# MAKING SPACES

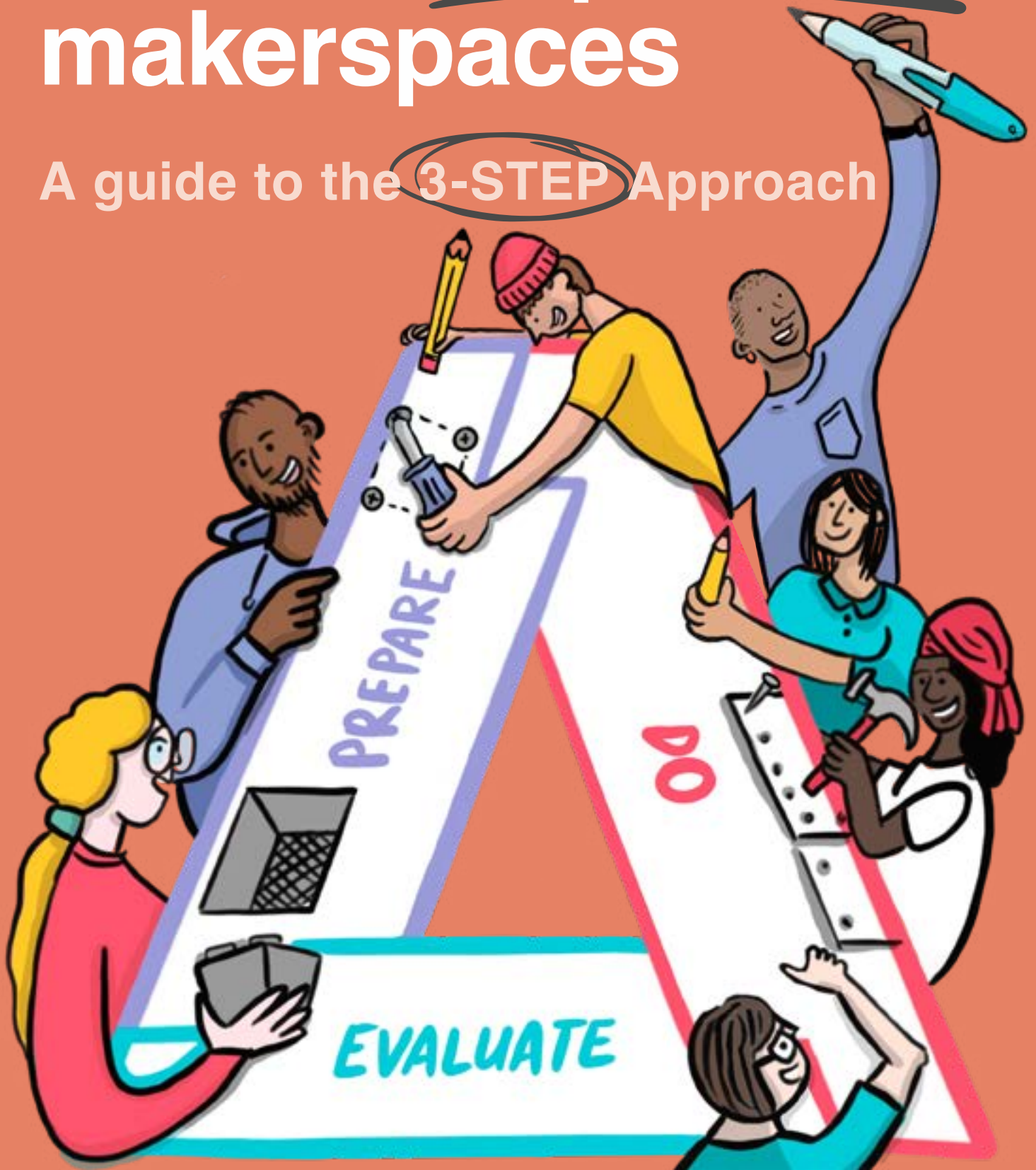# Towards equitable makerspaces

A guide to the 3-STEP Approach

# Contents

# Overview

## Why strive for equity in makerspaces?

**This guide is designed to help makerspace practitioners develop and enhance their practice in more equitable and inclusive ways.**

Makerspaces are exciting spaces with huge potential – they can support innovative and creative science, technology, engineering, and maths (STEM) rich making that benefits individuals and societies. They also help foster the skills and innovation that are needed to address societal and global challenges, such as the climate crisis and social inequities.

**Yet, relatively few makerspaces manage to work in sustained and meaningful ways with young people from under-represented and marginalised communities. This is a real lost opportunity because equitable and inclusive makerspaces can benefit everyone.**



**CONTRIBUTE** to building fairer, more inclusive communities and society

**SUPPORT** diverse young people to take action about issues they care about and achieve a wide range of positive outcomes, such as increased skills, confidence, and employment prospects

**INCREASE** and diversify participation in STEM, which is widely recognised as an urgent priority for supporting national economic prosperity, addressing global challenges, and fostering active citizenship and social mobility

