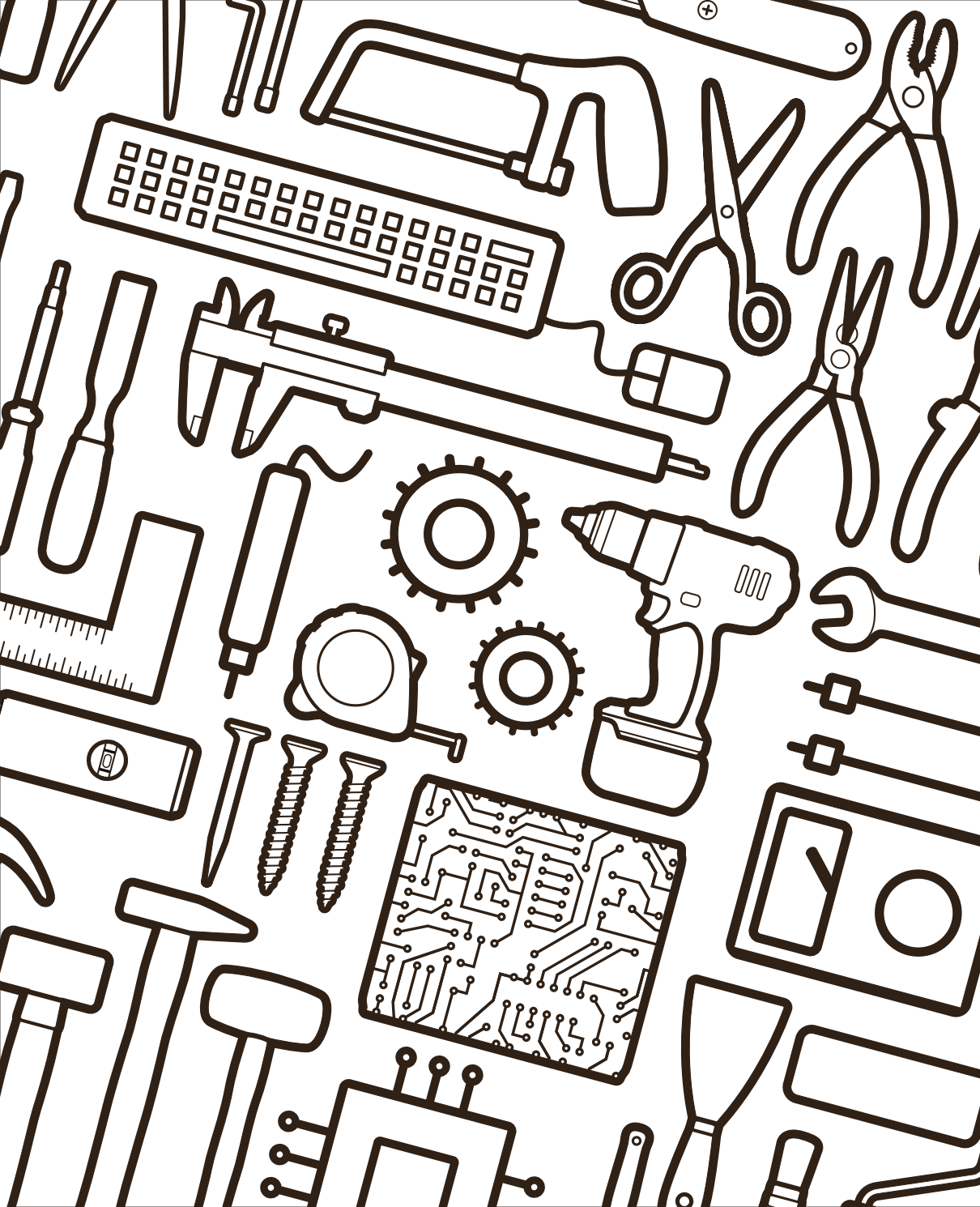
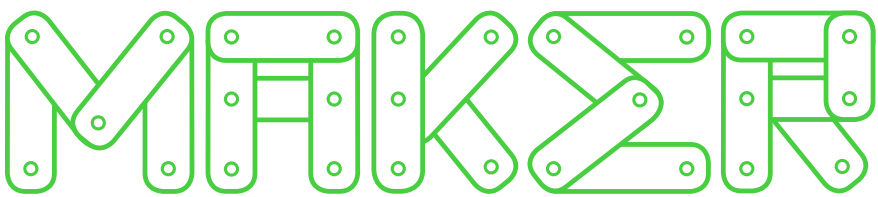
MAKER

ACTIVITIES IN YOUTH WORK

VERKE





ACTIVITIES IN YOUTH WORK

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Edited by Juha Kiviniemi

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www.verke.org
info@verke.org

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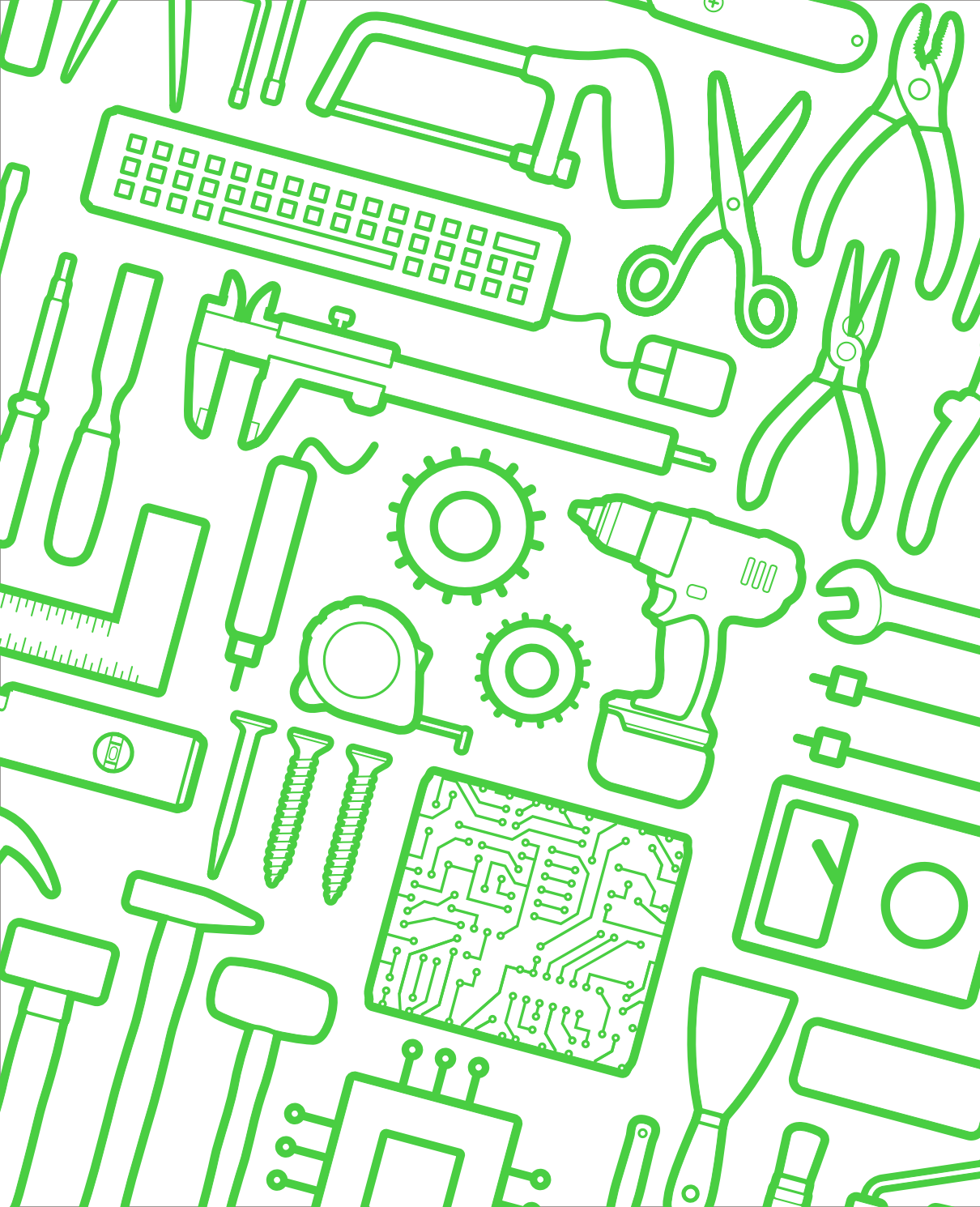


FOREWORD

TECHNOLOGY IS PRESENT IN ALL areas of our lives. Young people have grown up in a technologized world and are often at the forefront of adopting the latest technologies. What follows is that rapid growth of technology also puts pressure on the field of youth work: how can we adapt to the ongoing march of technology and digitalisation and update our activities to reflect this new age? How can we best support the growth of young people in this digitalised society?

Youth work is as a field, in many ways, in a unique position. While it's balanced on the fine line between young people's homes and free time, it is simultaneously positioned on the fringes of formal education. Youth work has a long tradition in boldly tackling media education and other similar topics brought forward by the technological world that young people so fluidly inhabit. Now it is high time to expand on our already impressive range – including phenomena such as digital media, online environments and digital games – by addressing the physical technology young people interact with every day.

One of the central aims of the maker movement is the democratisation of technology. According to the maker movement, citizens shouldn't be content in being merely passive consumers and users of technology but should instead be free to use technology as they please. This has a familiar ring

for anyone versed in media education, where one of the central aims is to empower young people to be creators instead of consumers. In both views technology skills also play a vital part in active citizenship in modern society.

Maker activities can take many forms in goal-oriented youth work. They can be implemented to give added value to any existing youth work activity, whether it's an arts and crafts club, a parish confirmation camp or a youth participation process. One of the central tasks of youth work is to organise meaningful free-time activities for young people, and maker activities can indeed be used to give established activities an additional upgrade or create whole new ones.

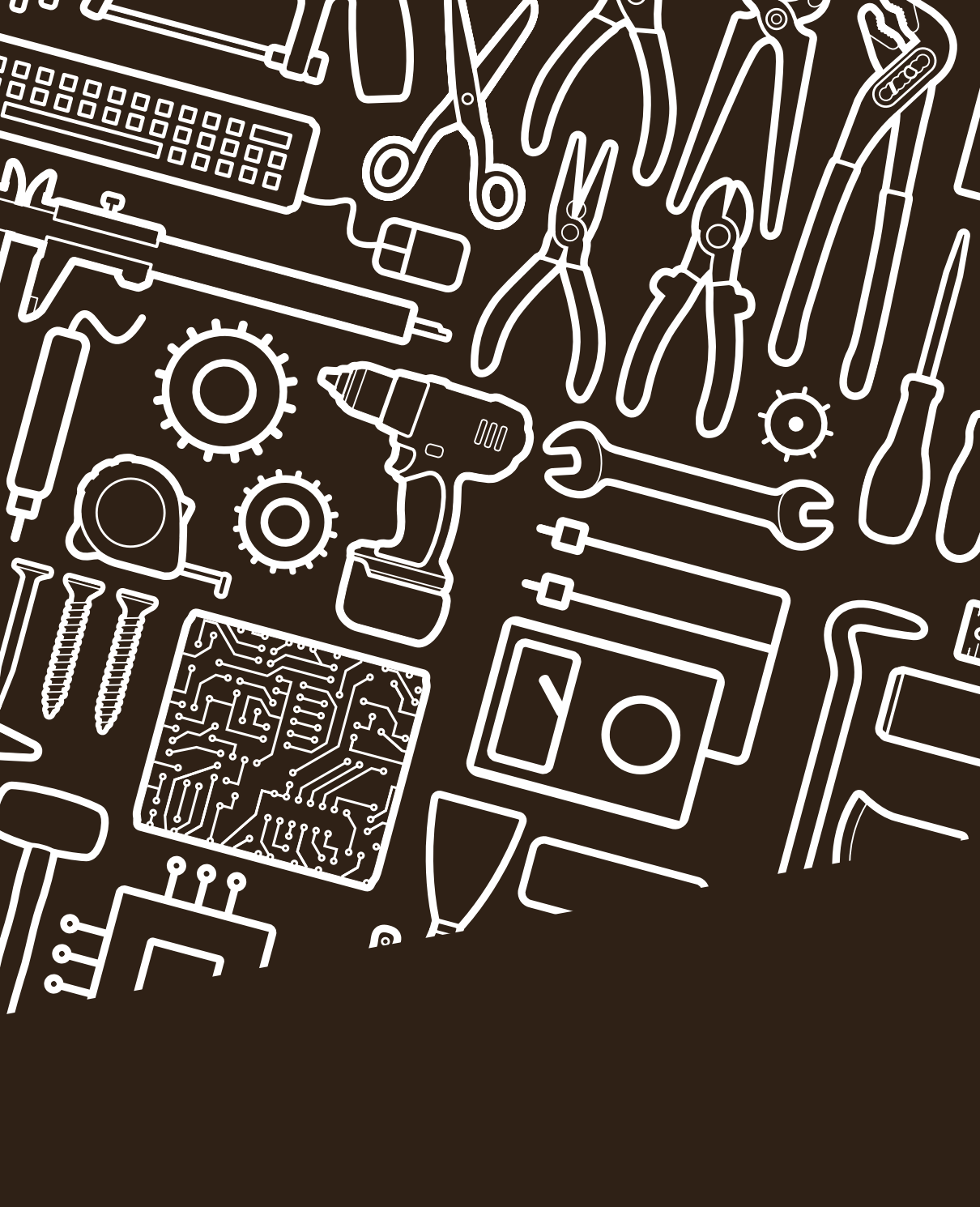
Maker activities in youth work can also be implemented with a goal to strengthen young people's understanding of and practical skills related to technology. It is clear that the role of technology in our daily lives is not likely to decrease any time soon. Active citizenship in contemporary society will invariably require new kind of technology-related skills and knowledge, and youth work is in an excellent position to help young people build a basis for these.

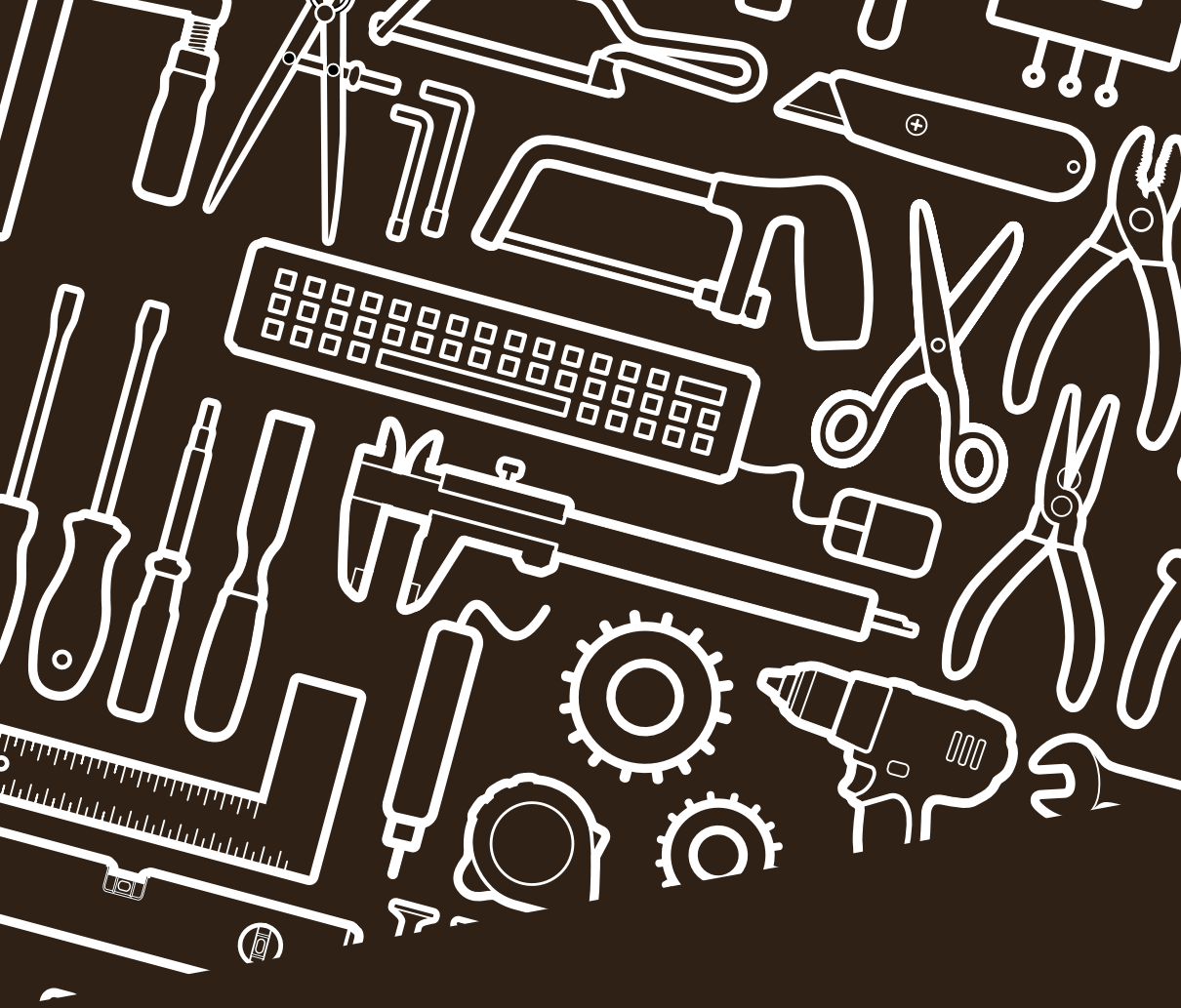
Naturally, maker activities are also about technology education in a non-formal context. It is clear that all young people's future professions and studies will involve technology somehow. Whether we believe that all young people should be programming robots in the future, all occupations are likely to utilise technology somehow.

Although maker activities are a relatively fresh addition to youth work practice, we believe it to hold a huge potential for any youth work sector or activity. It is our sincere wish that the articles within this publication can open new horizons to maker culture, the thinking behind it and give new practical tools to make maker activities a permanent and thriving part of daily youth work practice.

Finally, we would like to thank the writers of the articles as well as the Ministry of Education and Culture, whose contributions enabled producing this publication.

In Helsinki, November 2018
Juha Kiviniemi, Verke





1 DIGITALISATION AND MAKER CULTURE

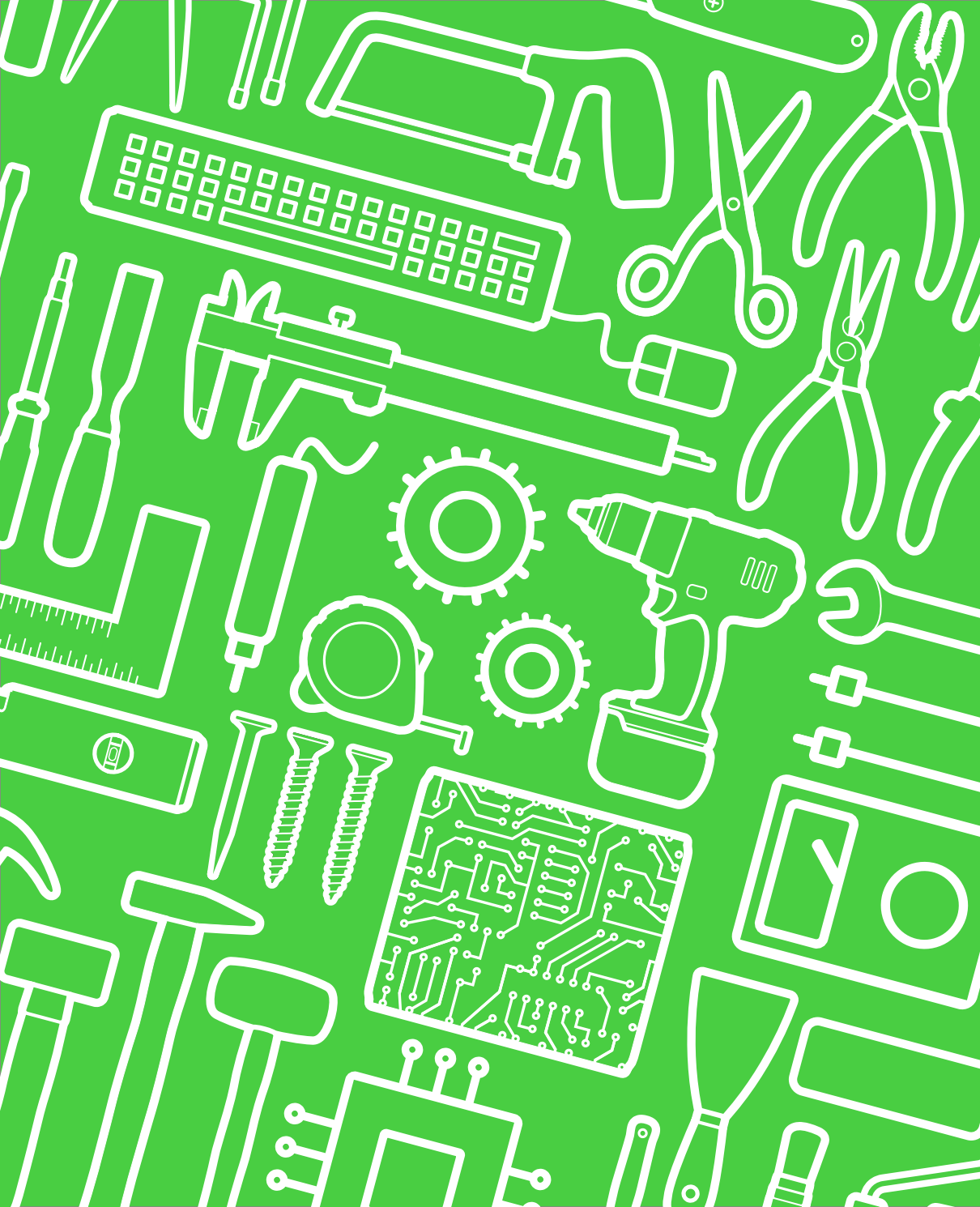
DIGITALISATION HAS CHANGED and is further changing our society on a fundamental level. The rapid innovations in digital technology and digital services influence young people especially strongly since they are often the first to adopt new technological solutions. Simultaneously the rapid growth brings with it new social aspects, new phenomena and new pressures to adapt to change. For the youth work field, our work is cut out for us if we wish to keep up with the times as well as young people's daily habits.

