace.ie) is a network that aims to change the lives of young people in Ireland by becoming Ireland's leading creative technology network for outcome focused youth development. TechSpace provides a range training, support and resources to youth workers and educators to enable them to facilitate digital media, STEM and creative technology activities through youth development principles with young people. Find out more at www.techspace.ie.

Various relevant resources have been created by Project Zero, Harvard Graduate School of Education, in particular, '[Creative Thinking, Maker Centred Thinking and Design Thinking](http://www.pz.harvard.edu)'. Find out more at www.pz.harvard.edu.

Various relevant projects have been undertaken by Media Lab, Massachusetts Institute of Technology (e.g. [Lifelong Kindergarten](http://www.media.mit.edu)). Find out more at www.media.mit.edu.

Various relevant projects have been undertaken by the international network of Computer Clubhouses, in particular '[Making! @ Clubhouses!](http://www.computerclubhouse.org/making)' Find out more at www.computerclubhouse.org/making.

Tinkering and maker pedagogies have been pioneered by the [Exploratorium of Science Francisco](http://www.exploratorium.edu) and a range of useful resources have subsequently been produced. Find out more at www.exploratorium.edu

[Instructables](http://www.instructables.com/) is a website specialising in user-created and uploaded do-it-yourself projects. It provides instructions and equipment lists for a huge range of maker projects, most of which could be done easily in a makerspace with young people. Find out more at www.instructables.com/

Festivals and events

The [Dublin Maker Festival](#) is a free, annual, community-run event that takes the form of a 'show and tell' experience where inventors/makers (sourced through an open call) showcase their creations at individual booths in a carnival atmosphere. It is a family-friendly showcase of invention, creativity and resourcefulness, and a celebration of the maker movement. This is a place where people show what they are making and share what they are learning, and it offers great opportunities to engage young people in 'doing stuff'. Makers include tech enthusiasts, crafters, youth workers and other educators, tinkerers, engineers and hobbyists, artists, science communicators, young people, authors and commercial exhibitors. Makers (and those engaging with the festival) are of all ages and backgrounds and come from all over Ireland and beyond. The festival's mission is to entertain, inform and connect the makers of Ireland, while inspiring the country's next generation of makers and inventors.

[Creative Tech Fest](#) is an annual celebration of the work of young people and youth workers involved in TechSpace. Young people come to showcase projects, to receive awards, and to take part in exhibitions. Find out more at www.techspace.ie/esbcreativetechfest.

Project development, management and evaluation in youth work organisations

Perry, M. & O'Gorman, A. (2013) *Creating Magic: A Handbook for Developing Arts Projects with Young People*. National Youth Council of Ireland. This excellent resource could be easily adapted and used to develop makerspaces that support youth work outcomes. Find out more at <http://www.youtharts.ie/sites/youtharts.ie/files/CreatingMagic.pdf>.

NYCI Youth Arts Programme (2017). *Capturing Magic. A tool for evaluating outcomes in youth arts projects*. This is an excellent evaluation tool which could be easily adapted for STEM and maker projects. Find out more at www.youth.ie/nyci/Capturing-Magic-Tool-Evaluating-Outcomes-Youth-Arts-Projects.

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