**EXPAND** its reach and offer through more creative, inclusive, and impactful practice and programmes

**DEVELOP** skills and wellbeing of both staff and participants

**This guide shares an evidence-based 3-step model.**

The 3-STEP model supports makerspace practitioners towards more meaningful equitable and inclusive practice. Building on research and development work by the Making Spaces Project conducted over four years with makerspaces from five countries, this 3-step guide builds understanding of the issues and provides practical case studies and exercises to help practitioners to put the ideas into practice.
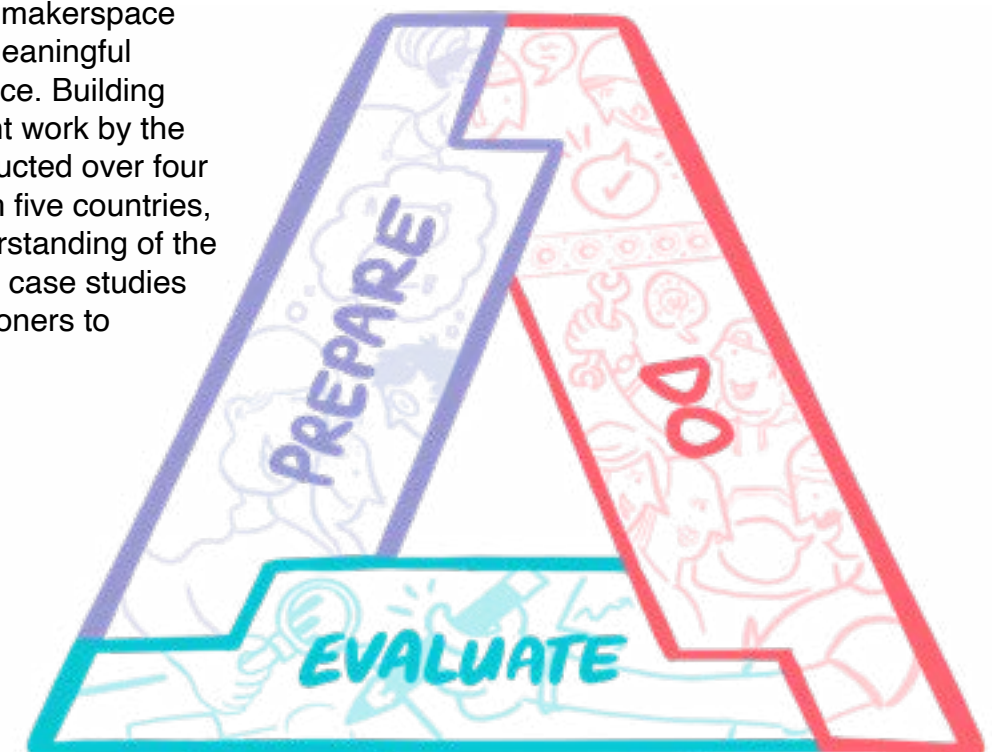
# A note on terminology

## There is a wide, and sometimes complex, range of terminology around issues to do with equity and social justice.

There are no universally accepted, used, or fixed definitions - the same terms can mean different things to different people at different times. However, words and terminology matter and the choices we make carry implications, so it is always good to carefully consider what language we use, why and with what connotations.

**In this guide, we commonly use the following terms in these ways:**



**We use this term rather than the common alternative 'equality'** to convey our understanding that rather than trying to treat everyone the same, it is better to provide differentially according to need.

E.g. ensuring that everyone has what they need to succeed, recognising their different contexts and starting points, rather than assuming that everyone can benefit equally from identical provision.

**We use this term to refer to the ideal of just, fair inclusive and reasonable societal relations** and outcomes, such as an equitable distribution of wealth, opportunities, and privileges such that all individuals and communities can exercise the full range of their rights without fear, discrimination, suffering or injustice.

**We use this term to refer to the practice or policy of ensuring a sense of belonging and fair access** to opportunities, resources and outcomes for all, so that no one is excluded or marginalised e.g. on the basis of their identity or background.

**We also use a range of terms to refer to people from communities that are excluded and under-represented in STEM and makerspaces.**

**These include:** *marginalised, under-served and minoritised.*

We use these terms rather than alternatives such as 'disadvantaged' because they helpfully emphasise the role of privileged or dominant systems, structures and relations in creating relations of inequity and exclusion.

**We believe that by thinking and acting in equitable and inclusive ways, makerspaces can work towards social justice.**

This guidebook talks a lot about equitable practice, by which we mean approaches to teaching, learning and facilitation within makerspaces that aim to challenge and transform unequal, dominant relations of power and privilege. As discussed later (in Step 3: Evaluate), our research has been particularly interested in investigating the extent to which equitable practice within makerspaces can support equitable youth outcomes (see Appendix A for our Equitable Youth Outcomes Framework). When equity is mainstreamed and embedded in professional practice, it can be a powerful force for positive change.

You may find this glossary of terminology helpful for understanding how we are using other terms. This glossary was co-developed with practitioners and young people, so we hope it is as clear and accessible as possible.

# The 3-STEP Approach

**The Three Steps Towards Equitable Practice (3-STEP) approach helps makerspaces strive towards equitable and inclusive practices and outcomes.**

The three steps (prepare-do-evaluate) may be familiar to you from other areas of organisational improvement. However, by introducing these familiar steps in the context of equity in makerspaces, this guidebook offers an innovative method of making equity a reality.

**The 3-STEP approach provides a comprehensive and practical way of putting your equity ideals into action.**

Its iterative approach is intended to be used cyclically, with the capability to return to any step that needs more attention.

This guidebook takes you through the approach, helping you to understand and complete each of the three steps by working through guidance notes, tools, case studies, reflective questions and practical exercises. (See Key Guide Elements on page 9.)