For us to begin understanding what maker activities could bring to youth work, we have to first dig a little deeper and look at the phenomena that the practical activities are built on. As much as maker activities are a part of the continuum of "traditional" arts and crafts and DIY culture, the maker movement is more multi-dimensional in nature. The movement subscribes to a goal of dismantling outdated formal teaching practices – or, at least re-evaluating their structures – and moving towards a culture of non-formal peer learning. A robust community learning and sharing aspect like the one built into the maker movement would not have been possible without the global reach of contemporary social media.

The articles contained within this chapter seek answers to the following questions: What is the relation-

ship between maker activities and digitalisation? What is its significance for digital youth work? How is the maker movement linked to – or an answer to, or even a catalyst for – societal change? Additionally, we take a look at how maker activities have evolved in the Finnish context.

All of this is of course underpinned by the question what all of this means for the young people using our services. What new technology-related competencies will be required of them in the future? How can we support young people's 21st-century citizenship skills? How can youth work rise to this challenge?



UPDATING AND UPGRADING YOUTH WORK WITH MAKER ACTIVITIES

 **Juha Kiviniemi**

THE MAKER MOVEMENT has brought with it a renaissance of sorts for DIY culture. In its contemporary form, the culture is heavily linked to the latest technologies, and it is underpinned by peer learning and open sharing of projects and ideas. Both of these have been made possible by advances in technology and the global reach of the internet. Maker culture has been defined from their respective viewpoints in other articles within this publication by Tomi Dufva, Heini Karppinen, Heikki Pullo and other authors.

DIY activities have been and continue to be a long-standing staple for youth work practice. Within the field there have been various activities, ranging from (but not limited to) arts and crafts in open youth work to renovating furniture in youth workshop activities. All of these activities have been at least twofold by design. While the adult working with the young person has used their expertise (such as woodworking, crafts or similar) to guide and coach the young person, there has also been a parallel process running. I have a hard time believing that there have been many such youth work activities where the youth worker hasn't simultaneously discussed with the young person about his or her life and whatever challenges they may be facing.

The above also applies to contemporary maker activities. Depending on the activity and the young people involved, the activity can mainly be a non-formal learning process, where young people build up their skills on, for example, coding or soldering. On the other hand, the same activity could be implemented as a group building activity, where the primary goal is to give the participants a shared experience to build on. The activity can "merely" be an exciting thing to do – while, of course, acting as a vessel to give the youth worker an excuse to engage the young people attending. When implemented in this way, maker activities don't differ that much from a cooking club or a pool table when viewed as a youth work approach.

As with traditional arts and crafts, practical maker activities are fundamentally also a creative process. One of the main goals of youth work is to help young people find the things that they can take pride in, feel a sense of achievement and positively realise their creativity. It needs to be noted, though, that while we can achieve many of the same goals with "old-school" activities as well – and I am far from bashing their effectiveness as a youth work tool! – we cannot stay rooted in only the tried-and-true approaches. If our field doesn't adapt its activities to the modern world young people live in, we risk becoming irrelevant relics to the young people using our services.

Maker activities are naturally also about technology education. Our world is thoroughly technologized, and the rapid development of digital technology is not as of yet showing any signs of slowing down. We interact daily with a plethora of devices, young people especially so. The youth work field has the potential to play a pivotal role in how young people understand the ocean of technology around them. Just as media education has been a vital part of youth work canon for a while now, it is high time to also see technology education as an equally integral part of our approaches.

I want to quote two colleagues: Anu Pöyskö, who has done a long career in media education once stated in a presentation that to learn about media is to also learn about ourselves; especially for young people the mirroring of oneself to role models and other influencers (also in media) is an integral part of the growth process. Another like-minded professional Péter Fuchs who runs a makerspace said that we require a certain level of un-

derstanding of how our daily technology works to understand media fully. Can we then deduce that we need to understand technology to understand ourselves? While that could be too long of a leap, it is clear that growing up to be a fully-fledged active citizen in contemporary society requires a whole new set of skills – both technological and otherwise. They could be described as digital and technological life skills.

Above I have attempted to explore maker activities in youth work from three distinct viewpoints. If they sound familiar, there is a reason: I intentionally began structuring my points around the definition of digital youth work, as put forth by the expert group on youth and digitalisation in late 2018. According to this first shared definition, digital youth work means proactively using or addressing digital media and technology in youth work activities. Furthermore, digital youth work should be seen as a tool, activity or content in youth work, or even all of these simultaneously. These viewpoints are hopefully easily found in the previous paragraphs.

When defining and discussing digital youth work, a central point has often been the required competencies for implementing successful activities. The topic is also widely covered on the expert group report. The broad scope of maker activities can seem daunting for the uninitiated youth worker, especially if they aren't tech savvy even in their private lives: How much does one have to learn and get a handle on before implementing these activities? Surely not everything?

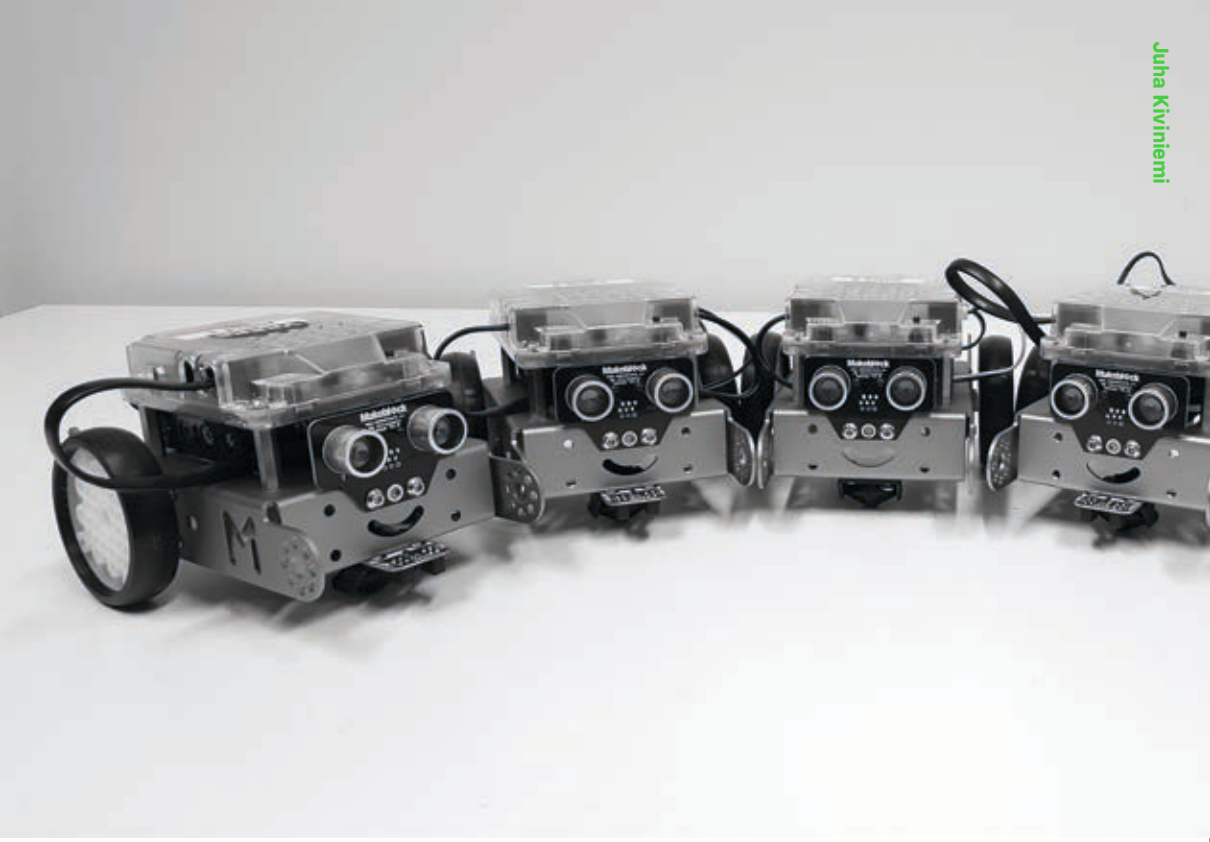
It is true that there is a particular learning curve in adopting maker activities, as with any new approach. To be able to motivate young people to at least try Arduino or the latest mBot kit, one does have to know at a minimum enough to explain why understandably. However, is that so ground-breaking? Surely a youth worker would not try to implement a new sports activity without getting to know the basic rules first. Similarly, it would probably prove futile to motivate a young person to try billiards, that cornerstone of youth work, by saying "I dunno, there seem to be balls and some kind of stick – figure it out, it'll probably be fun."

No one expects the youth worker to be a fully-fledged coder, engineer or 3d-modelling expert to successfully implement technology education in his

or her daily work. Luckily maker activities are rooted in the realm of peer learning and experimenting together. Youth workers can concentrate on being youth workers since there are probably several professionals who are much more adept in teaching python or C++. What our field excels in, however, is helping young people build confidence in their abilities. The motivated – and motivating! – youth worker can support the young person in finding out how their project could be implemented and search for solutions to emerging challenges together. While maker activities are a relatively new approach in our field, the focus should always be on the same thing: youth work. The most vital resource isn't money nor the technology being used, but a more familiar one: the competent, committed and enabling youth worker.

In maker activities, I also see a huge potential to bridge the gap between schools and youth work – or, if you prefer, formal and non-formal education. Youth work is in a unique position in the sense that young people come to our activities of their own volition and based on their interests. While giving us the freedom to move laterally, the lack of a fixed curriculum sometimes makes our activities a bit fuzzy and creates additional pressure for the professionals that further develop new activities. It is clear, though, that the phenomena and content related to technology are central to society, young people and learning, whether the context is formal, non-formal or something in between. Schools do teach programming, but the results have been quite mixed on many occasions. The new Finnish primary education curriculum gives educators more leeway to approach topics in new, creative ways, which also potentially lowers their threshold to adopt more non-formal approaches.

Could this open up new avenues of collaboration between professional fields? One such avenue could be a joint teaching moment where youth work professionals could explore technology education themes alongside teachers. Both would undoubtedly have their strengths and approaches to bring to the table. Simultaneously youth workers would get in contact with a sizable amount of young people in their area, and they could continue working with them in their leisure time. A well-structured continuum between



formal education and free-time activities could combine technology education topics in a way that would benefit both fields immensely. For example, the coding that young people are learning in school in a formal setting could be effortlessly transferred to building robots in a youth house or -centre.

What about maker culture itself? As previously stated, 21st-century maker culture is firmly underpinned by peer learning, sharing and communities. These values are sure to ring familiar to many youth work professionals. As a professional field, though, we sometimes tend to play our cards a bit too close to our chest.

What if we would instead follow the lead of the maker movement? What if, within the field, we would subscribe to a culture of sharing all of our

innovations, all of our experiments, all of our failures, successes and ideas just as openly? What if a youth work professional in, for example, Finland would find it a natural part of their work to show their stuff to colleagues in a different community on the other side of the country (or Europe) and say "We did a thing – here's how, do you want to make it even better?" For young people connected by a particular hobby or topic this is often already the natural order of things. It's also about participation: as long as the young person (or youth work professional, for that matter) feels that an idea, concept of process is their own, it's easy to take pride in and share it with others. This culture of open sharing should be supported in all possible ways, both within our field and with the young people we work with.

On the other hand, communities are in the core of youth work. Regardless of the youth work context, one of our main goals is to help young people to find communities to belong to. In the context of a youth centre, the goal can also be to foster a community within that centre. Youth work also often aims to serve the surrounding local community. For all of these, maker activities hold many opportunities. We could organise Maker Faire events to attract community members from all age groups and show a positive side of young people. Alternatively, we could use the expertise of retired professionals (engineers, designers, artisans...) found in our very community in practical activities alongside that of youth workers. Within a youth centre, we could use maker activities to bridge the gap between older and younger patrons by having the older kids lead their peers through activities, just as is done in other activities today.

It is clear that maker activities and -culture have a lot in common with the values and practice of the youth work field. I want to encourage all youth workers to dip their toes in the maker movement and see it below and beyond the surface of technology-related activities, even if you're not technologically inclined. However, a fair warning is also due: this current is easy to get swept away by.

THE BEST PART OF MAKER CULTURE IS MAKING SOMETHING WITH YOUR OWN HANDS!

Heini Karppinen

MAKING SOMETHING WITH YOUR OWN HANDS gives people joy and satisfaction. Satisfaction is increased by being able to work independently—or with your team—to design, define and complete something that has the power of expression or something that helps to solve a problem that has significance and meaning to you. People have always used their hands to make things, both because their circumstances have made it necessary and simply because it gives them pleasure. Consumption culture, which involves people using products made by someone else, is a relatively new phenomenon. Even if you could obtain everything you need without actually making anything yourself, it might not increase your satisfaction in life.

Maker culture is perceived as DIY culture on the surface. What sets maker culture apart from the traditional culture of crafts is that the artistic and creative elements are often complemented by digital components. The global economy and the latest technologies are utilised in learning and networking as well as in production and distribution. Interest in maker cul-

ture has grown as technology has become more affordable and accessible. Equipment that is now within the reach of hobbyists can be used to carry out projects that were previously restricted to the realm of professionals.

THE CONSUMER TRENDS BEHIND MAKER CULTURE

In recent years, trends such as doing things yourself, appreciating traditional manual skills, artisanal products, hyperlocality, voluntary simplicity and environmental awareness have risen in popularity in general and also among young people. The emergence of these trends is reflected in arenas such as social media aesthetics and blogs. The boundaries related to skills and competencies are being knocked down by combining creativity, art and engineering.

Whether we like it or not, technology and the media play a major role in our culture, and it's not always easy to define them as separate phenomena. Increasingly affordable technology makes new things possible while the media constantly demands new types of content. The term "prosumer" ("producer" + "consumer") coined by the futurist Alvin Toffler reflects the trend of the consumer playing a dual role by also being one of the producers of a service. The link between this trend and maker culture is obvious.

With today's technology and media leading to a convergence of the roles of producer and consumer, the significance of large organisations is changing regardless of their resources. Open technology, open data, open science, open learning opportunities and open makerspaces are some of the many possibilities created by the sharing economy. This sea of opportunities can be navigated by anyone, and you don't need a lot of money to do it. The aforementioned factors are also reshaping the ways of working in all creative fields, forcing a rethink of intellectual property rights and business models. Nevertheless, maker culture is not currently seen as a disruptive threat to traditional industrial production, even if such predictions have been made in the past.

A MIXING OF YOUTH CULTURE AND THE SYMBOLS OF ADULTHOOD

Youth culture is a strong driving force behind feelings and actions, and being aware of trends is very important for the technology, consumer and

media businesses, for example. Each generation wants to be different from the one that went before it, to culturally bind its members together while also strengthening individual identity and expressing it through the products bought and the services used.

Youth work and schools have the opportunity to recognise the early signals of trends in daily life and to take advantage of them in appropriate ways. Without common interests and internal motivation, it is difficult to learn or achieve the desired effects.

While young people have been perceived as trendsetters, consumerism has also changed. The traditional symbols of youth and adulthood have been intentionally mixed. Startup business courses are now offered to retirees and the idea of a wool hat knitting club organised by boys wouldn't raise many eyebrows these days. Instead, these phenomena are perceived as interesting and desirable.

This is the trend of the post-demographic consumer who breaks boundaries, takes advantage of the social freedoms and opportunities presented by technology and social media to establish networks around certain activities and do whatever he or she wants. The experiential dimension is considered important and an attractive role model can have a substantial impact.

THE ERA OF AUSTERITY, GLOBAL PROBLEMS AND OPEN TECHNOLOGY ARE CREATING SPACE FOR MAKER CULTURE

Today's young people have grown up in a society characterised by an economic slump, where public-sector finances are deteriorating and there appear to be no alternatives to austerity. The economy and resources determine what can and can't be done, and education is said to be in a global crisis. There have been suggestions that the young people of today are "a cheated generation" whose parents stressed the importance of getting an academic degree without realising that it does not automatically guarantee a job and a meaningful life.

In spite of all this, things are fairly good on average. Young people are accustomed to taking advantage of free or inexpensive digital services, and the focus of what is valued and appreciated has shifted. Young people are

encouraged to dream big and follow their own path. Entrepreneurship, for example, is perceived more favourably than ever before, and a growing proportion of people end up creating their own jobs.

The heroes of our time are reflections of our dreams and our culture. Today's objects of admiration range from Malala Yousafzai to the cave divers in Thailand, Lauri Markkanen, relatable video bloggers or startup founders with lucrative exits under their belts. Saving the world—whether through technological innovation that slows down climate change or a personal mission to make society safer for girls—has a strong appeal. We admire those who have brilliant ideas, manage to scale their innovations globally and achieve genuine success. The media puts the spotlight on people who combine artistic flair with scientific or technical expertise and surprise the

world with their diverse talents. We respect people who reveal that the secrets behind their success are hard work, finding what they are good at and fighting to achieve their goals. At the same time, we admire those who dare to be ordinary and genuine.

But what do we think of maker culture? What kinds of people are interested in it? Are they all nerds? Are programming skills essential? Do you need to know everything there is to know about computers?

Young people tend to compare themselves to others and youth is a life stage characterised by the search for one's personal identity. Young people also have a tendency to see the world as very black and white. Is this for me? Am I for this? Does this kind of activity reinforce the kind of person I think I am and wish to be?

Motivation doesn't arise from nothing, and seemingly complex technological jargon can make the world of maker culture seem distant. Coding and technology have traditionally been characterised by a gender divide and deeply rooted preconceptions. The question of how to increase diversity is also a challenge for maker culture. The excitement, joy and meaning of making something yourself and the thrill of the creative process can be difficult to communicate to someone who has never done it. For technology skills to be more equally distributed in general, it's necessary to highlight interesting examples and diverse role models within the culture.

We see maker culture as a way of thinking and an attitude that can apply to many kinds of activities rather than a strictly confined area of activity or a clubhouse.

EXPANDING THE RECOGNITION OF SKILLS AND QUALIFICATIONS BEYOND SCHOOL DIPLOMAS

Maker culture offers diverse voluntary opportunities for recreation and learning for those who are interested in pursuing them. Non-formal learning opportunities alongside formal learning are growing in general, and learning in online environments does not require financial resources. More than anything else, it requires the ability to discover interesting learning paths and communities as well as the skill and perseverance to learn new

things. These are skills that will divide young people. The recognition of skills must be developed further, and the expectation is that there will be new services for demonstrating skills and qualifications acquired outside the institutional setting.

Perhaps we will become used to the idea of people starting a study programme at any time and allowing them to demonstrate their skills in more diverse ways than merely obtaining formal academic qualifications. While it is technologically possible to independently complete extensive programmes of study online, achieving cultural acceptance for this approach alongside traditional degrees will take some time. Widely recognised academic degrees and traditional institutions have strong brands that reflect their quality and esteem. However, some major international corporations have already abandoned the traditional requirement of an academic degree in recruiting new employees. Academic programmes face growing pressure in trying to keep up with technological progress.

In the vast expanse of fragmented learning opportunities, many people feel left to their own devices and more in need of a charted path and safe harbour than ever before. Our knowledge-intensive society should be able to provide counselling or mentoring services throughout a person's youth, and beyond, to provide support related to education and training.

THE VALUES OF MAKER CULTURE ARE A GOOD FIT WITH YOUTH WORK AND SCHOOLS

Maker culture not only promotes creative activity, prototyping and innovation, but it also has social advantages. Maker culture aims to increase the use of open technologies and equal opportunities in learning, self-expression and building confidence. This means that maker culture is a potentially valuable proposition from the perspectives of education, school and youth work. How can we make it possible for all young people to have that initial first-hand experience of digital maker activities and problem solving?

Programming has already been incorporated into the basic education curriculum for mathematics as well as in thematic studies that introduce elements of technology and programming into various school subjects. In

our experience, the best way to bring maker culture into the lives of young people is instructor-led but largely independent project work done in collaboration with others. An enthusiastic instructor makes learning more effective, which is why our primary focus is on the training of teachers and instructors. It has been particularly rewarding to follow the joint courses of teachers of different subjects, which allow each participant to take advantage of their special expertise. One of our courses combined music and visual arts teaching with the programming of images and sound.

By its nature, technology-oriented project work is a shared learning experience for the instructor as well as the young participant. The goal is not to have the teacher know the solution to every problem that comes up. This can be a valuable new insight for the young person as well as the instructor. In working life, projects often involve creating something new, and the project manager's job is not to know the answer to every question, but rather to enable good working conditions for the team members, motivate them to forge ahead and inspire them to learn new things together.

THE EVOLUTION OF FINNISH MAKER CULTURE

Heikki Pullo

THE DIY CULTURE OF THE 21ST CENTURY, known *as maker culture*, is based on sharing knowledge and ideas, applying technology in open-minded ways and working together.

As Finnish DIY culture has a rich history when it comes to all of these aspects, Finnish maker culture can also be seen as a continuation of our history of crafts.

1900

In agrarian society, DIY implements were essential and manual skills were a precondition for a self-sufficient lifestyle. These aspects of peasant culture are discussed in ethnologist Kustaa Viikuna's book Isien työ *Veden ja maan viljaa Arkityön kauneutta (1943)*. The Finnish Cultural Foundation has also published a DVD collection of the documents described by Viikuna entitled *Isien työt*, available free of charge at http://www.kansatieteellisetfilmit.fi/isientyot.htm

The teaching of manual skills has an internationally unique history in Finland, as women's and men's crafts were specified as subjects of study in the 1866 Decree on Primary Schools. Crafts as a school subject has evolved

over the decades, but arts and crafts subjects still play a significant role in the Finnish basic education system today. There is no other country anywhere in the world that would have an equally long history of a national system of manual skills education. Also worth noting is the operations of adult education centres in Finland can be traced back to 1899, when the Tampere Centre of Adult Education was established.

Another interesting perspective on the sharing of ideas and skills in Finland is *Kodin taitosanakirja*, a "book of skills" compiled by Vilho Setälä and first published in 1930. The book contains an alphabetised set of instructions for making a wide range of household implements, along with advertisements by suppliers of materials. In later editions, the book's title was changed to *Taitokirja (1952)* and *Suuri taitokirja (1965)*. The Whole Earth Catalog (published 1968–1972 in the United States) shares certain characteristics with Setälä's books, although it was more of a counterculture publication that not only provided instructions for making things, but also promoted an alternative lifestyle and independent DIY culture.

The Internet plays a significant role in maker culture by facilitating the sharing of information and bringing makers together. Finnish technological development can also be linked to this phenomenon, as one of the first Internet-based communication services used by private individuals was IRC (Internet Relay Chat), developed in 1988 by Jarkko "Wiz" Oikarinen in Oulu. *IRC* enabled real-time conversations internationally.

2000

The manifestations of Finnish maker culture include *makerspaces* and maker events.

The first open technology workspaces in Finland were the Tampere Hacklab and Helsinki Hacklab, which both opened in 2010. The number of Finnish hacklabs has since increased steadily, with 14 active locations around Finland currently listed at hacklab.fi.

Open workspaces have also emerged in Finland with the arrival of the Fab Lab network. Established at MIT in 2003, the network is maintained by The Fab Foundation, which currently lists more than 1,200 Fab Labs around

Picture: Juha Kiviniemi

the world. There are currently five such fabrication labs affiliated with Finnish universities: Aalto FabLab (Espoo), TUTLab (Tampere), SensiLAB (Turku), RasekoFablab (Naantali) Fab Lab Oulu (Oulu). The first of these was Aalto Fablab, which was established at the Media Factory in Helsinki's Arabianranta district in 2012.

A third category of today's DIY workspace is makerspaces at public libraries. The Kaupunkiverstas Urban Workshop in Helsinki opened in 2013 as a continuation of a previous space known as "the meeting place", piloting the activities of an open workspace in a public building. The Urban Workshop subsequently moved to the premises of the Kirjasto 10 library and it is set to be integrated into the new Helsinki Central Library Oodi.

Workshops at City of Espoo libraries and Tekomo in Tampere are other good examples of the continued expansion of library services in the 2010s. The equipment provided in makerspaces located in libraries typically includes 3D printers, vinyl cutters and sewing machines. There are also workshops with more diverse equipment, such as the Iso Omena makerspace in Espoo and the upcoming Oodi library.

In the area of maker events, the non-profit organisation Wärk has played a key role. It organised its first Wärk:fest DIY festival in 2012. Since then, it has organised Mini Maker Faire events in Espoo in 2015 and 2017 in accordance with the international Maker Faire concept. Another Wärk:fest will be held in Espoo in November 2018. The events are like cultural festivals for makers, giving them the opportunity to present their projects, participate in workshops and find inspiration together. Hundreds of Maker Faire events are organised each year around the world, with the largest ones – the Bay Area Maker Faire and the New York Maker Faire – attracting tens of thousands of visitors.

Other events that are closely affiliated with maker culture include Hacklab Summit Finland, Pixelache Festival and Hyvinkää VärkkäilyFEST.

MAKER CULTURE 2018: TOWARDS GREATER TOLERANCE AND DIVERSITY?

Tomi Dufva

MAKER CULTURE NEEDS A MORE critical approach. Instead of printing plastic vases or just building robots, you think about what kinds of robots to build, how to use a 3D printer to make the world a better place and how to create a richer maker culture.

One of the challenges of our digital era is the disposable nature of our gadgets. When a smartphone becomes outdated or a quadcopter breaks down, we throw them away. It's hard to find instructions for doing repairs, and fixing a broken device can be more expensive than buying a new one.

Some years ago, the maker movement brought about a re-emergence of the culture of making things yourself. By combining new technologies, a strong community orientation and peer learning, maker culture introduced the digital era perspective to DIY culture and opened up opportunities for fixing broken equipment and coming up with clever new uses for hardware. The maker culture motto of "if you can't open it, you don't own it" brought courage and a new sense of adventure to the ownership of digital devices. The maker culture highlighted makers' rights in many ways, including "The Maker's Bill of Rights"", a poster that emphasises open software, the right to open up pieces of hardware and the open sharing of information.

2 lainausmerkkiä

OPPORTUNITIES IN DEVELOPING COUNTRIES

Maker culture has been an injection of new life for many manual skills, both old and new. The international communities enabled by the Internet have provided peer support as well as new ideas for makers.

The most impressive of these changes have been seen in the developing world, where maker culture has introduced new forms of agency for people. Various makers, from children to adults, have designed things such as 3D-printed prosthetics, clever ways to generate electricity or other equipment that improves the quality of life. (MacDonald 2016; Ekekwe 2015). In China, maker culture has helped create new business activity; for example, in the forms of open-source software and hardware (Lindtner & Li 2012; Lindtner 2015).

THE NEW INDUSTRIAL REVOLUTION WAS NOT AS DRAMATIC AS EXPECTED

In the West, in particular, maker culture has recently come under criticism for being narrow in scope and being overly focused on technology. The hyping up of maker culture as the new industrial revolution has been trampled by the market economy and we now see products being sold in the name of maker culture that are very far from the DIY spirit or discovering agency in the digital era (Hertz 2015; Morozov 2014). Maker culture is often associated with a 3D printer sitting idle in the corner of a library or school, only capable of producing plastic outputs that are not all they were cracked up to be.

Maker culture has also left many minorities on the sidelines. For example, Make magazine, one of the originators and mouthpieces of maker culture, has been criticised for being too focused on robots and boys (Buechley 2014). Before this year, women and people of colour were rarely seen on the pages of Make magazine. The culture it has presented is very white and very masculine. Even the ecological perspective and recycling have been largely disregarded in favour of highlighting new products for people to buy.

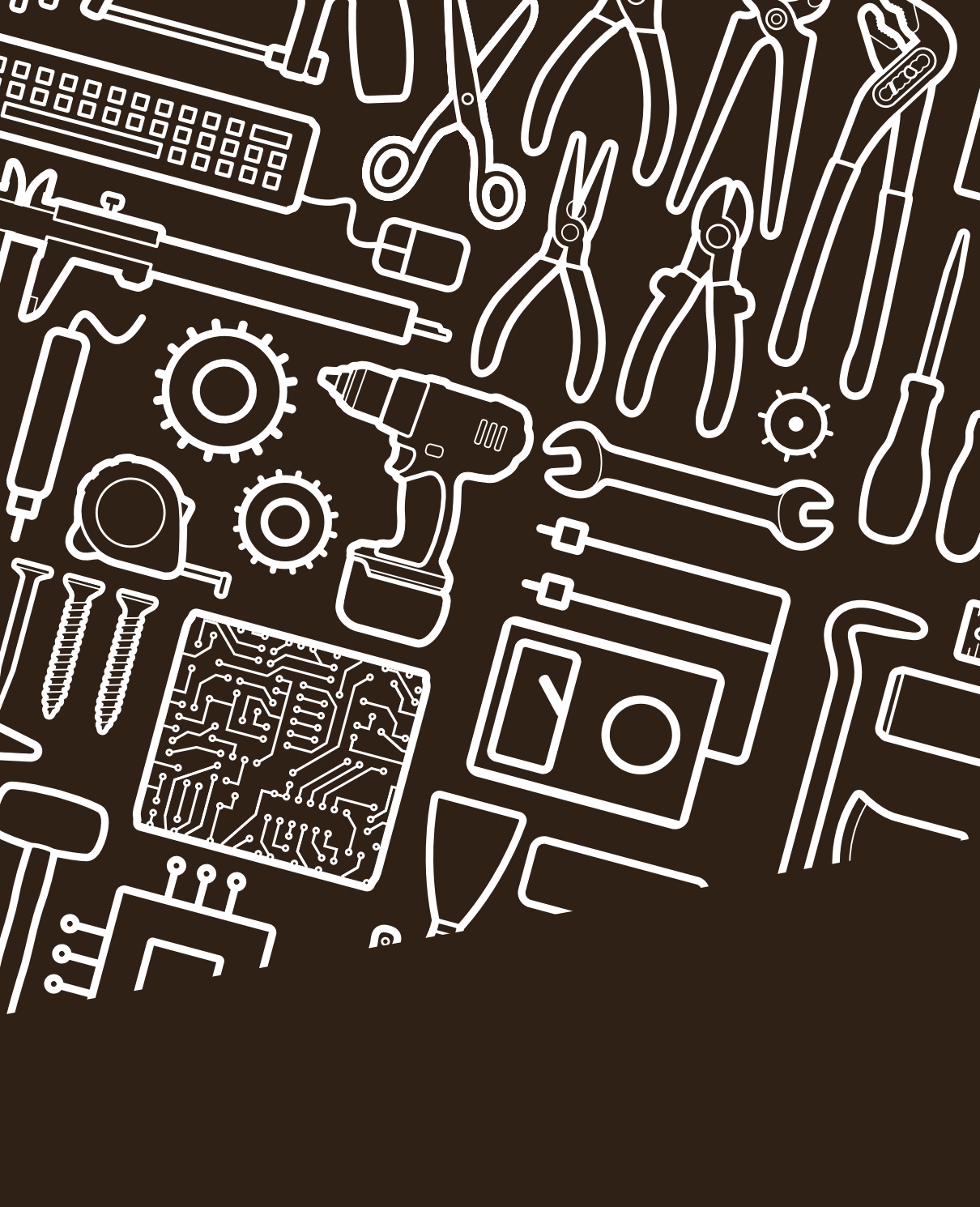
TOWARDS A MORE DIVERSE MAKER CULTURE

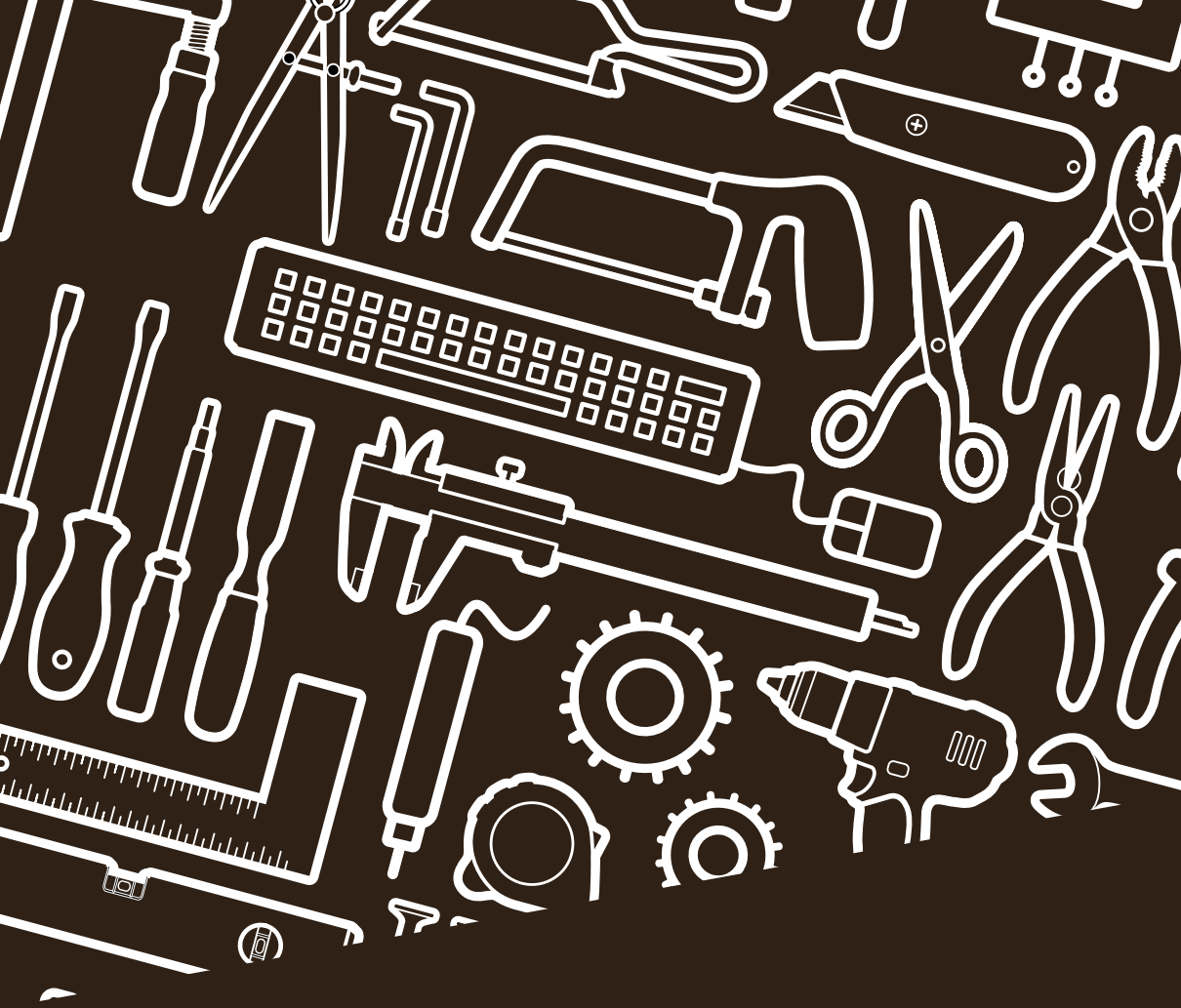
For the reasons described above, it is time for a renewal of maker culture. This year, Garnet Hertz published the 2018 edition of The Maker's Bill of Rights (Hertz 2018) to complement technical rights, such as open source

code and the ability to open up hardware, with social, financial and ideological rights. The aim is to create better opportunities for minorities and women to participate in maker culture.

According to Hertz, maker culture needs a more critical approach in order to serve as a comprehensive culture: in addition to 3D printers, we need dialogue as well as diverse, creative and bold ideas. Instead of printing plastic vases or just building robots, we need to think about what kinds of robots to build, how to use a 3D printer to make the world a better place and how to create a richer maker culture. Instead of participating in events where men present their new innovations or ideas, we need to demand a more equal world. A more tolerant and diverse culture of makers will also lead to richer and more imaginative inventions.

With the updated Bill of Rights, Hertz wants to present maker culture as a response to the post-truth era of algorithmic wielding of power and post-digitality. Nevertheless, the basic idea remains the same: by making things ourselves, we can understand the world and make it better. Inspired by Hertz, I would like to call on all makers and makerspaces to create an even richer and more diverse maker culture!





MAKER CULTURE AND YOUTH WORK

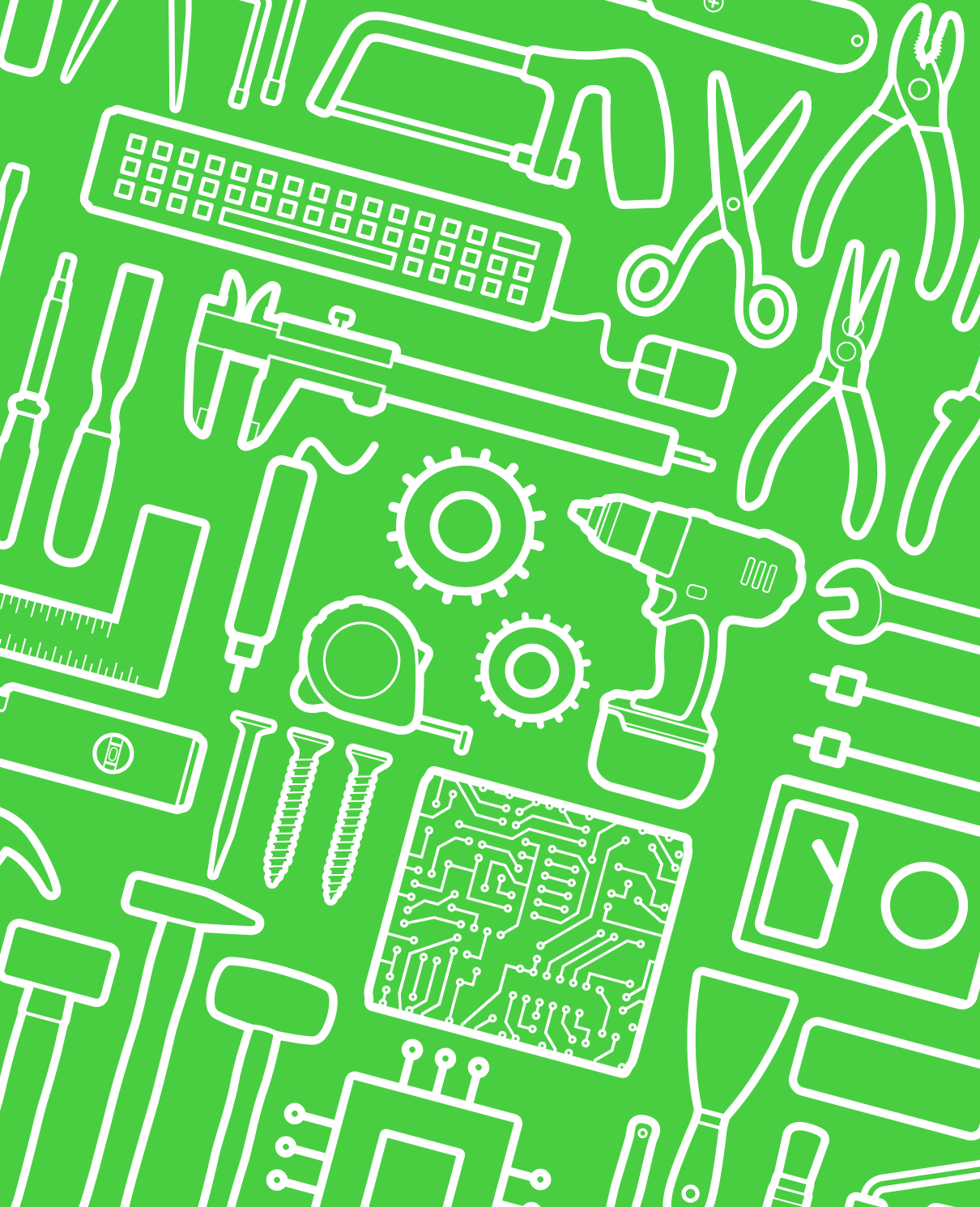
WHAT IS THE MINDSET of a typical 21st-century maker like? What are the fundamental ingredients of a makerspace? How is maker culture linked to local communities? Can maker activities help foster communities?

It would be a daunting - if not impossible - task to put together a thorough list of the "necessities" of a makerspace. While it is almost equally as challenging to try to shed light on the thinking and characteristics within maker culture, it is certainly a more appropriate approach. Let me put it like this: if you, as a youth worker, were tasked to explain to a layman what "youth work" or a "youth centre" are, would you start by listing all the available equipment there, starting perhaps from the pool table and the gaming consoles and rounding up the list with the basketball hoop and the kitchen? Alternatively, would it possibly be more natural for you to start by describing the activities, how young people benefit from them and the youth work goals set for your particular activities?

The articles that follow seek to explore the mindset, thinking and views of 21st-century makers, touching on topics such as growing up to be a maker, learning and formal education. The writers also seek to understand the characteristics of the most valuable resource to all maker activities: the enthusiastic individuals that seek one another to form communities. Additionally, the articles

aim to delve deeper into the relationship between maker culture, local communities and society. Finally, we also seek to define the soil of youth work structures that are necessary for maker activities to take root.

One prevalent theme in these contributions is the long-lasting effect of early experiences on the road to becoming a maker. Even if we wouldn't strive to have all young people become maker activists, many of the views expressed hereafter resonate with youth work professionals. Any activity that supports young people's self-reliance, creativity, lifelong learning and, above all, their healthy belief in their own abilities is bound to belong in the youth work bag of tricks.



BUILDING COMMUNITIES IN AND AROUND MAKERSPACES

Alexandre Boutaud

WHEN I WAS CONTACTED TO CONTRIBUTE to this publication, I was stunned, because of my background – or apparent lack thereof. I'm not an expert, I'm not a professional nor am I a professor. I instead consider myself an enthusiast, but maybe that's the whole point.

I'm Alex, 28 years old, and I have considered myself to be a maker for as long as I can remember. As a child when my sister was born, I was brought a small box of plastic construction blocks from a certain well-known brand. You all know the ones I mean. It was a little Formula 1 car and a simple starting point, but I very quickly realised that I could also create something else outside the supplied instructions.

When I was a kid, I remember my mother making carnival costumes for me. I spent a lot of time with my grandparents. My grandmother was working for a colourant laboratory and my grandfather, like my father, was a fantastic builder. You know, the kind of guy who knows how to (and wants to) fix everything, while also at the same time being a great cook. When he was cooking, he always kept me close to give me the possibility to understand what was going on and giving me a taste of every ingredient of the

recipe. Maybe that's why I wanted as a kid to be a cook, but I loved also to watch other members of my family doing things. Like my uncle who was a carpenter by trade, or the one who was a hunter.

I was observing all of these people, this passion that was within them. Whenever something had to be done, it was done well. They took the time and effort to make things better, to fix them, to sew garments, to recycle items to useful materials. At the time I was not aware that all of this was building and shaping my maker's mind.

My studies were, for the lack of a better word, chaotic. I was not very invested, but bright enough to have sufficient results to have peace from parents and teachers. In high school, I studied engineering and computer-ware, and on breaks, I would go into a woodworking school to learn how to build furniture. I had the opportunity and fortune to work with an artist and an art technician at one point. This was an eye-opener for me, realising that it was possible to work in different ways not *only* for the customer but *with* them, having them involved in the process of drawing and building right up until the piece was complete.

After this lengthy introduction, we have arrived at the point where you, the reader, are probably expecting some advice on how to engage young people in maker activities or how to set up a makerspace. But within that lies a small problem. During my travels in France, Luxembourg, Italy, Poland, Czech Republic and Bulgaria I've seen many makerspaces and activities, and I do have to say one thing: they are so varied! Different spaces, different sizes, different funding bases, different teams... There is no way to give an all-encompassing recipe for setting up a makerspace. I hope I can still give you some of the ingredients I have tasted along the way.

Generally, when thinking about a project like starting a makerspace, people usually think about money first. The rationale is when you have the money, then everything else will follow. And what is the thing that follows? Spaces? Machines? Equipment? Projects? People?

Firstly, when you search for funding, facilities or machinery, you can often find a city or a big organisation like a university or a company. But there is a risk that they will just put their stamp on your work and do what

they want with it because it's their money. This is why you first need to have a very clear idea about what you want to accomplish. With a clear, focused idea you will also be better able to keep to the path you've chosen rather than using your time and talent to figure out how to best "deserve" the funding you have.

If creating a startup and being a billionaire is your ultimate goal, a garage is more than enough. Both Microsoft and Apple are proof of this. But for me, the makerspace is a "third place"; it's not your home, but it's not your work either. It's a place for both sharing and building communities. And what do we need to build communities? People. Some might think that cats are enough for socialising, but as cool as they are on video, in real life they only want to observe the effects of gravity with the help of all the objects on your desk.

What kind of people do we want in makerspaces, then? Are they IT guys, machinists, tinkerers, designers, artists, makers or creators? Yes, maybe all of these, perhaps not – it's different everywhere. The reality might be that the nearest robot builder lives 100km away, so instead take your time and observe the local community around you. It could be a chess club, a group of cosplayers, model train hobbyist or almost anyone. Keep an open mind, and you can discover many people who would be delighted to join your community.