CRITICAL REFLECTIVE PRACTICE

PREPARE

CO-PRODUCTION

EQUITABLE PEDAGOGY & GOVERNANCE

DO

EVALUATE

AN EQUITY MINDSET

EQUITABLE SPACES

EQUITABLE OUTCOMES

INCLUSIVE ACCESS & OUTREACH
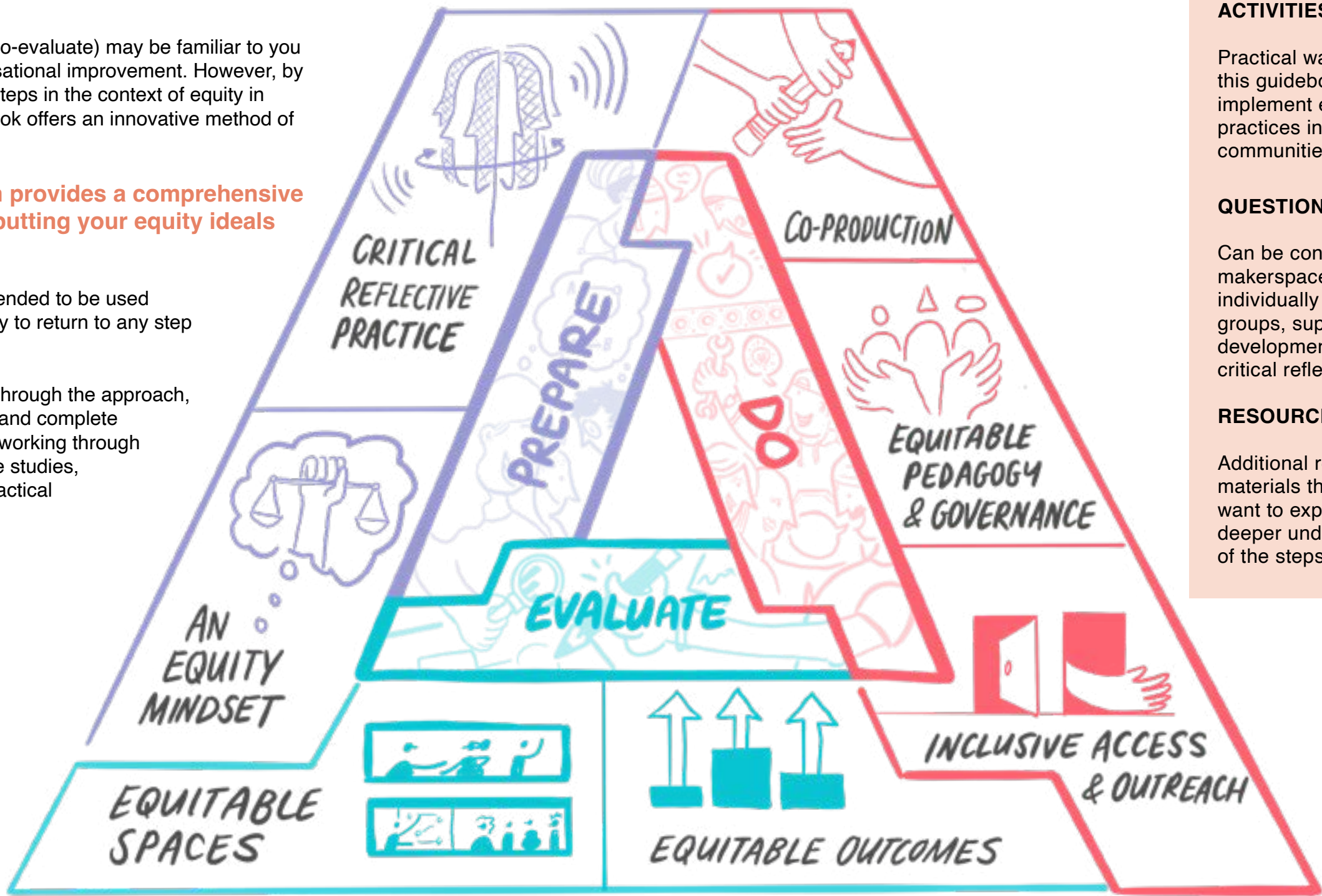
## Key Guide Elements

**CASE STUDIES**

Anonymised and collated examples from our project that best illustrate how the steps have been embedded by makerspaces in practice.

**ACTIVITIES**

Practical ways readers of this guidebook can directly implement equitable practices in their own communities.

**QUESTIONS**

Can be considered by makerspace practitioners individually or in groups, supporting the development of their critical reflective practice.

**RESOURCES**

Additional resource materials that you may want to explore to gain a deeper understanding of the steps.

# Who is this for?

**If you work or volunteer at a makerspace, are planning to set up or commission a new space, or work with young people in any capacity using scientific, technological and/or engineering-based making, then this resource is for you.**

As shown opposite, there can be multiple roles in a makerspace. For ease, we use the term makerspace practitioners as an umbrella term for all those who work in a makerspace in a variety of roles and capacities.