I've met some fantastic guys able who build their 3D printers or CNC routers from scrap, people with machines and tools they don't use in their garage, some with amazing skills and knowledge about ceramics, electronics, models... Generally, these people are not necessarily searching for a place with tools because they already have the necessary equipment to fuel and realise their passion. They can still lack a peer group, a group to collaborate with – in one word, a community. I met two guys with two different projects, both living in trailers without fancy clothes or the latest fruit-branded phone. They still had video projectors (which cost the price of a nice flat) for making video performances mapping live video on buildings or a 1,2 meter high 3D printer for making sculptures. I was once waiting for a beer at a bar and offered to share a bar of chocolate with a guy from Germany. He turned out to be an amazing artist who builds custom-made

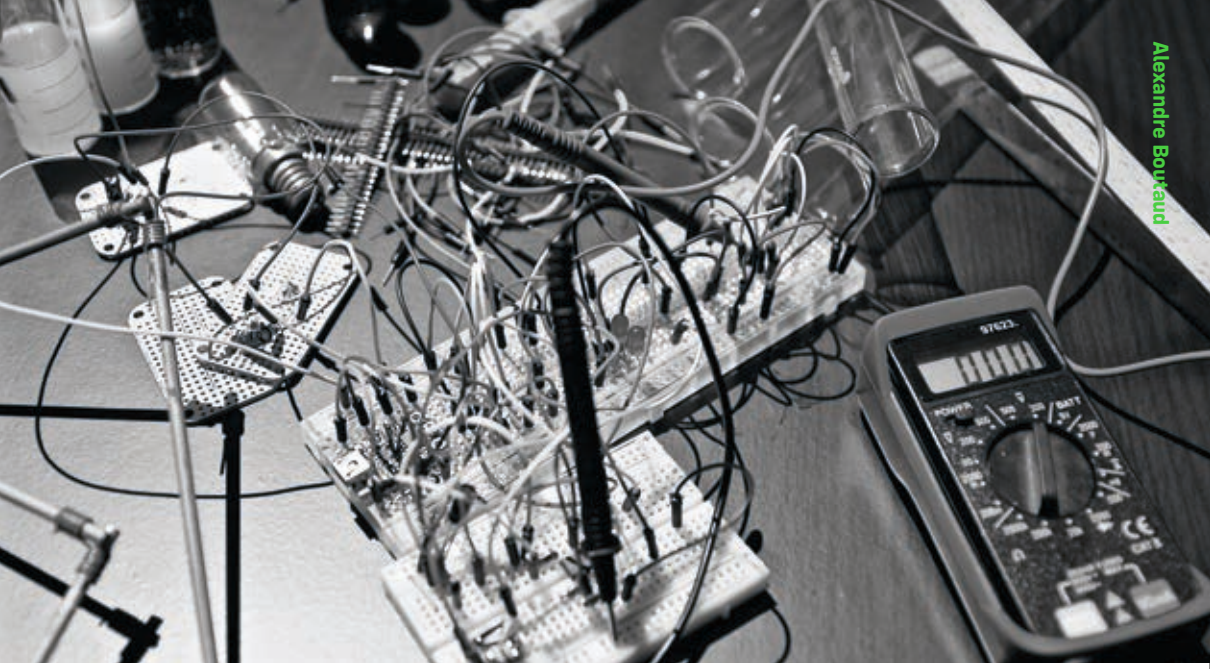
modular synthesisers. At a conference, I met a guy building old-school arcade video games in his garage. When you keep your eyes and ears open, you can make surprising connections.

Makers don't need a place for making their creations just because they are obsessed or crazy about their craft. Most of them can already find a way by themselves if they are motivated enough. What they do need is a place to share their passion, their art and everything that's going on around it. If making these random personal connections isn't enough, and you need to invest in finding the right people, you might look around the places and events in your community. Surely in your city, you might have hobby shops, model building events, flea markets of old tools, festivals... Start in those places, talk to the people you meet there and speak about your project, your ideas, and – yes – your passion. Tell them you have a place to share and collaborate, a place to make almost anything, a place to meet other like-minded individuals. Leave the people you meet your contact information and everyone will eventually know the guy with golden hands, too much time and too many machines and tools...

"One place to attract them all, one place to connect them all, one place to invite them all and in the sharing bind them".

A place for a developer to share a beer with a designer, a place for an artist or a graphic designer to hold an exhibition, a place for a robot maker to experiment, a place for a student to learn and improve, a place where a retired engineer can feel useful... Your space needs to be all of these and more before being a makerspace, because you, me and all of us need a community around us. A community of people where those still finding their way can meet, connect and learn from passionate people who can inspire them. We need to get out of this stiff structure of master and student because the internet is here now, and all the rules we knew before have changed. All the knowledge is now free, informal and out there.

Some adults might say that all this knowledge can even be dangerous for kids. But the fact is that kids and young people need to be inspired in a



way that is useful for their communities, the world and, of course, the kids themselves. The kids need to be shown that learning, sharing and teaching others can be more valuable than power or profit. Makerspaces, hackerspaces and fablabs were not created with research in mind; they are instead just a real-world version of an online forum where passionate people share what they do and exchange experiences.

But makerspaces are still just the tip of the iceberg. The society is changing, and many people have lost their trust in the powers that be. Many people, both old and young, hippies and punks, makers and hackers, are trying to create a new kind of micro-society to experiment and see whether we could do better. To prototype, if you will, whether we can still change where we are heading.

Some makerspace projects first start with a space and then start branching out; organising a repair party where people come with broken appliances or devices that are then attempted to fix together. Another way of engaging the community could be giving centre stage to retired people who

can, for instance, have valuable skills in sewing or fixing bicycles. In return, young people could teach them how to change their ringtone on the phone or to install Skype on their computer to connect with family members. I believe that everyone has something to give to their community; it's just a matter of finding out the thing they are passionate about or good at.

My plans for my space here in Poland for next summer include building a large bread oven and inviting people to bake their own bread. They could also share recipes while sharing a peaceful moment with others. I also want to have trade-in shelves where people could bring a bag of apples and take with them cherries or plums from the neighbour. Maybe we could even print names or faces on custom labels so you could thank them personally when meeting them on the street.

For building a society and a nation, we need a common past, a shared history, and shared values. In France we are passionate about politics, society and revolution. Two years ago a sociologist called Bernard Friot appeared in a conference in THSF (the hackerspace factory festival, in Toulouse) and said the French revolution was led by merchants and sellers, who then made the society in their image. If this society based on capitalism is to be rebuilt, hackers and makers must have an active role in it. It will be the challenge of the century to have makers start occupying the places of power, convincing the general public that the road we are on is unsustainable, and finally revolutionising our current system to reflect their values.

I know what you're thinking: who is this young utopian with his big words? Yes, I am a utopian, but I trust that makerspaces and the maker's mindset are the ways to go to fix our individualist and consumerist society. A makerspace is not a place to create new technological products, but maybe, just maybe, it's the place Marx was thinking about (without knowing it); a place where people will start to build a new society and take back control of technology.

What I trust in is this: the maker movement is already changing the world, community by community. So please continue learning, making and sharing.

PEDAGOGY OF MAKERSPACES

Robert Schommer

EVER SINCE I WENT TO SCHOOL, there have been efforts to optimise the teaching methods and of course the content. I'd love to say that things have changed for the better.

Digitalisation has a tremendous impact on how society works. The economic globalisation is partly based on new technologies that have tangible and intangible benefits, to ensure economic growth and to respond to the customers' demands. The transversal and bi-directional dependency have never been so important. Think about the impact of Eyjafjallajökull in 2010, Trump since 2016 and CO2 emissions.

While the first prokaryote cell needed 3.5 billion years to evolve to an existence capable of reading these lines, humans have intentionally pressed the evolution speed button since WWI. Look around you and observe all the commodities linked to what has evolved outside your body during the last 100 years. Imagine your life today without all of that.

The technology that surrounds us has become an integral part of us. Most humans on earth already have a symbiotic relationship with non-cellular components. Do you remember "Eyjafjallajökull", or do you ask Alexa?

We use smartphones as an upgrade to our brain's limited capacities. Calendar, Photos, Messages, Notes, Wikipedia, Translation, Autocorrect, etc. Is

it something bad? Well, I'm afraid the answer to that question is irrelevant, as it is the path evolution has chosen. Some living beings will have more issues than others to follow or even adapt to that circumstance. Cruel, isn't it?

So, what does all of this have to do with formal and non-formal education? Well, everything!

First, the number of people suffering due to their incompetence to use new technologies must be as low as possible. Second, people shall not only be consumers. They should always remain curious about how things work. Third, people should have an active critical approach whenever the balance between social, economic and environmental stability is at risk.

No other living being invests as many years in the education of its offspring as humans. Yet, we must admit that some will become dentists and won't necessarily need to know how to knit a shirt, while others may become tailors and won't be able to use a scaler and mirror to remove plaque and tartar from someone's mouth. But both will still use smartphones to communicate with each other.

During the last decades, more and more parents and politicians tend to say that formal education is the most important learning platform for everything, even basic manners. As a student, I did not feel comfortable with that. Especially during a phase in high school when I was trying to be cool and "fit in", my bad test results would define my life options. While struggling with puberty, I suddenly had to choose what I would become and do for the rest of my life. And by choosing, I mean taking what's offered by the system according to my test results. I decided to listen to Rage Against the Machine. I fought for more life options. That has been the most precious effort of my early life. However, that state of mind wasn't pure coincidence. Right before puberty, my father was my biggest idol, and although he had no higher education whatsoever, he never let it be an obstacle to reaching his goals.

This is something nearly impossible to teach. You could talk it over and over in class, and nobody would feel the pressure you need to feel to start fighting for better life options. And honestly, school isn't the best place to develop such ideas. It must come from the inside, and it will grow much stronger. Maybe you know that feeling from sports?

When I was in third grade, I had – let's call him – a hippie teacher. During biology class, he took us outside the school and made us dig a small pond, we filled it with water, and he dropped a couple of tadpoles into it. Once they started growing legs, the girls gave them names. The boys were jealous they had missed the opportunity. The hippie gave us different seed bags and no information on what to do with them. Whenever someone asked anything, he just pointed at the schoolbook. At the end of the school year, every single child of the hippie class had at least one flower, a vegetable and an A in biology. Oh, and a frog named after him.

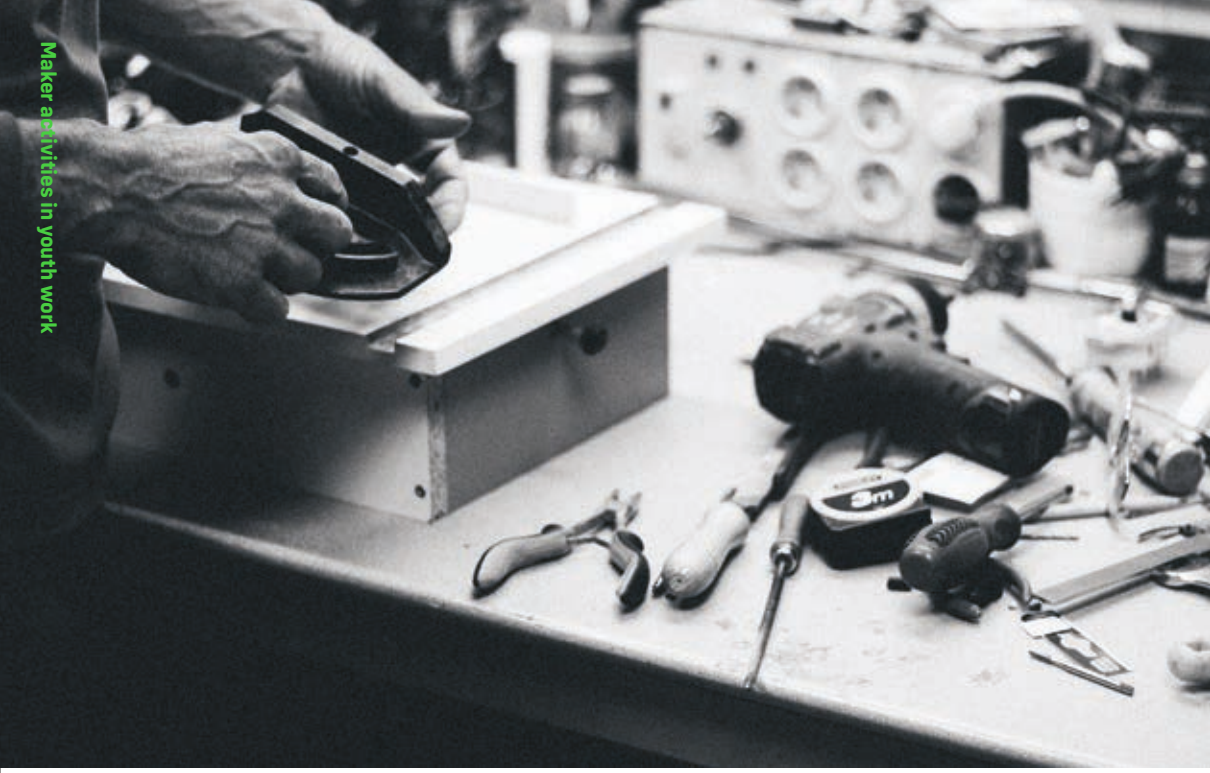
I'm still connected to most of these people via Facebook. We still post pictures of animals and what we grow in our gardens, yet not all of us have become hippies, teachers, farmers or frogs. That experience, although we were only 9–10 years old, gave us confidence that we could do something with our own hands.

It might sound funny, but when I was feeling terrible during puberty, knowing that I could grow myself something to eat and have fun in nature would make me smile and calm my temper. That's what non-formal education is to me: Building up self-confidence, showing life options and raising awareness about what surrounds and connects us.

Non-formal education should be 1/3 of the whole learning process, leaving 2/3 to formal education. Both must be separated, and a substantial part of formal education must be learning and tests. Life is hard and often unfair in a way that no teacher or parent could prepare us for. Making school easier is most definitely a dangerous path to choose.

Whenever a bored child asks "wtf is mathematics good for?", rational formal education fails. As you dig a pond of 4 square metres and 1 metre at its deepest spot, you quickly learn how to use measuring tools. When you need to run 100 metres with buckets to fill that pond with water, you start to appreciate the help of the rain and how to calculate the travels. This is an elementary example, yet formulas I've never forgotten.

During high school, I had a course on analogue electronics. We learned about essential components like wires, fuses and interrupters and had to make a simple circuit with a real light bulb, like the one you would use at



home. All applicable safety rules and standards had to be respected, so there wasn't much space for fun. The main fuse had a little red LED light to show the ON/OFF state. A student asked about the difference between a LED bulb and the 220 Volt light bulb that we were using. The teacher explained the principle of the Light Emitting Diode (LED), that it would start emitting light at a specific voltage threshold, depending on which way the electric current would flow and that it needed a resistor to limit the current as itself had nearly none, because according to the formula U = R x I even at constant U for voltage, the I for current would rise so high that it would burn the LED. As a diode is used to ensure that current only flows in one direction, an LED would additionally, although in a much weaker way, give a visual feedback of that flow. Honestly, I cut the explanation down to its essence, as in reality it took about 10 minutes with schemas on a flip chart

and how to calculate the value of a resistor according to current or voltage and stuff. When I think about it today, the teacher did a great and passionate job, from a "formal education point of view". But then, that same student who asked about the LED refined his initial question. He asked what we all thought: "But it makes light? Can we use it as a little torch?" The teacher started yelling. I guess he thought none of us had listened to him during his passionate exposé about the infinite world of low voltage circuits… Imagine what would have become of our class if we had started exploring the use of LEDs as a light source back in 1992.

Today, I wish a teacher could say: "If you really want to know why, go to a Makerspace, try to use it as a light bulb and tell us what you found out." In non-formal education, seemingly stupid questions must be allowed; actually, they make 80% of a Makerspace.

So, there we are, yet another fancy word to describe an educational tool. Makerspace.

Formerly known as a hackerspace, bad publicity made the hackers start calling themselves researchers and their messy garages became labs until those "researchers" called their labs Makerspaces.

Here anybody and especially students are allowed to fail at something. No outcome of any activity is required (search for "useless box" on YouTube and think about the required knowledge to build it). A Makerspace could have state of the art computers, 3D printers, laser cutters and an endless stock of electronics and of course lots of robots.

I have spent a lot of time in such Makerspaces, and my conclusion is that you don't necessarily need any of this. What you need is a true understanding of how non-formal education works and why the maker movement is vital for today's society. When you as a coach live by that conclusion, you'll make a Makerspace out of any room filled with open-minded people who participate with no obligation. Of course, you'll have rules to ensure the safety and mutual respect; a work frame.

I had the chance to work as a coach in the most modern and best-equipped Makerspace in Luxembourg. It operates as a rentable on-demand Makerspace for schools and youth organisations that send their youngsters

for a specific workshop (3D printing, electronics, programming, etc.) or as an open space Makerspace, which anyone who's still a student may visit. It's free of charge!

The most difficult "clients" were those who came because they had to. After a quick introduction of less than two minutes, I would ask them if they had any project in mind that could be done with any of the equipment in the Makerspace. The older they were, the longer it took to hear a response. Sometimes, they wouldn't even come up with one single idea. And it's OK; remember most of them are never asked what they precisely would like to do. Mostly, youngsters and even we adults are just consumers of products and circumstances. Playing an active role behind a video game or a website's content management system is no daily business for many of us. So, depending on which workshop they came for (or were forced to come for), I started showing horribly bad and totally useless stuff other Makers made. I showed professional projects that broke, never worked and spectacularly failed. That's when I got their attention. I offered to continue working on those projects or to come up with a new idea. Then, at least half of them started tinkering. I left the others staring and gazing. Yeah, most of them were bored. But magic would happen. Never underestimate how boredom stimulates the creativity of youngsters. Of course, they need a frame in which they are allowed to act, but they must never be forced to anything!

Some asked if they could use their smartphone, others if they may surf the internet.

- Yes, if you use your phone to install an app you developed.
- Yes, if you surf instructables.com to find funny DIY projects you could do.

In the end, 99.99% of the forced visitors were engaged in a project. Some projects would be of a shallow level, others much too confusing. But as a coach, you would never judge! If someone asks a simple question, give a simple response. If someone asks something you don't know, perfect – admit it and show him how you find the answer. Of course, you'll use the internet. And trust me, you'll find a solution. Because, even if you don't find anything within the static internet, posting your question on a forum will create a response. For some youngsters, it will be the first time in their life

that an authority figure honestly admits an intellectual gap. It's a key experience to see that it is OK. Furthermore, they'll learn that "not knowing something" is not the end of the quest. Using modern technologies will become a reflex. Understanding that anyone can contribute will be lifesaving. Becoming aware that sharing information is ensuring the greater good, priceless.

Some youngsters will probably use modern technologies like the internet in the way it was intended for. Maybe for the first time in their life! During your internet research, you'll be able to talk about trustworthy sources, how data is collected and the power of knowledge contributors.

Non-formal education is a sustainable way to educate. Just like with the hippie teacher, no one is forced to become anything. Even if a student was able to program a game with the help of YouTube tutorials, MIT's App Inventor or Minecraft, they will not feel like they had been forced to. A lot of them will not become programmers in their later life. However, they got an insight into modern technologies. Maybe they even learned to appreciate stuff they use, because they saw how much developing work a modern video game or a smartphone app needs. Knowing that the internet can be used for more than just watching porn, Snapchat or shopping is great, but knowing that IT might also be a study and job option is, again, priceless. This applies not only to programming but also to electronics, design, biology, chemistry, physics, languages and, in fact, to every aspect of our society.

The key to success is the coach that finds a non-formal way to implicate a participant. It's nothing new. It has been done for decades, but till recently it had no fancy name. We all need more self-confidence, life options and a stronger will to communicate with each other. In real life, you will need to work with colleagues, accept decisions and find solutions. Learning for a test, being tested on that content is very important, but it is not real life. And, in my opinion, it is not even the job of formal education to teach real life. Teachers, especially in high school, have much too much knowledge to transfer and to test than they would have time left to build up self-confidence and to motivate youngsters to make more out of their existence.

Most importantly, today's technologies are evolving at a speed far beyond the rate at which a regular school programme could be adapted. A

Makerspace, however, can. Makerspaces and non-formal teaching keep youngsters up to date and even one step ahead. In non-formal education, no expertise is needed in any precise domain if that teacher knows how to motivate youngsters for projects and how to sustainably share knowledge and help.

Everyone can find helpful ideas on the INTERNET to start projects. The youngsters will realise how precious these times are and how many possibilities they have. As soon as a critical mass will be actively taking part in society, their ability to work as a group, sharing knowledge among all and the motivation to question procedures will help to minimise the gap between those who have issues with modernisation and those who push our evolution further. They will positively influence tomorrow's form of society, knowing that the status quo is not an option anymore.

TOY HACKING AND LOW-COST MAKER CULTURE IN LOCAL COMMUNITIES

David Allistone

MAKER CULTURE IN LOCAL COMMUNITIES is vitally important in our age of digital technologies, as it provides a gateway and unique opportunity to reach people who may not have access to emerging technologies. Digital and physical isolation, lack of confidence, skills and knowledge are all barriers that need to be overcome, and maker culture helps reduce these barriers. But the most common issues are often affordability or lack of access to maker equipment and materials or a place to be able to engage in maker activities within local communities.

So what is maker culture? When I discuss maker culture, people most instantly think about 3D printers, laser cutters and other expensive fabricating machines that you will find in a fab lab, makerspace or community workshop. To some people it might seem like second nature to join and become a member of such a space. But to others who lack confidence, social mobility or the budget to join one of these projects, it might seem like a distant dream, or possibly a technology nightmare. Another barrier might be an age restriction, as many machines might be considered too complicated

or expensive to be used by children or young people; this might also apply to new, inexperienced makers or people with disabilities.

So how do we overcome these barriers of access to technology, affordability, confidence, skills and knowledge?

The answer is simple: you start a group, community or organisation with friends, family, peers and like-minded folk with the aim to create, design and make things. If your focus is to encourage other people to get involved, then you will need to create and test engagement maker activities that will provide an accessible gateway to maker culture that are affordable, simple, and above all fun!

This is what I did with some friends back in 2011. Myself and fellow artist Hannah Coxeter decided to start Exploring Senses CIC. When we started we had no real plan and no money; we just knew that we wanted to create activities, play and make things, with an aim to inspire other people to do the same. We had both just graduated from the University of Brighton Design and Crafts BA course, fuelled with a passion to help make the world a better place for future generations to live in. It was the time of Austerity, post the 2008 banking crash and the last thing we wanted to do was to just make stuff to sell. Instead we thought it would be fun to design and create activities and experiences that inspire people to live more fulfilling creative and meaningful lives.