**This guidebook supports practitioners to:**

Understand key issues and ideas for supporting equitable practice with diverse young people

Put ideas into practice

Learn about the expected outcomes from such an approach

Access and use tools for evaluating your practice

**Whether you are new to thinking about engaging young people in your makerspace or have extensive experience of inclusive engagement, we hope this resource will be of interest and relevance to you.**

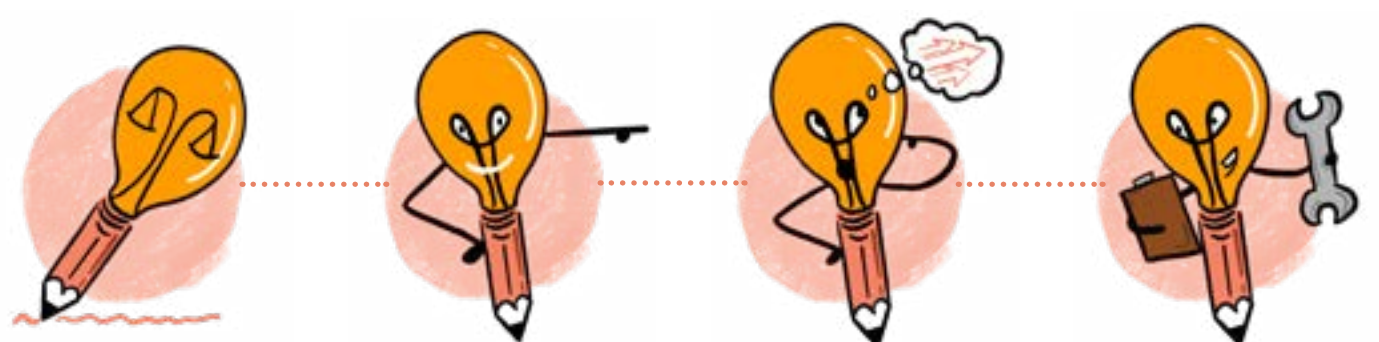The diagram on the next page details some of the ways in which this handbook and associated online resources may be useful for makerspace practitioners in a range of different roles.

## ROLES

## How can I use this resource?

*Heads of makerspace organisation who set organisational priorities and strategies, and make funding decisions*

- Inform policy and decision-making regarding equity, diversity and inclusion agenda
- Help create more equitable and youth-centred programmes
- Increase understanding of how your makerspace can be more accessible for diverse and marginalised young people
- Improve organisational evaluation
- Generate new understanding to support fundraising in relation to equity issues
- Design outreach strategies/activities to invite the makerspace into new and diverse communities.

*Staff who manage, design and run youth programmes*

- Gain new understanding about how to run equitable workshops and programmes for diverse young people
- Generate practical ideas on how to design and evaluate programmes that support equity
- Achieve increased understanding of how to support young people with diverse needs
- Develop tools to work collaboratively and equitably with colleagues and young people.

*Staff who support youth programmes and provide technical expertise*

- Achieve increased understanding of why and how to support more inclusive participation
- Generate practical ideas on how to support diverse young people's participation in your programmes
- Develop tools to work collaboratively and equitably with colleagues and young people.

*Staff or volunteers who support facilitation and running of youth programmes*

- Achieve increased understanding of why and how to support more inclusive participation
- Generate practical ideas on how to support and evaluate diverse young people's participation in your programmes.

# What is this resource based on?

This guidebook and the 3-STEP approach are the result of a four-year international collaboration between university researchers and seven makerspaces from five countries (Nepal, UK, Palestine, Slovenia and USA) as part of **Making Spaces**.

**Find out more about:**
- **The UCL Research Team**
- **Makerspace Partners**
- **Youth co-researchers**

This resource is a result of practitioners, youth co-researchers and university researchers coming together to reflect on their practice and try out more equitable ways of designing, planning and facilitating their youth programmes in makerspaces.

Throughout this resource we have included anonymised composite case studies that reflect learnings from the findings of this research. In addition, we have included the (anonymised) voices of young people and practitioners who took part in the study. For more background information on our research project, see Appendix B.

# How to use this resource

Completed individually or collectively, this guidebook can be used as a professional development tool or in broader organisational development.

It is divided into four main sections:
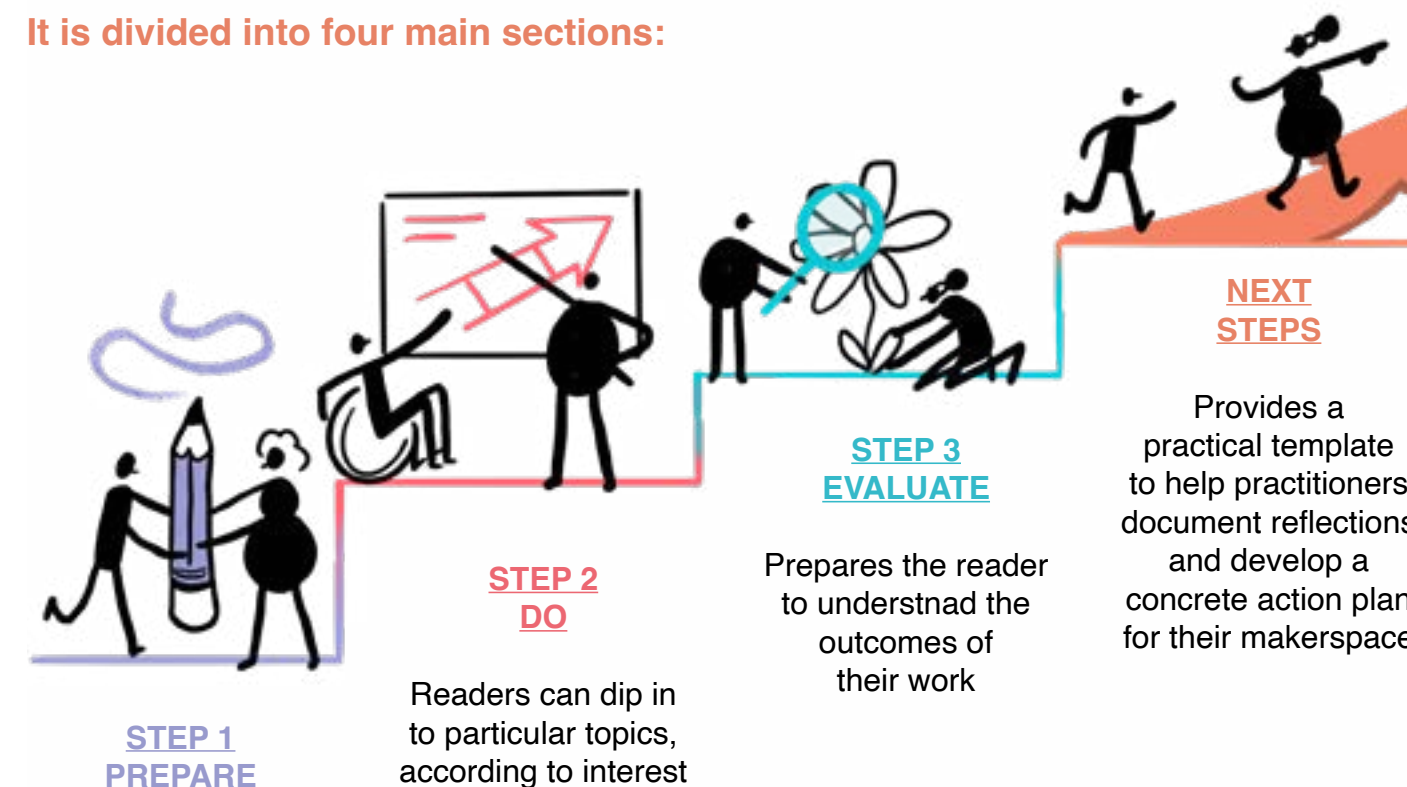
**STEP 1 PREPARE**
This will provide key tools to engage with the rest of the guidebook

**STEP 2 DO**
Readers can dip in to particular topics, according to interest

**STEP 3 EVALUATE**
Prepares the reader to understnad the outcomes of their work

**NEXT STEPS**
Provides a practical template to help practitioners document reflections and develop a concrete action plan for their makerspace

It may be useful to print out a copy of the activities and make notes on it as you work through the 3-STEP approach. The guidebook can be used as a standalone resource, but you may find it more effective to use it in conjunction with the associated online course.

**As an individual** you may wish to work through the reflection questions and activities on your own. If you do the online course, you can share reflections with others taking the course.

**As a group or organisation** you may wish to set up a joint meeting to tackle the reflective questions and activities together. Some readers may also find it particularly effective to complete a week of the online course alongside reading this guidebook, followed by a collective team meeting, during which participants discuss their ideas and reflections.

# Impact of the 3-STEP approach

Over four years, the team iteratively developed and trialled the approach, collecting extensive qualitative and quantitative data to understand its impact on youth and practitioner outcomes.

*I met amazing new people, learnt about new industries, and gained skills – I learnt so much and I feel hopeful for my future.*

**Youth participant**

## Data collection included:

**Pre/post surveys** with young people who attended makerspace programmes on which practitioners employed the 3-STEP approach.

**Surveys with practitioners** to capture their experiences of using the approach.

**Interviews with young people and practitioners** who had taken part in programmes using the approach.

**Data (field notes, photos, videos) of youth programmes** that used the approach, and practitioner workshops.

**Arts-based and creative evaluation data** from practitioners and young people who had used the approach or experienced it in action.

Analysis of this data indicated that the 3-STEP approach resulted in a range of positive outcomes for young people, practitioners and the makerspace organisation.

Our evidence shows that equitable and inclusive practice supports a wide range of benefits to young people and wider society.

This includes improved STEM-related knowledge and skills, as well as benefits to young people's identities, employability, and mental health and wellbeing:
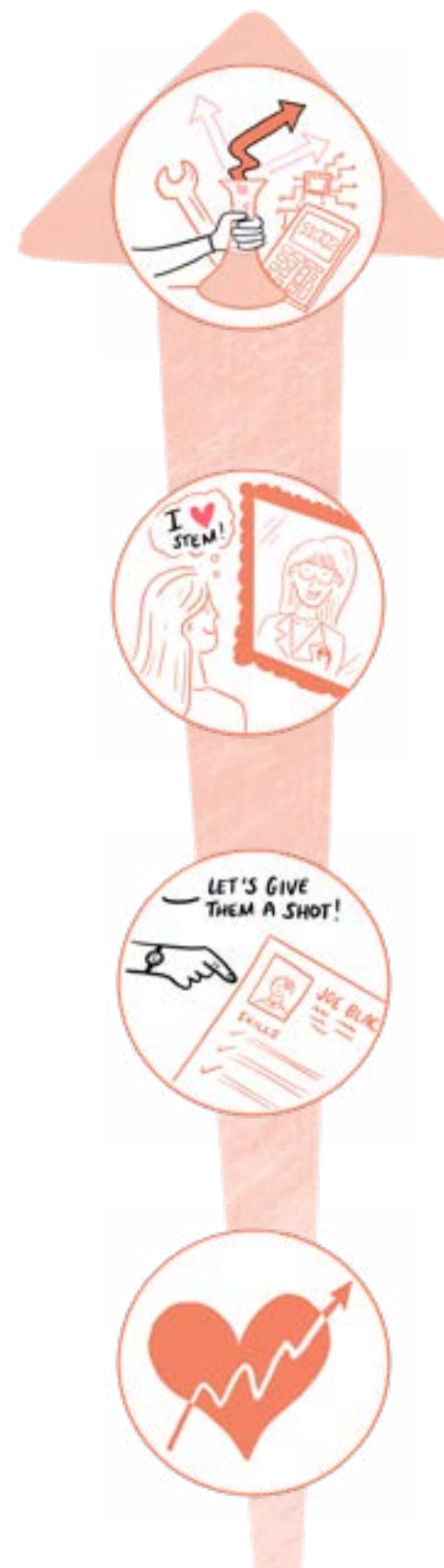
### Improved STEM skills among young people from diverse communities