Our organisation Exploring Senses is a not-for-profit community organisation based in Brighton, England. We are a group of freelance artists, makers, youth workers and educators who work together on projects sharing skills, knowledge and experiences. We enjoy designing and creating new combined arts, crafts and digital activities, workshops, events, exhibitions and commissions. Sometimes our activities are part of a bigger picture, such as neighbourhood planning or for historical sites such as museums, but mostly our activities are about bringing together communities.

Our overall aim is to empower young people and local communities to become active citizens, working and living together happily and creatively. We believe "happy people make positive actions" and "we embrace optimism through imagination and creativity".

David Allistone

Picture: Exploring senses

When we first started delivering maker activities they were very simple. We looked online and researched a little to find out what other people had been doing at that time. Our first workshop involved making automata mechanical moving machines out of dried pasta and sweets. At the time, we were broke and had a very limited budget, and this was an important factor. You could say that not having much money helps you become more inventive as you have to use your imagination and creativity to find low-cost solutions to problems.

Our second workshop was an arts commission for Brighton and Hove City Council to celebrate People's Day. The budget was very low so we thought of a simple public activity where we asked people to draw on a postcard, things that made them happy around the theme of "Wish You Were Here". The postcards were given to elderly people who lived in care homes. The activity was simple, but we soon noticed that children would draw things instantly, young people would often consider this more and that adults were often lacking in confidence to draw. It became clear that maybe giving people blank paper and pens and asking them to be creative is a big ask for some people as they are not in their comfort zone.

After delivering these two workshops we decided that we wanted to create a makerspace for children, young people and local communities. After experiencing "Build Brighton", which is our local makerspace for adults, we realised there was a need for such a space. We felt a little intimidated by the local makerspace, as it is a very male environment and, even though we had a few years of maker experience at university, the adult space just seemed to be too full on for us. With this in mind, we wondered how many other people might feel the same way that had even less experience than us.

We approached Brighton Youth Centre, as we thought it might be a good place to create a makerspace project for local children, young people and their families. Luckily the youth centre had a spare room that was not being used and were given the green light to start developing a makerspace project. To begin with we installed some old workbenches given to us by the University of Brighton and made some other tables out of found wood.

So you have a space – but what do you do in it?

October 31st is Halloween and this is a big event for most people living in the UK. We like to dress up, trick or treat and host parties. The Youth Centre was hosting a big open arts event to celebrate Halloween and we were asked to provide some activities. We had no money, but we did have a nice makerspace to work in, albeit just a few tables and chairs. What to do was a big question. When looking for workbenches we had contacted Emmaus, which is a local international charity that provides ex-homeless people a place to live and work as a community. Emmaus is also a house clearance, second hand store, community café, emporium, garden centre, wood store and a very fun place to visit. The people there are very helpful and gave us a tour of the place. During our visit I mentioned that I was interested in circuit bending old electronic toys to make musical instruments. Circuit bending is a very fun activity, and it's fairly low-cost in terms of materials and tools (check online for more details), but you do need lots of electronic noisy toys to work and a lot of patience! Unfortunately, Emmaus did not have many electronic toys available at the time to give us, but they did have hundreds of soft and plastic toys that were either slightly dirty, had parts missing or no CE label so they could not be sold and were going to be thrown away, destined for landfill.

We thanked Emmaus for the toys and took them back to the youth centre makerspace. We started to dismantle the toys with junior hacksaws and scissors, then stitch the soft toys together and hot glue plastic to plastic, and plastic to soft toys. The results were hilarious and reminded us of the mutant toys, such as Sid's spider baby toy in Toy Story. We called this activity Toy Hacking. Our Halloween Toy Hacking event lasted six hours, and it was one of the most chaotic, rewarding and exhausting experiences of my life. Over 100 people participated during the event, and many people stayed for more than two hours and some young people returned to rework their Toy Hacks, as they had been inspired to do so. Instantly we could see that Toy Hacking was a success – in fact, more than we had expected. Some of the Toy Hacks that people made during the Halloween event looked very much like they had the personality of their makers embedded within them. After running several more Toy Hacking events, it was became clear the activity

Picture: Exploring senses

was an identity project: many people gravitated towards toy objects they liked and recognised, or shapes and colours they found interesting, then made creations that embedded their personalities, hobbies, interests, what they liked or disliked, or relevant themes to whatever inspired or troubled them at that moment in time. Toy Hacking is a very Surrealist activity, as it stimulates the life of objects made by human creators. It is a very accessible, affordable, imaginative and creative workshop, providing instant results that are of value to the makers and inspiration to other people.

Toy Hacking is a hands-on activity. People of all ages will enjoy this workshop and you are likely to see more engaged activity from people of mixed abilities than if you ask someone to draw something with on paper with a pen.

Toy Hacking is one of the most perfect youth engagement activities that we have tried and tested. It is subversive and destructive to cut the head

of a Barbie doll with a hack saw, but when you glue a new head on from another toy or reassemble the parts to make a new creation, you will see something new emerge that is unique and beautiful. People who make Toy Hacks treasure what they have made as they have made them out of their own pure inspiration. It's hard to express how truly magical Toy Hacking is. You really do need to try it out for yourself to experience the pleasure. I'm sure once you have started Toy Hacking, you will be instantly addicted.

Looking back at this moment in time, it is clear to see that Emmaus giving us the Toys was a serendipitous event. The Toy Hacking workshop success was a total happy accident. We had not much money, we were given some materials, we had some basic tools and we made the most of what we could with what we had. Ultimately, this is what maker culture is all about to us. It's not just about having the latest 3D printer or being the most skilled; it's more about working together as a community in a space, doing things because we feel we need to.

Once people get to know you as a group of makers who provide fun activities and events, you will find that some people reengage and show an interest in what you are doing and may ask if they can help. Other people will come to you with problems or ask how you make things. If people come to you or ask for help, you need to make the effort to help them, as this is how you build an authentic maker community.

As artists we enjoy researching and developing new activities and processes that combine arts, crafts and digital activities. We share and test our research in partnership with the local maker communities we have established within our city at Brighton Youth Centre, in local schools and at our Exploring Senses MakerLab on Brighton seafront. We often showcase maker projects that we have created in partnership with local communities within art exhibitions in public places such as libraries and cafés, and occasionally art galleries. We also provide free participatory workshops that relate to the artworks exhibited and ask for members of our community to help facilitate the workshops. The exhibitions and workshops increase the confidence of the existing maker community and inspire other people to join the group.

Most of what we make is made out of recycled materials or biodegradable new materials such as PLA plastic, as we do not wish to have a big material impact on our environment. We often like to use cardboard and other scrap materials such as pallet wood. Toy Hacking is one of our main activities, but we also use 3D pens a lot with PLA filament, make interactive sound "Talking Pictures", and use digital textiles printing, cardboard crafting, 3D scanning, 3D printing, mobile apps and CAD software such as Photoshop and Illustrator. We are not code-centric, but do code when we need to using Scratch with children and Arduino with young people and adults. Our activities are very simple and accessible. We use lots of apps as digital tools as they are fun and easy to use. We also enjoy making physical objects and then converting them into digital things and then either 3D printing or surface printing the objects. This is a creative process and helps participants think creatively about the digital and real world and how they interact together. Failure in making is important and happy accidents often appear out of failures. Always expect the unexpected and celebrate the unusual diversity of making things together. If you work alone you can do things, but if we work together we can achieve great things – strength in numbers!

Developing a maker community is a very organic process. Every maker community is different. Our challenge was to create a maker community with little or no money. This is how we started, and I would invite you to do the same. If you would like to know more about how to do this, feel free to get in touch.

STEAMING AHEAD: TOWARDS EMBEDDING STEAM IN IRISH YOUTH WORK

Janice Feighery, Barbara Nea and Hilary Tierney

IN 2012, THE NATIONAL YOUTH COUNCIL OF IRELAND (NYCI) hosted its national conference on the theme of digital tools in youth work. The Screenagers conference brought youth workers together to discuss the potential of digital technology to contribute to youth work's mission to empower young people and enable them to become creators rather than consumers in the digital world. The conference, and follow-up international conference, highlighted that many youth workers think that it is important to include technological innovations in youth work to keep it relevant to young people, but there were also considerable anxieties, with many feeling they were insufficiently trained and that they did not have the right resources. This was particularly so when trying to move beyond the basic uses of technology (to arrange activities and provide information, for example) and use it in more creative ways. From 2014 to 2016, NYCI led the international Erasmus+ funded Screenagers research project, which involved five partners, engaging with 1865 youth workers and young people through case studies and focus groups in Austria, Denmark, Finland, Northern Ireland and the Republic of Ireland. NYCI surveyed

and interviewed 283 Irish youth workers to further explore the training and support they would require to enable them to use technology more effectively in youth work. Subsequently, NYCI catalysed and partnered in a range of domestic and European projects to address needs. The publication of the sectoral-led research (Harvey, 2016) signalled a turning point for digital youth work in Ireland.

During the same period, Camara Education Ireland established the TechSpace Programme in 2012 with the vision 'to be a national movement that aims to change the lives of young people in Ireland by becoming Ireland's leading creative technology network for outcome-focused youth development'. Camara develops and delivers digital and STEAM (Science, Technology, Engineering, Arts and Math) capacity-building programmes to 222 youth services engaged in the TechSpace Network. The TechSpace model is based on The Clubhouse Network, a global community for creativity and achievement through technology originating from the Media Lab at Massachusetts Institute of Technology and the Boston Museum of Science. Between 2014–2016, the ESB funded Camara to develop an evidence base for STEAM in youth work in Ireland. The TechSpace Maker pilot project trained and supported 20 youth workers to deliver Maker activities to 150 young people. The pedagogy was informed by the world-renowned Clubhouse model and Tinkering Studio at the San Francisco Exploratorium.

In 2016, NYCI, with its expertise in delivering systemic capacity-building programmes and research on the technology-related support needs of the youth sector, and Camara, with its experience of addressing such needs through its pedagogical and technological specialism, joined forces. NYCI and Camara successfully secured funding from Science Foundation Ireland (SFI) to design and deliver the STEAM in Youth Work Maker project out across Ireland. SFI were impressed; the previous year, it had found that young people from disadvantaged socio-economic backgrounds are likely to be disengaged from science (Science Foundation Ireland, 2015). In recognition of the youth sector's ability to engage this same cohort of young people and its potential to deliver STEAM education in exciting and innovative ways, SFI provided two-year funding. This would allow NYCI and Camara,

through TechSpace, to train and support 320 youth workers from across Ireland to deliver STEAM and Maker projects to well over 4,000 young people, most of whom wouldn't have had access to out-of-school STEAM education otherwise (Meister 2017).

In addition, NYCI were nominated by the Department of Children and Youth Affairs to represent Ireland on a European Commission expert group set up under the European Union Work Plan for Youth 2016–2018. The group recently published a definition of digital youth work (European Commission, 2018), an umbrella term used for digital and STEAM youth work in Ireland.

Taken together, these initiatives provide a basis for engaging the youth work sector systematically and on a bigger scale than had been possible prior to that.

ENGAGING THE YOUTH WORK SECTOR

Bringing STEAM education to the youth work sector offers huge potential in terms of the relational and process outcomes of youth work, such as those linked with social, emotional and mental wellbeing. Examples include:

- through emphasis on group work and self-expression and in offering emerging digital tools to engage young people
- in supplementing formal education through the provision of enjoyable, hands-on, inspirational experiences of STEAM, that are relevant to young people's lives (Department for Education and Skills, 2016)
- in allowing young people to develop 21st century skills (creativity, problem-solving, critical thinking and team working), so critical to their engagement with society and futures (P21 Partnership for 21st century skills, 2007).

While it is still early days, preliminary findings from the evaluation of the NYCI TechSpace STEAM in Youth Work Maker Project show that youth workers believe the inclusion of STEAM within youth work is supporting such outcomes. For youth workers themselves, emerging findings indicate that most of those who take part really enjoy training and support around

STEAM; want to continue to develop their practice in this area, and to have access to further support; and their perceptions about STEAM and its relevance to youth work develop.

The other major benefit to the involvement of the youth work sector in STEAM and Maker education is its ability to engage young people who are at risk in terms of educational disadvantage. Working through the youth work sector ensures the project focuses on disadvantaged young people because the sector works with young people who are significantly more disadvantaged than the national average (53% vs. 14%) (NYCI, 2012). This is particularly important as many other non-formal STEAM engagement initiatives, outside of the youth sector, struggle with this (Archer & DeWitt, 2017). Our preliminary findings indicate our project is improving equality of access to hands-on, inspiring, informal STEAM opportunities in Ireland. For example, over half of the youth workers we have trained will go on to facilitate STEAM and Maker activities with early school leavers, while a third will work with young offenders and a third will work with young people who experience addiction.

LEARNING THEORIES, CONCEPTS AND METHODOLOGIES

Experiential learning, a mainstay of youth work processes, is inspired by the work of Dewey, Lewin and Piaget and strongly associated with the work of David Kolb. Kolb's (1984) Experiential Learning cycle is a theoretical framework used by youth work organisations in Ireland to inform the design, delivery and overall approach of youth work activities (Devlin & Gunning, 2009). Mark Smith, in his seminal book Creators not Consumers (1980), discusses experiential learning (learn by doing) in a youth work context and how it is based on three assumptions:

- people learn best when they are personally involved in the learning experience
- knowledge has to be discovered by the individual if it is to have any significant meaning to them or make a difference in their behaviour
- a person's commitment to learning is highest when they are free to set

their own learning objectives and are able to actively pursue them within a given framework

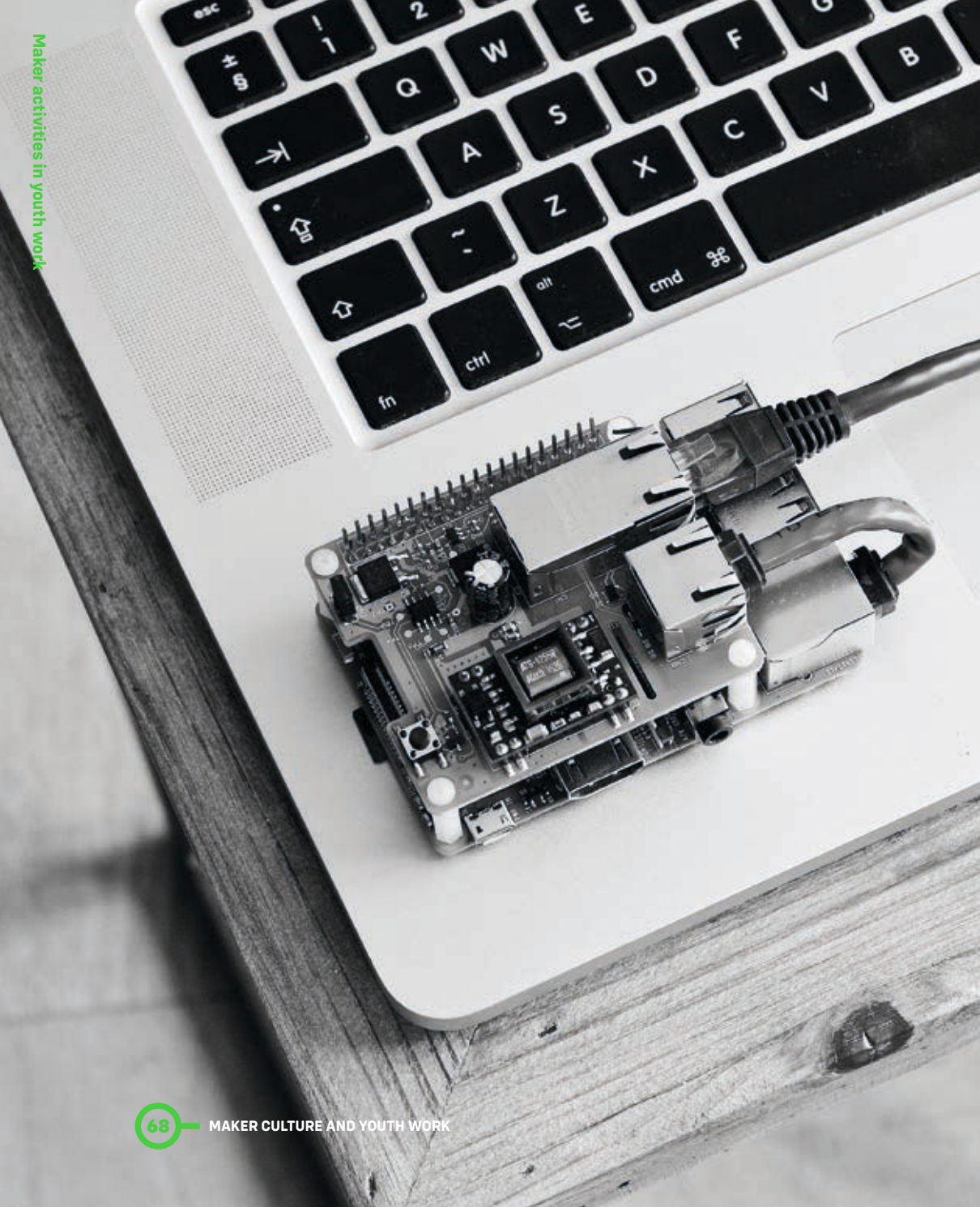
The growth of digital youth work in Ireland has been greatly influenced by the international Clubhouse Network developed by Mitch Resnick's Lifelong Kindergarten Research Group at MIT Media Lab and the Boston Museum of Science in 1993. The Clubhouse's 'learn by designing' pedagogical approach is inspired by two important theories of learning and education: Piaget's constructivism and Papert's constructionism (Resnick). The approach utilises new technologies to promote new types of learning experiences, engaging young people who have often been alienated by traditional educational approaches. This approach is entirely consistent with the Irish youth work sector's principles (Devlin, 2017).

LEARNING BY DESIGNING

The learning by designing (Computer clubhouse 2016) methodology is used by TechSpace to train youth workers to facilitate STEAM activities. Young people learn to design, create, experiment, explore, inquire and solve problems through technology and project-based learning. The content areas are: 1) circuitry and electronics, 2) paper crafts, 3) microcontrollers and robotics, 4) 3D design and printing, 5) coding.

Papert's approach is grounded in social justice and equity. He also believed that if young people were to engage with powerful ideas and construct knowledge, then they would require agency over the learning process and ownership of the technology used to construct knowledge (Stager, 2017). In the 'maker process', a youth worker's role is to become a master inquirer, to model curiosity and to engage a young person through a 'tinkering mindset' (Semper, 2015).

The learn by designing methodology has synergies with the two social education frameworks: youth work as process and product, and knowledge, feeling, skills as elements of a problem (Smith, 1980). The 'maker process' defined by the Clubhouse Network's 'Start Making!' programme (Remold, 2015) outlines a six-stage process to support youth workers to facilitate STEAM projects with young people. By the end of the first four stages (con-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nect, play, build, remix) the young people have produced a prototype of their 'products'. The fifth and six stages (open make, and show and share) are critical steps to deepen Kolb's experiential learning cycle, what Dewey calls the 'transaction' in experience (Ord, 2012). In the open make and show and share sessions, the new knowledge, feelings and skills developed from each of the earlier stages are applied by young people to improve the project they are working on before showcasing and sharing it with their peers.

IN PRACTICE: NYCI TECHSPACE STEAM IN YOUTH WORK MAKER PROJECT

The STEAM in Youth Work Maker project is building the capacity of the Irish youth sector to engage in the global Maker movement and to deliver STEAM (science, technology, engineering, art and maths) education projects across Ireland. Internationally, this is one of a small number of projects that is capacity-building the youth work sector, on a wide, national scale, to deliver STEAM education (see also Curiosity 2017).

Participants initially take part in an introductory training day during which they undertake a range of STEAM and Maker activities and gain the skills and knowledge that they need to facilitate high-quality STEAM learning experiences with young people. They learn the logistics and pedagogy of the 'maker process' (Remold, 2015); how to solder; use a Makey Makey to turn an everyday object, such as a bunch of flowers, into a computer keyboard; make simple circuits; make scribble bots; and make their own speakers.

Following the one-day training, they receive a grant to buy the equipment they need to facilitate STEAM and Maker activities for your young people. They also have access to follow-up support, resources and an online community of practice, so that they can continue to develop their confidence and expertise as they go on to deliver STEAM and Maker activities with young people. The young people they work with have the opportunity to showcase their creations at the amazing annual Creative Tech Fest.

Challenges faced

As a pioneering project, and one of only a few we have come across internationally, the project team has been learning by and through experience as

they design, deliver, adapt and modify the programme to ensure maximum engagement and impact in the youth work sector.

One of the main challenges encountered relates to the 'resistant mindsets', identified in Screenagers (NYCI, 2016), among parts of the youth sector to the involvement of youth workers in STEAM education. During our first year, we engaged the early adopters, but some did not get the organisational support to embed what they had learned within their practice and to continue to develop and deliver STEAM projects. Other youth workers did not see the relevance of STEAM to youth work. As a result, much of our effort has focused on awareness-raising through engagement with sector leaders to highlight how STEAM and Maker can be used within youth work to enhance youth work outcomes. In our second year, instead of filling our trainings through open-calls, we 'pitched' it to managers to commission on behalf of their colleagues as continuous professional development opportunities. This approach is proving to be more effective in embedding STEAM as a methodology within youth work.

Another key challenge relates to the inquiry-based and constructionist learning model that our project is based on, and which is central to effective STEAM and Maker education. There is a certain degree of discomfort for some youth workers 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 (almost 20% of those we train in some way struggle with this). Supporting youth workers through this discomfort is an ongoing area of learning for us and the focus of much of our upcoming activity.

IN PRACTICE: NUI CERTIFICATE IN DIGITAL CREATIVITY IN YOUTH SETTINGS

Dynamic working relationships across sectors continue to be central to developments in establishing STEAM in Irish youth work. The Department of Applied Social Studies [DAPPSS] at Maynooth University is the longest established provider of professional youth work education and training in the Republic of Ireland and has partnered very effectively with the youth sector to develop special purpose accredited programmes that respond to emerging practice needs.

Collaborating with Camara Education Ireland/Techspace, the Centre for Youth Research and Development [CYRD] at the DAPPSS designed a ground-breaking certificate programme, 'NUI Certificate in Digital Creativity in Youth Work', which was launched in 2018. The programme is unique in Europe and responds to the continuous professional and practice development needs of the non-formal education sector by enabling youth workers and educators to develop specialist skills and knowledge in digital youth work. (Techspace 2017) It is certified at Level 8 on the Irish National Qualification Framework [NQF] and carries 20 ECTS credits across 100 hours of tuition, along with substantial self-directed work which includes designing and implementing a digital project with young people. The students learn to use technology as a tool for digital creativity so that it can be extended to young people themselves, empowering them to be creators.