This is valuable for supporting young people's potential life chances, social mobility and active citizenship, and for achieving national goals of widening participation in STEM and addressing STEM skills 'gaps'.

### Increased identification with STEM

This is helping to increase and diversify the constituency that feels connected to STEM. This is important, given that wider research shows how identity is a key mediator of STEM engagement and participation.

### Improved employability among diverse young people

Enabling more young people – particularly those from under-represented communities – to feel more confident and prepared for future work. This is beneficial to the life chances of the young people in question, as well as to the social and economic wellbeing of their communities and wider society.

### Improved health and wellbeing among young people, particulary those from marginalised communities

This is important for young people themselves and for wider society, given fears about the global mental ill health 'epidemic' affecting young people, particularly in the wake of the COVID-19 pandemic.

# Youth outcomes

**Analysis of pre- and post-survey data showed significant increases in young people's STEM skills, STEM identity recognition, job/career skills and teamwork skills.**

*It was so inspiring, especially being able to see the representation of all these women and people of colour who are so amazing.*

Youth participant

*Built confidence through learning multiple coding languages, while also receiving CV help and advice.*

Youth participant

*I was able to obtain valuable skills, met so many amazing, supportive people. I found out what I wanted to do for a living.*

Youth participant

**Results show increases in many equitable youth outcome areas after participating in this approach.**



YOUTH OUTCOMES — PRE / POST bar chart showing percentages for ENGINEERING SKILLS, DIGITAL SKILLS, COMPUTING SKILLS, SCIENCE SKILLS, STEM IDENTITY RECOGNITION, CAREER SKILLS, TEAM WORK
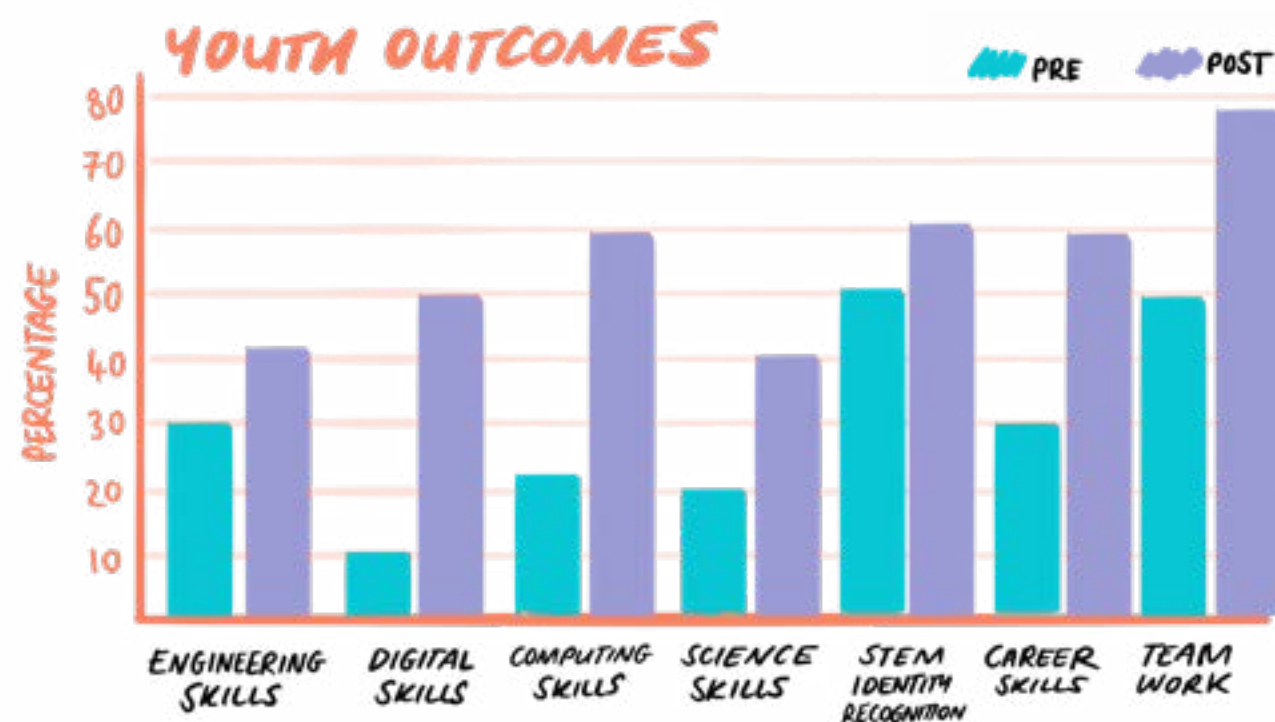
The majority of young people also reported increased confidence across a wide range of areas as a result of their participation in makerspace programmes that used the 3-STEP approach.