The curriculum is underpinned by an educational philosophy that promotes non-formal, experiential learning central to good youth work practice. This will include the deployment of a framework to strategically integrate educational technology in youth organisations supported by an established pedagogical approach to digital creativity in youth work. Students develop competencies to confidently and effectively use the key theories, frameworks, models, approaches, and tools to ignite creative confidence in young people through digital and STEAM programmes.

INITIAL FINDINGS

The first cohort of students are passionate, innovative non-formal educators from across Ireland. They come from an exciting mix of backgrounds: from youth theatre, vocational education, national youth work organisations, a start-up STEAM education business for schools, and youth workers working through the medium of the Irish language.

Through the programme, the students have grown into an inter-agency, supportive community of digital youth work practitioners. In October 2018, a student showcase event took place with students' exhibiting a range of projects that blended digital and STEAM: from VR to 3D fabrication to puppetry animation. An in-depth programme evaluation is currently underway.

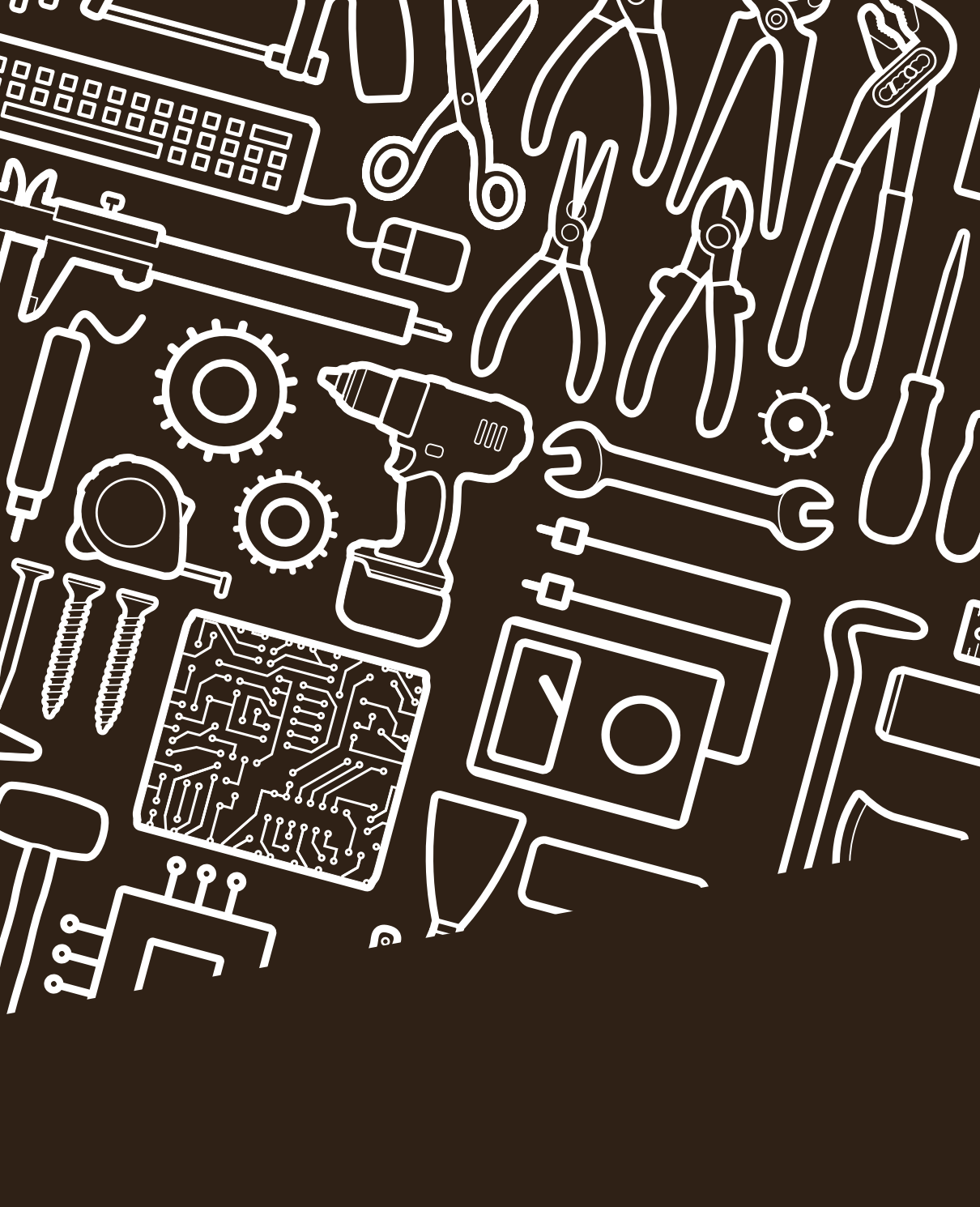
CONCLUSION

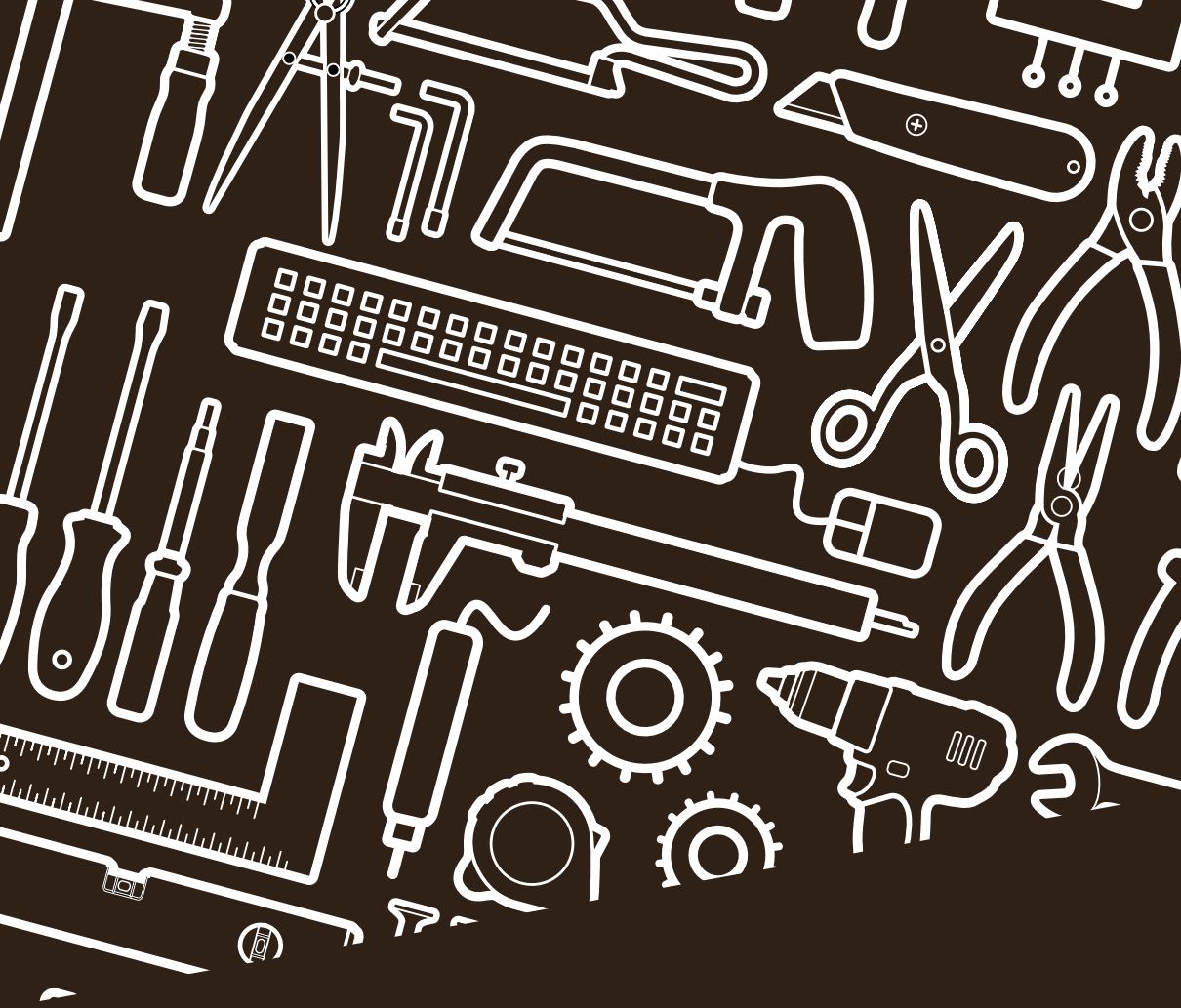
The emergence of 'digital youth work', STEAM and Maker education as youth work methodologies within Ireland has been instigated by the youth work sector itself. While the government has acknowledged the benefit of informal STEAM learning, as of yet, no policies have been implemented through which the government formally supports the youth work sector's role in this area.

A substantial two-year grant received from the Science Foundation of Ireland to a youth work sector-led STEAM education initiative has been an important acknowledgment of the exploratory work the sector has been doing since 2012. This grant has also had considerable impact on the youth sectors' wide-scale ability to innovate in using STEAM and Maker education within youth work. Complimentary sector-led initiatives such as the NUI Certificate in Digital Creativity in Youth Settings are resulting in specialist expertise being developed by innovators in the field. There is now widespread awareness among the Irish youth work sector of the considerable potential STEAM and Maker education has to support youth work outcomes. We are now at a point where our evidence base around best practice in the area of STEAM and Maker education is emerging and we are developing a clearer picture of exactly how it contributes to youth work outcomes. We anticipate that the future of this area of youth work will continue to grow and, over the coming years, as the momentum builds, we hope that:

- STEAM will be embedded as a robust, evidenced-based tool within youth work methodologies with supporting infrastructure
- STEAM as a youth work methodology is mainstreamed within youth work professional education programmes and continuous professional development programmes for youth workers.
- Ireland's youth sector will become a leader in the use of STEAM and Maker education within youth work internationally.
- Ireland's youth work sector will become an established part of the broader STEAM education ecosystem, fully recognised within relevant central government department policies.

One of the things that we have going for us as we seek to turn those hopes into reality is the effective creative partnership between key youth sector organisations, specialist digital training providers and higher education institutions. These are early days – exciting days – as we take the first steps towards embedding STEAM in Irish youth work.





PRACTICAL MAKER ACTIVITIES IN YOUTH WORK

PRACTICAL MAKER ACTIVITIES can be implemented with many kinds of equipment. If you go online seeking to find the grandest examples or visit a fully-fledged makerspace, it's easy to get discouraged. It's good to remember, though, that you can get up and running also with basic and inexpensive tools. As with other forms of youth work, it's not always sensible to go all-in from the get-go without first figuring out a plan for implementation. Instead, it's still wise to keep in mind the most critical focus: our youth work goals.

How can we strive to reach these goals with maker activities? What should we do? Where do we start?

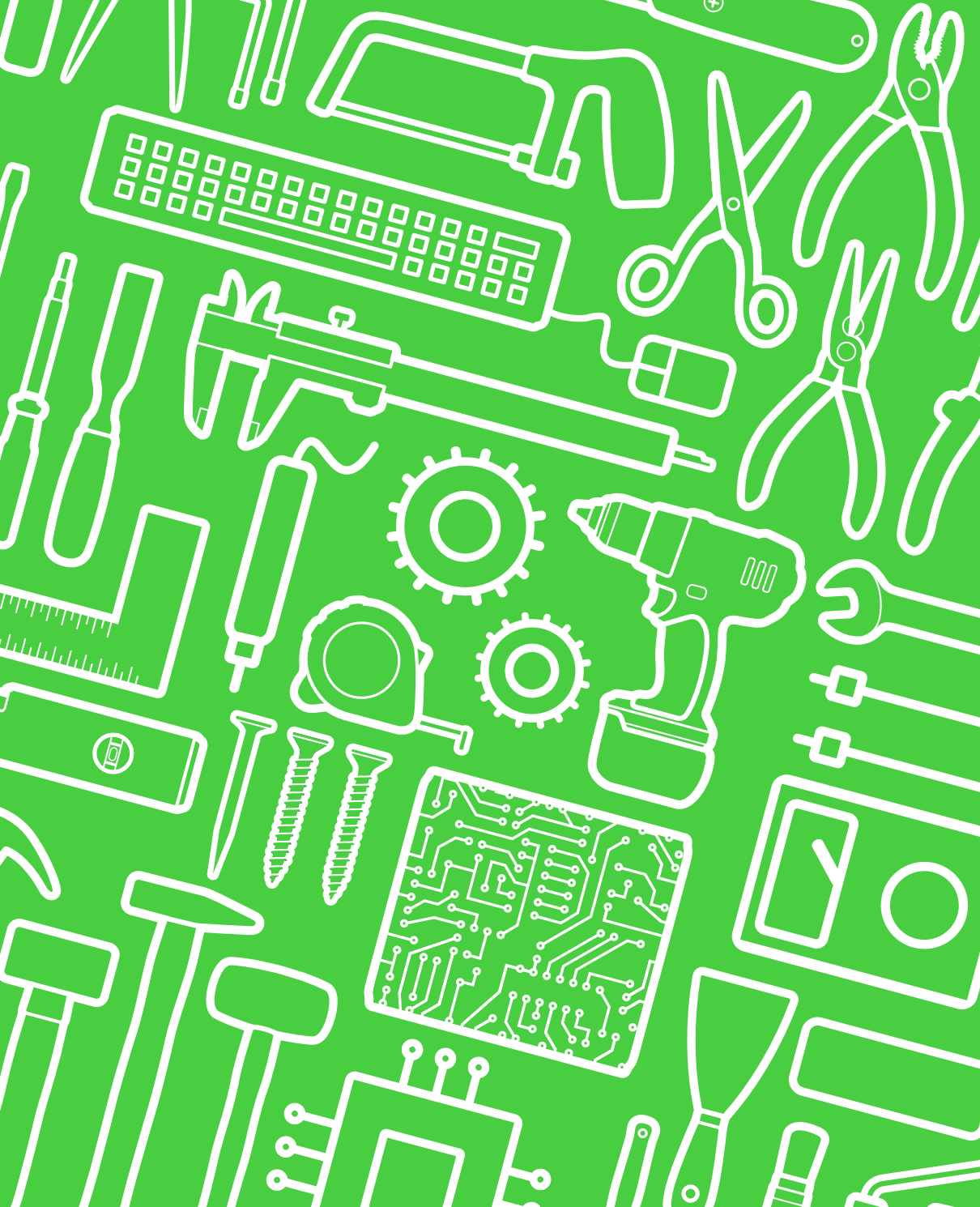
These are some of the questions we seek answers to in the next articles. Whether we are talking about coding, tinkering with electronics or using ready-made kits, all the approaches mentioned are quite inexpensive to get started with.

The chosen examples also have an additional shared trait: none of the approaches requires vast amounts of additional competence building to be able to use them in daily youth work. As we've mentioned before, maker activities are underpinned by a strong characteristic of peer learning; what this means for the youth workers is that they can learn with young people as they go without worrying about knowing everything. It's good to keep in

mind that no-one expects the youth worker to be a professional coder nor do they have to be an engineer; the most important thing is to do what we do best by supporting the young person during the process and together seeking answers to any questions that come up.

If you are looking for specific step-by-step instructions to directly implement with young people, I'm afraid we have to let you down. Were we even to attempt compiling such tutorials, they would very quickly become obsolete when technology evolves. It would also be impossible to take into account all the variables such as the space you are working in, the skill level of youth workers and participants, the exact model of technology and so forth.

We still hope that the articles within help guide you in the right direction: how could maker activities be a part of your daily youth work? How can you get started and figure out what you would personally first want to try out? How are your youth work goals reflected in your maker activities? Above all, we hope that these articles can inspire every reader and get excited about the myriad possibilities of maker activities in practical youth work.



THE BASIC TOOLS OF MAKER ACTIVITIES

Juha Kiviniemi

IT'S EASY TO BE IMPRESSED when you walk into a fully equipped makerspace for the first time. The room is typically dominated by large and imposing hardware. Laser cutters, CNC milling machines and rows of 3D printers are bound to make you wonder how much it all costs and give you a sense of desperation in the pit of your stomach. Few youth work organisations can afford these types of investments. The best response is to take a step back and think about what maker activities are all about and what they include. Read on to establish a few starting points.

PROGRAMMING

In most types of digital maker activities, some basic programming skills will eventually become a necessity. This does not, however, mean that you need to first learn a new programming language to get started with maker activities. Getting started is actually easy and often free of charge. One of the most popular platforms is Scratch, a visual programming language aimed at children and developed at MIT. Scratch is used in basic education to teach programming, which means that it's a platform that many young

people today are familiar with. While you don't need to know a single line of actual code to do a bit of programming on Scratch, the underlying logic is the same as in all computer programming. As one of my colleagues who has previously taught coding to young people put it, you don't (yet) learn an actual programming language, but you learn to think like a computer.

Derivatives of Scratch and other similar visual programming environments are used in many maker applications. For example, mBot kits (covered in more detail in a separate article) are programmed using the Scratch-based mBlock language, and the Javascript Blocks environment used on the micro:bit platform also feels reassuringly familiar. Even the Arduino platform, which is even suitable for advanced projects, can be interfaced with by a visual programming environment by using snap4arduino or other similar applications. What all of these have in common is that it is easy to go from the visual environment to using an actual programming language as your skills improve.

Engaging young people in Scratch-based activities can be challenging, but proven youth work contents can and should be used as incentives. The small built-in animation platform in Scratch, for example, provides an opportunity for storytelling. Coding simple (or not-so-simple) games is also possible. A youth centre specific quiz could easily be programmed on Scratch. This makes coding a creative activity instead of a purely technical skill, which brings us to the heart of the maker approach. The Scratch website includes a wide range of user creations that can be freely edited by other users. This is a great way to get started.

READY-TO-USE KITS

For those who want to build actual electronics, ready-to-use kits are a good alternative. Programming becomes a lot more engaging for most young people (and youth workers!) when the result of writing code is not simply a line on a screen that says the code works, but changes in the actions of a robot scurrying around on the floor. It could even be something as simple as controlling LED lights to make them blink in a certain sequence. In any case, there is a fundamental fascination in using code to control a physical device.

One example of a ready-to-use kit that has been used in youth work is the mBot kit of aluminium-frame robots on wheels. Before use, the robots need to be built, either with or without instructions. Simply building the mBots is a good way to get started. Building an mBot takes about an hour and it introduces the participants to basic technical problems and logical thinking: why is the robot's proximity sensor not working? Did I attach the cables correctly? Why is the robot going in the wrong direction? An mBot built using the basic model can serve as the foundation for group activities in youth work even without programming, because they can be controlled by a Bluetooth-compatible mobile phone or the mBot remote.

As stated above, the robots can be programmed using a Scratch-based visual programming language. In the spirit of maker culture, there is a wealth of examples online on what these little robots can do when appropriately programmed, so we need not explore that in any great detail here. The youth work perspective, however, is the youth worker's responsibility: how could these robots be used as an instrument of group activity in my specific group of young people? How can building robots be framed as an appealing and creative individual or group activity? The question can be approached from the perspective of youth work processes: can robot building be turned into a competition? Can young people be encouraged to build a robot using as much creativity as possible, not following the instructions that came in the package? Can programming be made into a group assignment where the overall goal can only be achieved if the separate components worked on by different groups operate correctly?

Other popular ready-to-use kits include Vex IQ and the Lego Mindstorms platform. There are also robots that require no assembly, meaning that their use is focused more on controlling and programming the robot. For example, Sphero, a spherical robot designed for educational purposes, is used at some Finnish comprehensive schools. As robot kits all have their own strengths and weaknesses, you have to evaluate—and, if possible, test—the various alternatives to find the one that best suits your needs.

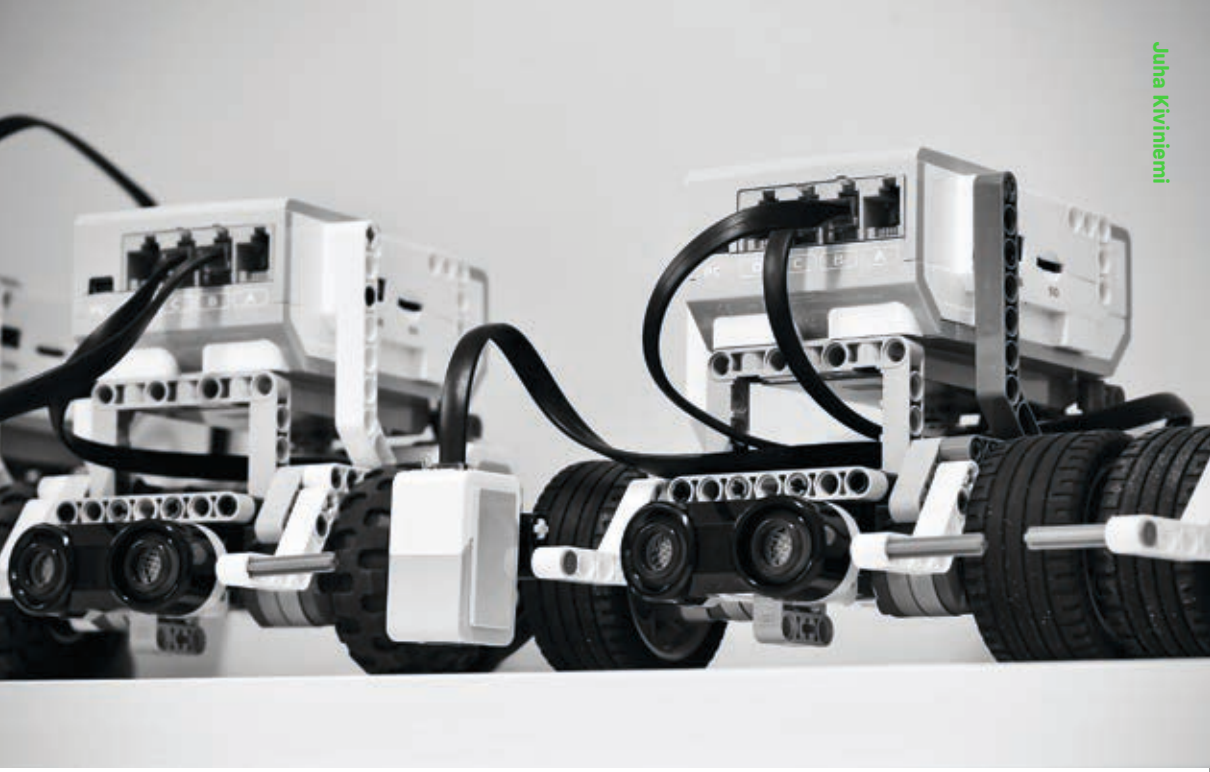
MICROCONTROLLERS

It could be said that one of the key goals of maker activities is to understand technology. One form of technology that we come across every day is the microcontroller. Did you take the lift down from your flat this morning? The doors are probably controlled by a microcontroller. Did you wait in your car at a traffic light or scan your ticket on the tram? Another microcontroller. These small devices are the "brains" behind most modern hardware. They are often manufactured specifically for one purpose. A microcontroller that opens the doors of a lift may not know how to do anything else. You can think of it as a highly specialised computer. The goal of this approach is to minimise manufacturing costs.

Microcontrollers used in maker activities are not specialised to the same extent, but they are nevertheless typically used to perform one task at a time. The task might be to build a physical device around the chosen platform (such as blinking lights, a doorbell or the moving hand of a clock) and to program a microcontroller to control the device in the desired manner.

This is a great example of a creative process: before connecting a single wire or writing a single line of code, you should usually know what it is that you are trying to accomplish. If you are working with young people, you should make a point of discussing it with them. While plans may change as you go along, it makes sense to maintain a clear idea of the basics of the project. For example, when building a doorbell, keep in mind the basic formula of programming: if X happens, then perform Y. In practice, you could break it down to a simple scenario: a person wants to enter through the door. What needs to happen for this to be accomplished? The person pushes a button. What needs to happen next? Writing down this real-world formula provides a clear idea of what needs to be considered: the position of the button (depressed or not) needs to be read or signalled somehow, and the programming of the microcontroller must execute something (probably a sound) when the position of the button is "depressed", and so on. The logical thinking learned from a visual programming language, such as Scratch, helps here.

Because maker activities around microcontrollers are based on technical building as well as programming, they present an opportunity for a highly



effective approach in youth work: in group activities, not every participant needs to know everything. Each member of the group can make a contribution by relying on their individual strengths. Some can focus on assembling the physical device, while others can focus on programming. In larger projects, responsibilities can be broken down into even smaller components, allowing everyone to participate and contribute in a manner that suits them. Alternatively, you can give several groups of young people the same platform, supplies and skills and let different groups work on different projects.

The previously mentioned Arduino development platform is widely used and affordable, which makes it an excellent alternative for getting to know microcontrollers and the programming of physical devices. Many other products, such as mBot kits, are also based on the Arduino platform. Another example of a good microcontroller platform for youth work is micro:bit,

which was originally designed for use in education. Regardless of which platform you choose, their use can typically be expanded as the participants' skills improve. The skills learned while working on these platforms can also be used in future projects on other platforms.

ROOM FOR GROWTH

To conclude, I'll go back to where I began: it's easy to be impressed by a fully equipped makerspace, but making use of such facilities and tools comes down to one's basic skills and creativity. The devices mentioned in this article are useful tools for building these two basic pillars. While you might think that a micro:bit microcontroller (priced at less than €20) and a laser cutter (priced at thousands of euros) don't have much in common, what they are ultimately about is giving tangible form to your creative ideas by using certain technical skills. The same goes for a 3D printer, for example. While you can learn a lot from making a new version of an existing product or device, the basic human traits of curiosity and creativity will eventually take over. Could I make this idea work? How could I solve this problem? How can I improve this?

For adults who work with young people, this often translates to some very fundamental questions: how can I support a young person's confidence and help them believe that their idea is feasible, or encourage them to revise it (instead of giving up) if it's not? How can I help a young person find out—or work together to find out—how to resolve a technical or functional challenge? How can I spark a young person's interest in 21st century DIY culture and keep that fire burning even when they encounter problems and setbacks? What kinds of discussions on technology and its impact on people's lives can I have with young people while we engage in these activities?

Regardless of the chosen point of departure, maker culture's basic principles of sharing and peer learning always boost learning: even when inspiration wanes, you can always find a project from which to take ideas or parts for whatever you're working on. There is also tremendous room for growth: almost all of the hardware is compatible in one way or another, whether they are robots, coding platforms or makey makey banana controllers. The only limit is your creativity.

MICRO:BIT – SO SMALL, YET SO POWERFUL

Maja Katinić Vidović

IF YOU ARE JUST STARTING OFF your digital adventure as part of your youth work, BBC micro:bit is one of the most useful little tools to begin with. With the aim of upgrading computer education in UK schools, BBC launched a campaign in 2015 to provide one million micro:bit devices to pupils. What they didn't expect was that micro:bit would soon become popular on a global scale. To briefly explain the devise in not-so-technical terms: it's a programmable platform with which you can play and create even if you have never written a line of code in your life. That is what makes it perfect for both youngsters and youth workers.

Although originally designed for usage in formal education, micro:bit instantly became famous in the makers community and digital youth work. It is now being used in workshops for youth and adults, festivals, meetups, schools and even personal home projects. One can create an alarm, humidity sensor for plants, temperature sensor, simple game or a robot. Based on BBC's research, 86% of students said the micro:bit made Computer Science more interesting and half of the teachers who have used the micro:bit say they now feel more confident as a teacher, particularly those who say they are not very confident in teaching Computing (Micro:bit 2018).

Picture: Maja Katinić Vidović

As STEM education (Science, technology, engineering and maths) and digital youth work collide more and more, it is becoming more important to teach youth not only about the possibilities of technology, but also about the responsibility of using it. However, jobs of today and tomorrow are requiring the same level of knowledge in both technical and "soft" skills. In order to combine both of these skill sets, micro:bit has proven to be a great tool, especially when working with the youth.

WHAT IS THE MICRO:BIT?

The device is small – just about half the size of a credit card – and has an ARM Cortex-M0 processor, accelerometer and magnetometer sensors, Bluetooth and USB connectivity, a display consisting of 25 LEDs, two programmable buttons, and can be powered by either USB or an external battery pack. The device inputs and outputs are configured through five ring

connectors that form part of a larger 23-pin edge connector. For such a small form factor, this little board can be surprisingly versatile! One of the most important factors here is versatility, as you can see in the later examples; the device alone gets you started, but there is still ample room for expanding once you get more ambitious with your projects.

Devices can be bought from resellers (check microbit.org for the list of resellers in different countries) and usually, one device is used by one person. After obtaining the board the next step is to connect it to a computer, tablet or a mobile phone and to give it "instructions" by using one of the visual editors – Javascript Blocks or Python. Both editors are very easy to use, and they help children in learning how to code, developing logical thinking and problem solving. After all, that's what coding is mostly about regardless of the programming language being used, and these basic skills are transferable to any programming environment. After coding a micro:bit to perform in specific way, download the code, copy it to a USB drive on your computer which is connected to micro:bit (or upload via Bluetooth) and the device will perform the given task. It can really be an eye-opening moment for youngsters and educators alike when a physical device works according to how you programmed it!

PRACTICAL ACTIVITIES WITH MICRO:BIT

Start by showing your group of young people a simple step-by-step on how to code a micro:bit to shine LEDs in a shape of a smile. To encourage creativity, ask the group to think how else they can use the LED lights on the device. To practice argumentation, ask every participant to explain their idea and allow every idea to be tested. Testing is a part of "learning by doing"; it teaches youth a simple method of trial and error, but it also encourages "out-of-the-box" thinking, so make sure to always leave enough space and time for participants to test, fail and succeed.

Over time, you can add more complex tasks such as using a micro:bit as a thermometer or adding more hardware to the device. Micro:bit is even more powerful when combined with crocodile plugs, spring connectors or different types of sensors. However, one of the coolest things for kids and

youth is that micro:bit can be connected to a mobile device via Bluetooth. Try using Bitty Blue app for Android and iOS to turn a micro:bit into a compass or to design different patterns.

If you are working in a community-based organisation, ask a group of youngsters to think about the problems and challenges in their community, school or at home. Write them all down and brainstorm the possible solutions, focusing on those which can include the micro:bit. Some schools are using micro:bit, coded by their students, as moisture sensors for the plants in the school garden. Six students from London's Highgate School came up with the idea of using the micro:bit to help people with autism recognise other people's emotional states as part of a one-day coding challenge earlier this year. The team coded the computer so that a user could scroll through a series of graphics, shown via the LEDs, of faces presenting different moods. When they found a match, they could press another button to make the LEDs state what the image represented – for example "happy", "sad" or "angry" (Kelion 2018).

As you can see, the possibilities are endless. Most important thing is to familiarize children and youth with all the features of micro:bit. Once they know what can be done, their imagination will do the magic. However, make sure to explain that working with micro:bits or any other electronic device is not a competition but a collaboration, which is one of the many benefits of this little tool. Other benefits include increased engagement of young people, boosting future employability by making learning about technology fun and improved learning through interactivity and hands-on experience. Finally, micro:bit is affordable, even from the perspective of non-profit organisations – its average price is about 25€.

One must admit that all the benefits and methods fit perfectly into the principles of youth work; they include, but are not limited to, the development of new skills and attitudes, building a sense of community and positive group atmosphere, the development of decision-making skills and creativity, and last but not least, encouragement for social responsibility. Even if youth workers use other tools such as Arduino or Raspberry Pi, it is undoubtedly obvious that STEM education needs to be an essential part of

youth work. Every school, youth organisation or youth centre should have at least one micro:bit (which is the basic premise behind the device) and adults should support youth in exploring, playing and creating with it.

As a youth worker, don't be afraid. There is a huge online community of micro:bit users, a number of tutorials and how-to guides. All you need is a bit of will and motivation. If we are supporting youth to step outside their comfort zone and be more creative, especially with technology, then we should also lead by example. Into the unknown and good luck, fellow youth workers.

MBOTS IN CHURCH YOUTH WORK

Kari Surma-aho

I **WORK AT IISALMI PARISH**, which is part of the Evangelical Lutheran Upper Savonia Parish Union. The union consists of five parishes with a total of approximately 31,000 parishioners. Iisalmi is the largest of the parishes, with about 17,000 members. Our youth work organisation includes the senior youth worker and three other staff members. We work in the parishes without fixed working hours, which makes it easier for us to participate in projects.

FROM ENTHUSIASM TO IDEAS

I took part in an mBot workshop organised by Verke at the 2018 National Youth Work Seminar of the Evangelical Lutheran Church of Finland. I had no previous experience of mBots personally, nor did anyone else in my work community. Immediately after the workshop, I told my colleague about the inspiring experience I'd had. We began to develop ideas on how we could make use of robots in our work. The lack of technical equipment was temporarily solved by us borrowing mBot kits from Verke for use at our youth spring camp for my core target audience, which consists of secondary school students (over the age of 13) and older students. At this early stage,

we were truly on unfamiliar ground when it came to the potential applications of the technology. We relied entirely on our imagination.

The mBots are an effective tool for learning the basics of programming, but what was the extent of my knowledge in this area? I can't say that it was particularly impressive. A long time ago, in my youth, I had written some programmes for small games, copying the code from computer magazines, which introduced me to the world of programming. My children used to play with Lego Mindstorms robot kits, which are akin to mBots. To put it in other words, I didn't have much in the way of knowledge and skills, but I had the just the right amount of enthusiasm thanks to the interests I'd had in my youth. The other members of my work community are not particularly interested in technical gadgets. When we were planning our activities around the mBots and considered buying kits of our own, we really didn't have much technical background information about the product.

Of course, before buying our own kits, we had to think of how they could be used in youth work. Our annual budget is fairly small, so we have to carefully consider and justify every purchase we make. We can't afford to buy things on impulse. Our basic vision was to build and operate the robots at the youth camp as well as organise instructor-led club activities. We didn't come up with any major plans for the mBots at the very beginning, but the kits were nevertheless seen by the work community as a viable tool for introducing an entirely new way to carry out modern youth work. However, we recognised that our resources were limited: having only 1–3 kits at the youth camp would not be enough to make it a meaningful activity. Having 5–6 mBot kits would make the activity suitable for about 15 participants, but we simply could not afford that on our own.

THE POWER OF COOPERATION

The youth workers from the local parishes meet once every six weeks to develop ideas for, agree on and prepare for cooperation between the parishes. At one of these meetings, I presented the mBots to my colleagues and proposed that we would pool our resources to buy a larger number of kits. The idea was that we would have a total of 5–6 mBot kits, each priced at

€100, between the parishes. Due to resources being relative to the size of the parish, we suggested that the smaller parishes would each buy one kit and Iisalmi, being the largest parish, would buy several. Some of the youth workers got excited by the idea, so we agreed to make a joint purchase with the Kiuruvesi, Lapinlahti and Varpaisjärvi parishes. Each parish paid its share from its activity budget and we did not use any external funds.

We have agreed that all of the parishes that participated in the joint purchase can borrow mBots from each other. To make the logistics easier, all of the kits are kept at the Iisalmi parish. Iisalmi is centrally located in the region and the workers visit each other's area on a weekly basis. We have acquired three toolboxes for the kits to make them easy to transport and to prevent damage. Thus far, we have not allowed outside parties to borrow the mBots. The joint use of the mBots has been smooth and there have been no time conflicts due to overlapping activities.

The mBots I first saw in action at the seminar were based on WLAN connectivity. While they are, in principle, less prone to connection malfunctions, we ended up getting Bluetooth mBots due to their ease of use. The Bluetooth versions can also be programmed on smartphones, which allows the young participants of our events and workshops to use their own devices. We have had six Bluetooth mBots in operation simultaneously in a small space without any connectivity problems, and the range is sufficient for use in a school gymnasium, for example. However, when the batteries get low, the connection to the robot is easily lost.

KNOWLEDGE IS POWER

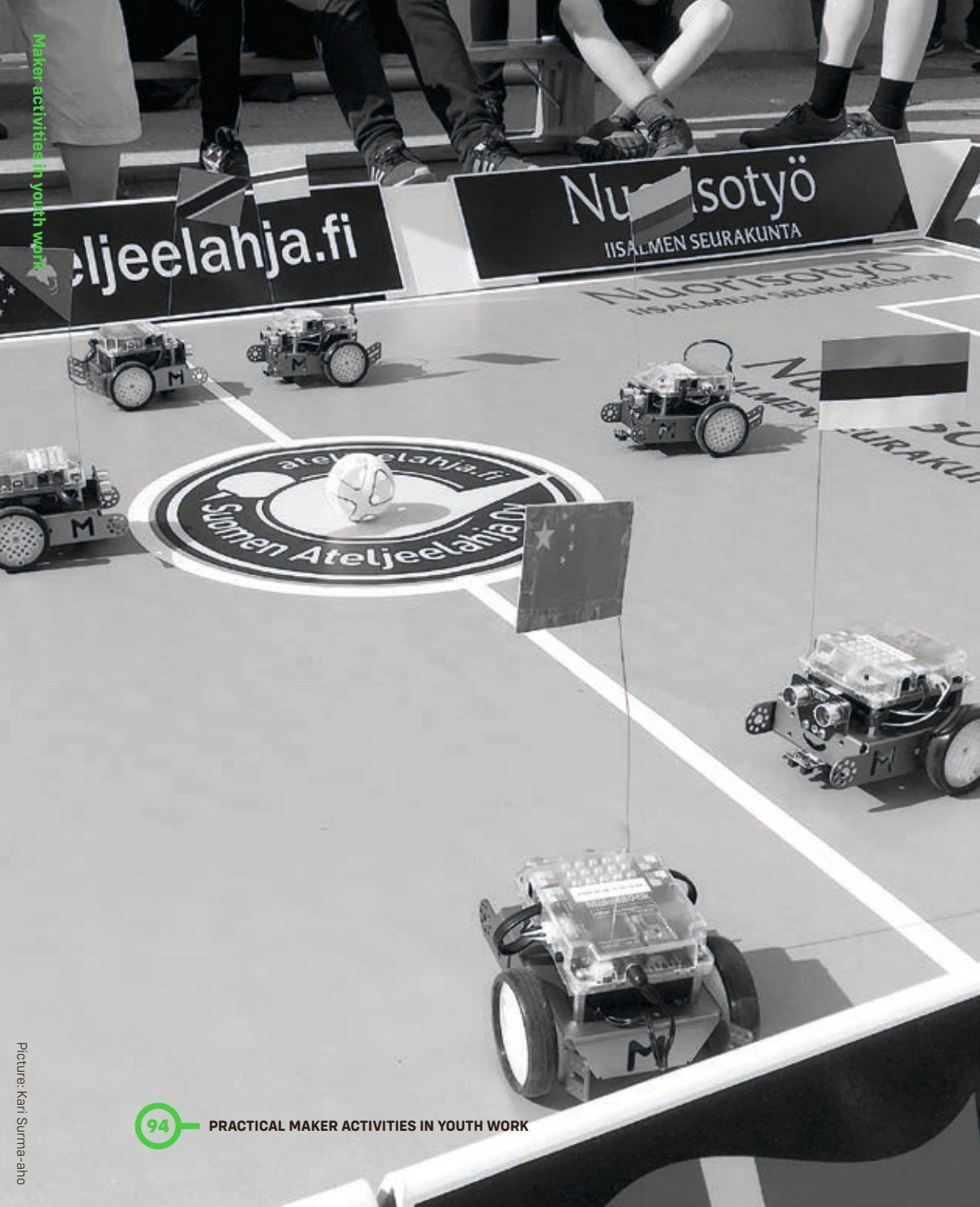
I contacted Verke to come and provide mBot training for the parish employees who participated in the joint purchase. In the spirit of cooperation, I also sent messages to local schools, the library and the city's youth services to inform them of the opportunity to receive free training. To my delight, the parish youth workers were joined at the training event by teachers from two different schools, representatives from the library and the city's youth services, and even two participants from outside the area (from Kuopio and Vesanto). At the training event, everyone had the opportunity to see differ-

ent versions of mBots in action and to test them for themselves. After four hours of training, we continued to study and build mBots on a self-directed basis. The training event also provided a good opportunity for networking with other professionals in related fields from the area.

Local networking in your city is also a sensible thing to do from the perspective of resources and the organisation of work. The ICT programme at the local vocational school showed me what they had done with the programmes they had developed. We have also worked with the city's youth services to borrow their iPads to use them to control and program the mBots at several public events. Inspired by attending the training event, the library has also purchased its own mBot kits for test use to allow the city's residents to familiarise themselves with the product. Schools in Iisalmi have also shown interest in mBots, and these small robots have helped open up channels of communication even with teachers that we have previously not had much contact with. The more we have been involved in public events with the mBots and been covered in the local media, the more requests we have received to make visits to schools. We have held discussions with teachers to come up with ideas on what the school visits could look like. One possible approach would be to first let the older students assemble the mBots and then allow the younger students to drive them. We are still working on the final structure of our school visits. While we wait for them to get started, we have received a good amount of publicity in the local press for our mBot activities.

YOUTH WORK APPLICATIONS

The parish organises a "feel good day" early each year for 8th graders in cooperation with schools and the city's youth services. The purpose of the day is to bring a welcome break to the long winter of schoolwork by doing something fun together. The participating students make their way around many different activity points, spending about 45 minutes at each. Our contribution was an activity point where the students had to drive an mBot through a slalom course as quickly as possible. The students, who went around with their classes in groups of 20–25, were surprisingly excited by driving the mBots and watching others drive them.



Picture: Karl Surma-aho

We have also used mBots at open house events a few times, but these have not involved actual assembly or programming activities. The mBots were also exhibited at the spring fair organised by the city, and visitors to the fair had the chance to try them out.

The national Mission Festival 2018 was held in Kuopio. Our parish was selected as one of the producers of the programme aimed at young people. We built a football game using mBots. The playing field was a 2x4 metre roll-up "play mat" with the lines of a football pitch printed on it. It also had walls around the edges to prevent the ball from leaving the playing field. We used a floorball ball and played games consisting of two five-minute halves. Players queued up for their turn non-stop. Before their turn, we gave them brief instructions on how to control their mBot. We had a constant stream of players for the two-hour duration of the activity, and everyone seemed to have a great time. We also engaged young people at the activity point by having Iisalmi-based youths serve as referee, play-by-play commentator, timekeeper and scorekeeper. One of them also worked as a technician, tightening the necessary screws on one or two mBots after each period of play. Adult parish officers supervised the queueing, took questions and gave brief descriptions of missionary work. The activity was linked to the missionary work done by the church by having the mBots adorned with the flags of six countries where the Finnish Evangelical Lutheran Mission operates: Botswana, China, Colombia, Papua New Guinea, Tanzania and Estonia. The flags also made it easier for the players to identify the mBot they were controlling. The flags were later also used in confirmation classes, as they make it easy to talk to young people about the scope of missionary work and the various activities that FELM carries out in different parts of the world.

One of the most fun occasions where we've used the mBots was the retirement party for a teacher. The other teachers organised the party for an IT teacher who plays football. Some 20 teachers attended the party. I set up the mBot football activity as described above and it was a huge success! The teachers were so excited to play mBot football that we ran out of time. It was a great way to meet cooperation partners. You simply set up a little friendly competition and our inner child comes out to play.

WHAT'S NEXT?

We haven't yet started actual coding with the mBots and the Scratch programming language, but it is an area that we should expand to at some point. I have personally explored the platform and found it promising, and it has also given me the spark to get to know the fascinating world of Arduino technology. Who knows where all this will take me!

To wrap up, I would like to encourage anyone with an interest in technology to invest in mBot kits of their own. I hope the account I have provided above underlines the diverse potential of mBots in youth work, and getting started with them is not difficult. Coming up with ideas on how to use them and organising the activities themselves is much easier when you don't need to always figure out where you could borrow a few kits.

LED HOBBYHORSES

Juha Kiviniemi

DIGITAL YOUTH WORK HAS OFTEN fallen into one significant pitfall: it has often been seen as a niche activity that is a separate islet from daily youth work. The latest European definitions, however, confirm the oft-repeated mantra: digital youth work is not a separate discipline but can be integrated into any form of youth work. The question is how this should be implemented in practice.

Maker activities in youth work have been – at least when viewed from a distance – exhibiting a similar characteristic. The activities haven't always integrated fully into daily work but have instead been seen to be of interest to a select few. The best thing for all digital youth work would naturally be full integration into the very fabric of youth work itself. In the workshop that I describe in this article, we tried to kill (depending on how you count them) at least three birds with one stone. We implemented a maker activity into both youth work tradition (arts and crafts) as well as a Finnish youth subculture (hobbyhorses). If you don't have a clue what a hobbyhorse is, it's ok - you can put this article aside for a minute and go look it up online. I'll wait.