OUR POSITIVE OUTCOMES INCLUDED:

- NETWORKING 94%
- CONFIDENCE in JOB SKILLS 93%
- PREPARED for FUTURE 93%
- CONNECTED to STEM 90%
- BROADER VIEWS of WHO does STEM 88%
- MEANINGFUL MAKING 88%
- INTEREST in PURSUING STEM 87%
- SELF CONFIDENCE 80%
- FEELING SUPPORTED 80%
- CHALLENGING INEQUITY 71%
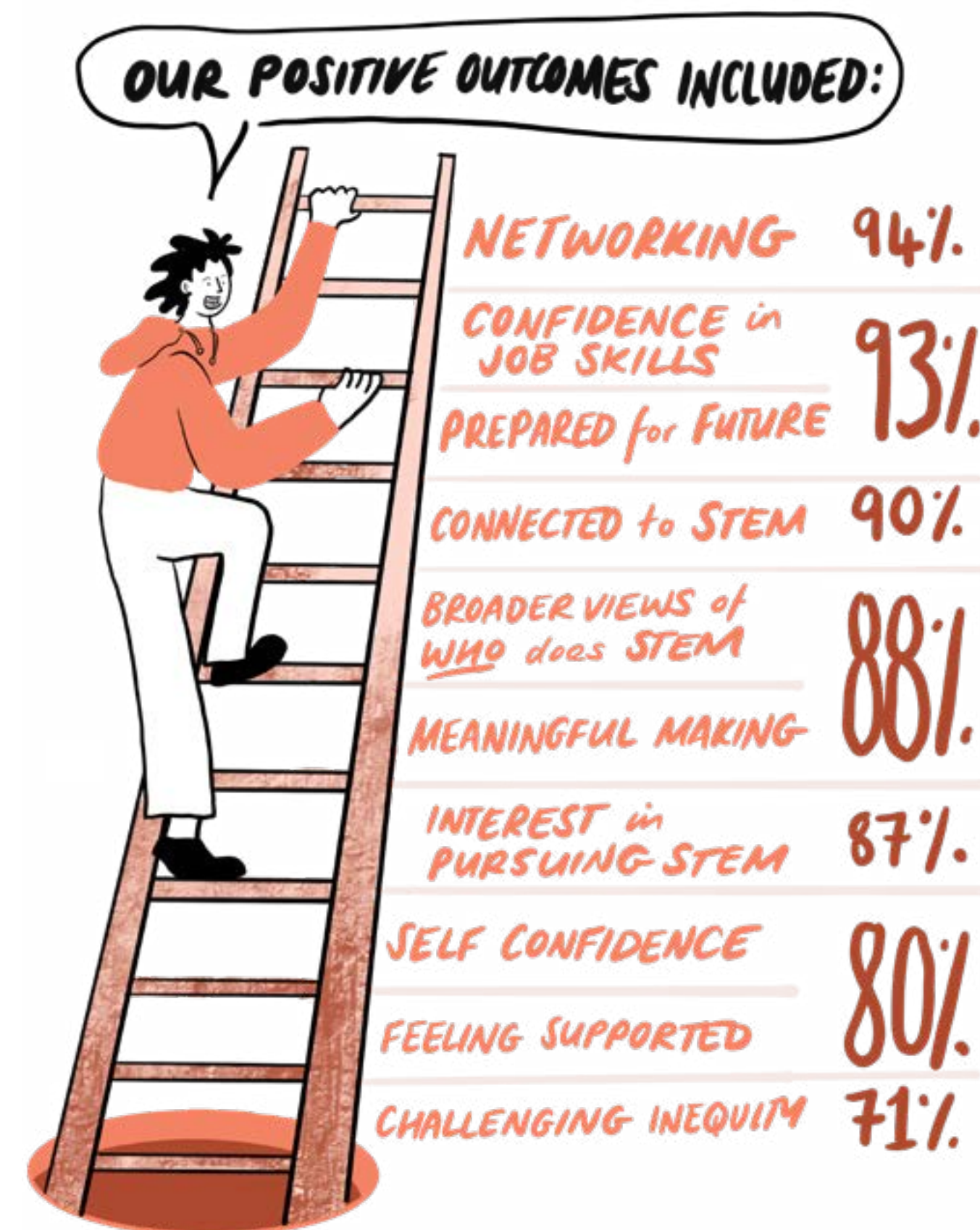
# Practitioner outcomes

**Survey data showed that practitioners felt the 3-STEP approach had increased their understanding of equity and made them more confident in their ability to design inclusive programmes.**

**100%** of practitioners agreed that their understanding of equity had improved.

**96%** of practitioners now felt more confident in designing equitable youth programmes.

INCREASED UNDERSTANDING & CONFIDENCE to design INCLUSIVE programmes

**96%** agreed that they now valued young people's voice and agency more in their practice.

**88%** reported an increased awareness of the needs, lives and backgrounds of youth participants.

# Organisational outcomes

**Positive outcomes were found for participating makerspaces at the organisational level, including more diverse participation among staff and on youth programmes, a greater integration of equity issues into organisational strategy, and stronger relationships with communities and external organisations.**

**83%** of practitioners reported their makerspaces had improved the inclusion of diverse staff.

**79%** of practitioners reported an increased emphasis on social justice issues.

OUTCOMES for ORGANISATION

**72%** reported an increase in the number of diverse young participants taking part in their courses/ programmes.

*[We have achieved] a good gender split, a good representation from people of colour and people who have different sorts of issues... more diverse voices.*

**Organisation participant**

**68%** agreed their space had increased partnerships with organisations that work with diverse/ marginalised young people participants.