PIMPING HOBBYHORSES

Hobbyhorse aficionados are an excellent target group for embedded maker activities since they are predominantly girls. Motivating girls and young

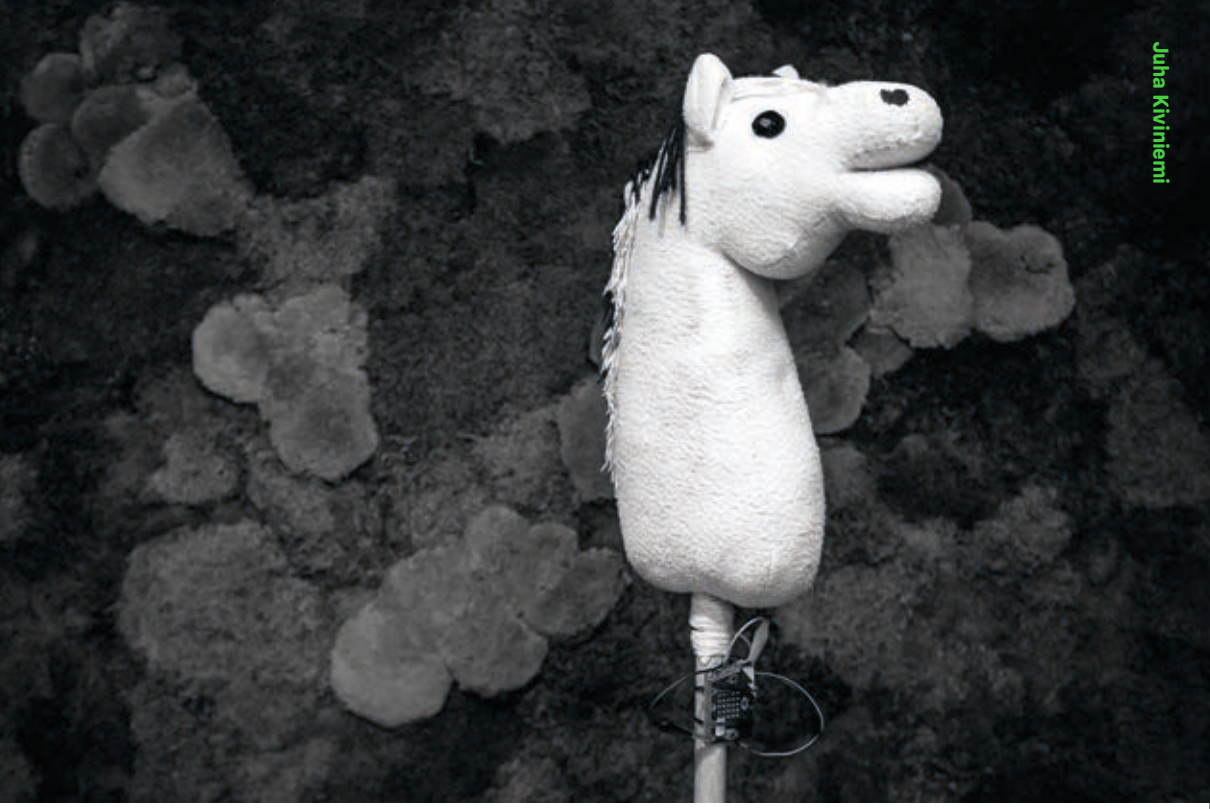
women to engage with activities based on technology can be quite a challenge for even the most proficient of educators. One thing applies here, though, as it does with other activities: girls – or anyone else for that matter, barring tech hobbyists – don't usually engage with a technological activity solely for the technology itself. Instead, they are drawn in by something they are already interested in, whether it's hobby horses, old-school synthesisers or visual art. Many youth work activities are attractive to young people as they are, and it would be wise to build technology education content around them.

Our hobbyhorse workshop is at least on the surface very simple. Our idea was to build glowing LED lights into the eyes of the hobbyhorses, as done before in a workshop by our colleague Mikko Turunen. This requires creating a simple circuit to be inserted into the hobbyhorse, either a pre-existing one or one made on the spot. Since we wanted to take things a bit further and tie the workshop even more securely into digital technology, we also opted to add a microcontroller into the circuit so the eyes could be programmed. This gives us the chance to transform programming from an intellectual activity existing only on a computer screen into something that has an effect on the physical world. Experience has taught us that learning coding becomes much more engaging when utilising this kind of approach.

There is an additional benefit to be gained when we combine a "traditional" youth work method with technology education: there is a definite opportunity for peer learning among colleagues. Digital youth work has often been implemented and developed by a few single individuals both in Finland and abroad. In this kind of activity, we can potentially make full use of two youth work professionals' specific expertise, for example, a digital youth work guru and an experienced crafts instructor. By implementing a common youth work activity, they can learn from each other's skill set and approaches. Ultimately the young people they work with will invariably benefit from this process.

TOOLS OF THE TRADE

You obviously can't have a hobbyhorse workshop without hobbyhorses. Many hobbyists potentially coming to your activity will probably already



have one (or several, or too many to count, as often happens with any hobby). Alternatively, the hobbyhorses can be bought from a store or manufactured as part of the workshop. Especially when young people are bringing their own, it's fair to make clear that the hobbyhorses used will have to be subject to some invasive surgery. How else can you install new eyes?

The first technical part of the process is the circuit. What you need are LED-lights of your chosen colour (an assortment can be offered to participants to select from), suitably sized resistors (so your LED lasts longer) and some wire. You might want to also get little clips to attach your leads to the microcontroller. The microcontroller (more of which later) is the single most expensive component of the bunch, and even that one costs under 20 euros each.

It is probably obvious that you also need some tools to actually build the circuit. Since wires with the insulation still on don't conduct electricity very well, it needs to go. While you could use your teeth (please don't), the removal of insulation from the ends of the wire is better done with any sharp object, from scissors to bowie knives. Sometimes a neater (not to mention easier, and definitely safer) result can be reached by using specialised pliers. While it is basically possible to build the circuit by just twisting the ends of the wires together, this isn't recommended – this kind of joint is not optimal from neither a mechanical strength or conducting efficiency standpoint. You will be much better off by soldering the connections. This kind of project doesn't require advanced micro-soldering skills, so it is doable even with inexperienced participants or instructors. When I tested the workshop concept I was making solder joints together with an 8-year old participant without receiving nor incurring significant burns; she had never done it before, and I am myself by no means an expert either. Soldering irons are hot, though, so some basic safety considerations are in order.

There is also an added benefit to making a soldered circuit even if you don't absolutely have to in this project. Inevitably when your maker skills and activities develop you will need to create new solder joints or dismantle existing ones. A particular principle is evident in many non-formal learning processes, as well as most (if not all) maker activities: you can always build on what you have previously learned and progress toward more complex projects. There is also a redeeming factor to this project that makes it perfect to learn to solder: since the circuit will be hidden inside the hobby horse, the solder joints don't need to be pretty, as long as they work. I know my own messy blobs of solder rarely invoke the beauty in the eye of the beholder, but they work most of the time.

The circuit itself is easy enough to construct. From the jaws (or, if you are not using a microcontroller, straight from the power source, usually a battery holder) you have two wires coming out. Often these will be red and black; if you have used your own leads, your colours might differ. What's important is that you know which is which, by for example testing them with your LED light; for reference, the positive leg of the LED is usually longer. If

your wires are the same colour, save yourself some trouble and mark them to differentiate them. I know from personal experience that figuring out the difference between yellow and yellow several times in a row can get tiring after a while. The colour of the wire doesn't matter to the signal (or power) within, of course - this is only for our benefit.

The circuit diagram is as simple as this: the positive lead from your power source goes (via a suitable length of wire) to both LED's positive leg. This means you have to make a Y-shaped lead by soldering three lengths of wire together. On each positive leg, you might want to solder a suitably sized resistor to improve the durability of the LED light; instructions for resistor values (as well as a more extended explanation why this is a good idea) can be found online. To be fair, I skipped this part when using the micro:bit and a 3V LED and nothing exploded or caught fire. Your mileage may vary. After completing the other side, repeat the same steps (without the resistor) for the negative lead. If you are using only a power source, you are now ready to install your circuit inside the hobby horse.

When the circuit is complete, it's time to tackle the surgical side of things: the new, shiny eye transplants should be, well, in the eyes and the rest of the circuit should be tucked away inside the hobbyhorse. Before installation, it's usually a good idea to test that everything works. If there is no light, it's time to engage in an exciting game called "troubleshooting", which often teaches us much more than building something and succeeding on the first try. For any adult guiding young people through the process I will give one tip, which might be obvious to some: rather than telling participants why the circuit isn't working, even if you see it yourself, instead ask good questions that reinforce the logic of how things work. This way learning is even further enhanced. I find it an excellent approach to ask participants to follow the signal path from the beginning, whether we are soldering or building something on an Arduino breakout board.

If you are building the hobbyhorse in the same workshop, it's advantageous to structure different phases so that participants are not required to tear down something that they just made an effort making and, with a larger group, so that everyone isn't necessarily on the same phase at once. When

the hobbyhorse is a pre-built one, some consideration should be made on how to install the circuit with minimal damage to the outside shell of the hobbyhorse. Here we can still use a lot of creativity because most of the end result is hidden from prying eyes.

ADDED INTELLIGENCE VIA MICROCONTROLLERS

In this project, we used the micro:bit microcontroller, which is covered more in depth by Maja Katinić Vidović elsewhere in this book. Simply put, a microcontroller is a device that does what it's told and controls a device attached to it according to its programming. We had three reasons to use micro:bit for this project: first of all, it is cheap in comparison, coming up at under 20 euros each. Second, it's used to teach kids programming in primary education and is in fact intended for this very use. Third, the device itself is tiny, as the name implies; about the size of a matchbox, it's easy to conceal inside the hobbyhorse without it gaining too much weight nor bulk.

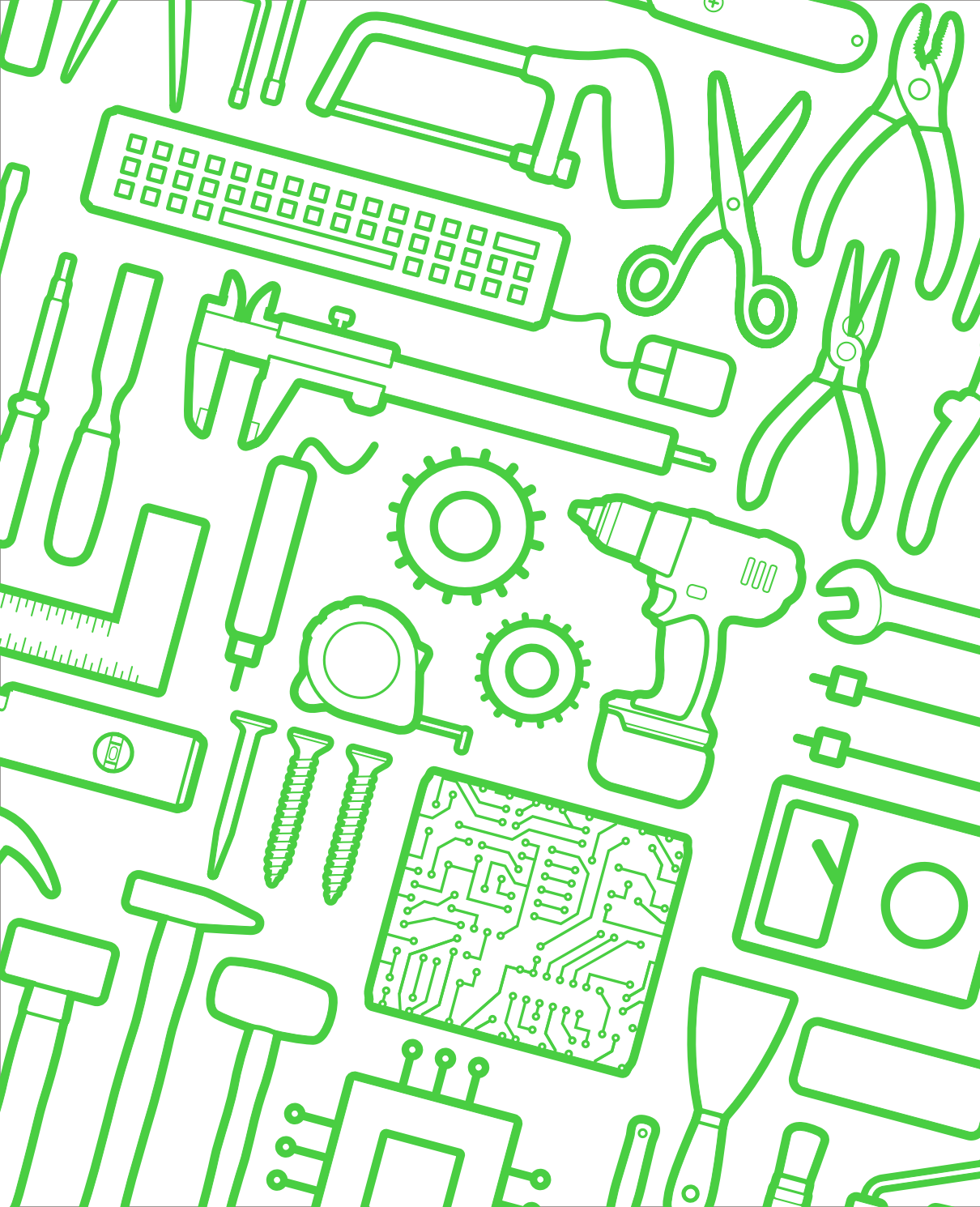
Programming the micro:bit is straightforward and is done through a visual programming environment. Neither participants nor youth workers are required to know how to code, but logical thinking skills and creativity are essential. By using a microcontroller (instead of a straight-up power source), we can enable young people to define how their upgraded hobbyhorse acts. The eyes can, for example, light up when the microcontroller shakes (i.e. when the hobbyhorse is being ridden) or when a certain threshold of acceleration is passed (when you run fast enough). With additional hardware and creative solutions, other configurations are possible. Even though we weren't able to test very complicated circuits within this workshop, I'm confident that young people could come up with very creative solutions given the proper support and room for experimentation. A good starting point for programming can still be to provide young people with specific tasks or goals, such as "how can you make the eyes blink five times every time the hobbyhorse is shaken?" Once the basics are there and their creative minds start churning, it's time to change gears from trainer to supporter.

FRONT AND CENTRE: YOUTH WORK GOALS AND YOUNG PEOPLE

All digital youth work should always be underpinned by youth work goals and values. With this kind of activity the goals can be varied: maybe we want to increase or broaden the appeal of our existing crafts workshops, maybe engage more girls to experiment with technology, perhaps we want to teach coding, or maybe we just want to provide meaningful leisure activities. Whatever the case, it's always good to reflect on how the activity fits into our own youth work goals and maker sure that young peoples' needs and wishes are addressed.

After your project or single workshop is done, you still have two things to do. The first one, preferably done with participants, is central to maker culture: sharing. Whatever project you completed, share your results and what you've learned with other young people and youth workers. Challenge others to do even better and help your participants to take pride in what they have accomplished.

The second and perhaps even more critical task is to identify the young people who have got some kind of new kick, spark or joy out of the project and ask from them the most important question of all: "What do you want to do next?"



CONTRIBUTORS

DAVID ALLISTONE is an artist, maker, facilitator and director at Exploring Senses CIC, which is a UK not for profit community arts organisation. When David is not making things at work, he will be found making things at home with his family or DJing playing records at parties.

ALEXANDRE BOUTAUD is a human and an enthusiast about making and sharing with the hope of changing the world.

TOMI DUFVA is a lecturer in Aalto university School of Arts, Design and Architecture. He specializes in new forms of visual arts education. Dufva is also an artist that combines new media with traditional methods. His research in centered in post-digital art education, bodily aspects of digitality, combining arts, science and technology, coding literacy, media education and questions around AI and machine learning.

JANICE FEIGHERY has developed and led digital creativity and STEAM programmes for youth workers and young people in Ireland and internationally for over 12 years. She co-founded the TechSpace Programme and currently works for

Camara Education Ireland where she manages the Certificate in Digital Creativity in Youth Settings, in partnership with Maynooth University.

HEINI KARPPINEN is the CEO of Mehackit, a social enterprise with a mission to democratise technology skills. Heini has a degree in education and a career in consumer research and business development. Now her ambitions are at scaling Mehackit Atelier online learning service for global markets in schools and youth work.

JUHA KIVINIEMI is a digital youth work expert who has become interested in the possibilities of maker education in the last couple of years. When he is not training youth workers in Finland or abroad, he can most likely be found online trying to assimilate all the information on the internet.

BARBARA NEA works towards equality and social justice by developing, managing and delivering inclusive educational programmes. In London, for 13 years, she worked in a number of Black, Asian, minority ethnic and refugee organisations in capacity building, training, policy development and programme management roles. She is also a qualified teacher and has taught physics in secondary schools from 2012 until 2016. Today she combines her interest in STEAM education with her previous experience of working in voluntary sector organisations in her post as Coordinator of the STEM in Youth Work project.

HEIKKI PULLO is a technology educator who published his master's thesis in 2015 on Finnish maker culture. Now he works in Arabia primary school in Helsinki and as a technology educator in Käsityökoulu Robotti. He also works as a freelance trainer through his webpage makerspaceman.com.

ROBERT SCHOMMER studied psychology and mechanical engineering in parallel and quit both german universities because of a challenging job opportunity at a local TV station in Luxembourg. A few years later he started his own rich media company and he is a niche solution provider in the ICT domain.

KARI SURMA-AHO has been a youth leader for the Evangelical Lutheran Church of Finland since 1988. He primarily works with young people over the age of 13. Kari is interested in all sorts of technical gizmos, from foam RC-airplanes to electrical or mechanical puzzle locks in escape rooms. Kari's motto is "screws are meant to be opened and machinery is meant to be explored."

HILARY TIERNEY is a professional youth work educator based in the Centre for Youth Research and Development at the Department of Applied Social Studies in Maynooth University. I've no doubt about the potential of creative collaborations to change the world.

MAJA KATINIĆ VIDOVIĆ is an Erasmus+ trainer and an e-learning expert. She is involved in several international projects as a training & education specialist. She spends her days mixing education and IT, reading old-schools books, doing sports and watching Netflix.

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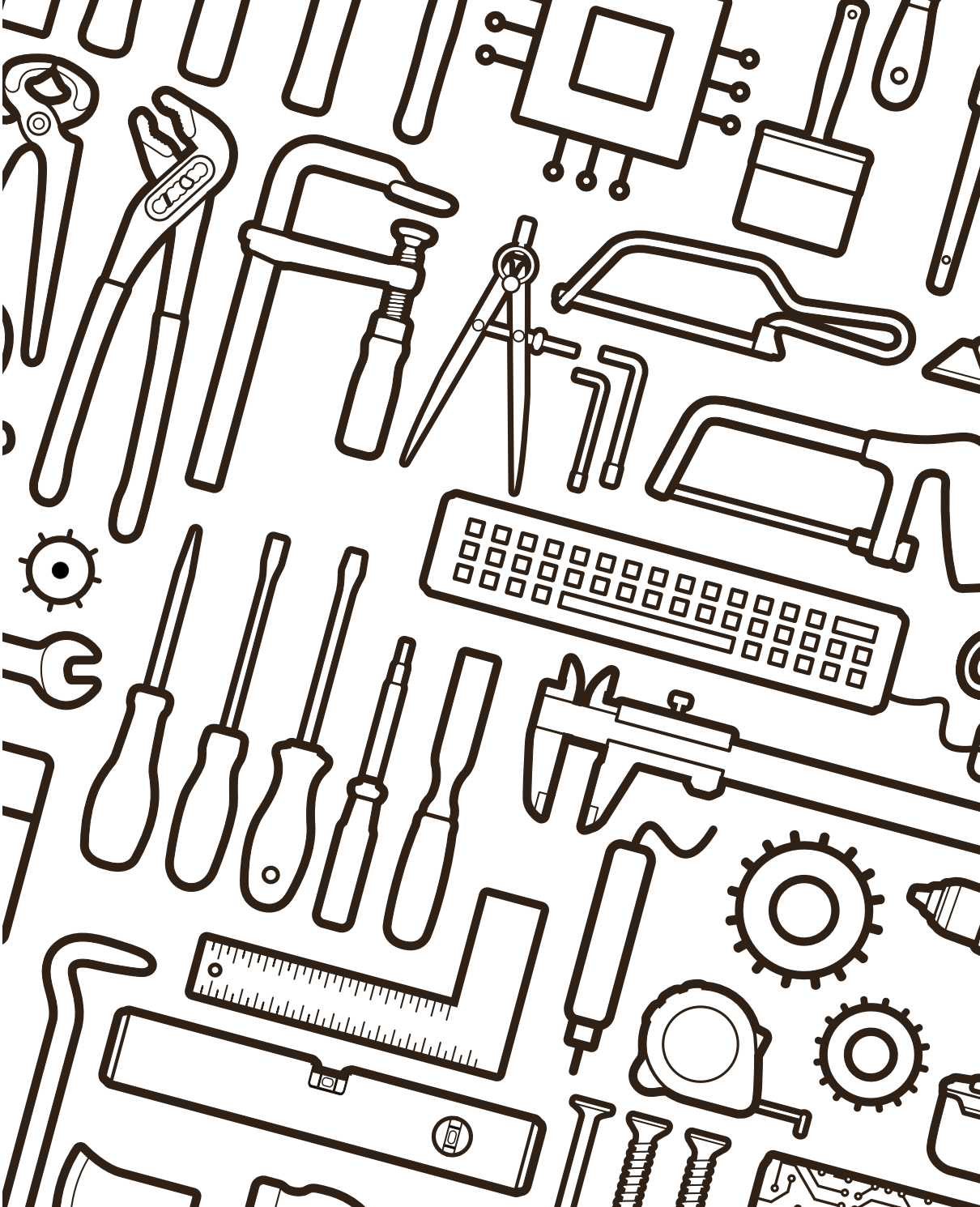

MAKER ACTIVITIES IN YOUTH WORK

WHAT IS THE SIGNIFICANCE of the maker movement for youth work? What do maker culture and youth work have in common? What is the added value of maker activities for established youth work practice? How does one get started?

The maker movement has brought forth DIY culture once more. Although youth work has a long-standing tradition in both supporting young people's practical know-how and developing digital youth work, adapting 21st-century craftsmanship to youth work curriculum hasn't always been easy. It is clear, however, that the youth work field must adopt maker methods as a permanent part of youth work methodology to keep up with technological progress. The articles in this publication seek to explore the possibilities of maker activities in youth work from the viewpoints of digitalisation of society, maker culture as well as practical youth work activities.

This book is intended for anyone interested in digital youth work and maker activities. We hope that it will aid readers in understanding the phenomena behind practical maker activities while giving new viewpoints and tips for youth work practice. Most of all we aim to inspire readers to explore the possibilities of maker activities in practical youth work.

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