# STEP 1: Prepare



## Preparation is the important first step of our model.

In this section, we explore two processes that we see as key to developing equity in makerspaces.



**First, we explore what it means to develop 'an equity mindset'** and how to utilise this way of thinking to examine relations of power and privilege in every aspect of your work.

**Secondly, we look at how 'critical reflective practice'** can help unpack embedded inequities in your setting and develop a habit of interrogation that will benefit you on your journey towards equity in makerspaces.

**Developing an equity mindset and a habit of critical reflective practice takes time and commitment.**

So, whilst **Step 1: Prepare** is an effective starting point, we encourage you to return here throughout your journey to review the ideas, case studies and even re-do the activities as part of an iterative process to improve your understanding and put the steps into practice.

You may find it useful to use the **Next Steps Table** to document your reflections and ideas at the end of this step.

# An Equity Mindset

**Over many years, our wider research has found that the potential for equitable practice needs to be built upon the foundation of an equity mindset.**

Cultivating an equity mindset means putting issues of power, social justice and inclusion at the heart of how you think about your practice. It involves making equity issues a central concern – not something that is peripheral, an add-on, or a 'nice if we have the time' consideration. An equity mindset combines an understanding of equity issues – and the different ways in which these might be understood and interpreted – and a commitment to challenge social injustices through your practice.



**So, how do you develop this 'equity mindset' and how do you know you are progressing in the 'right direction'?**

Luckily there are free, accessible tools – like the Equity Compass – for exactly this purpose.
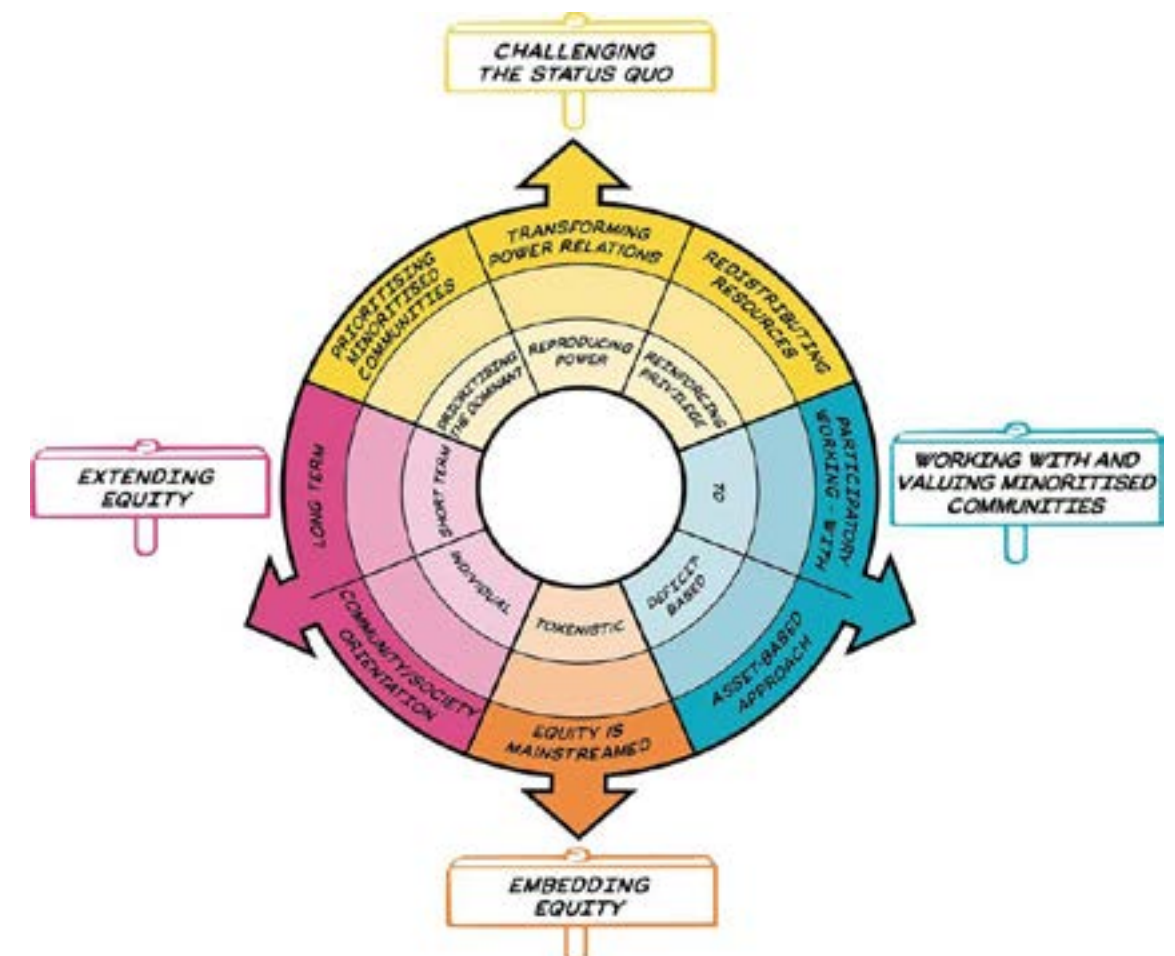
We strongly advise reading the summary document on how to use the compass (note: this version is for Informal STEM Learning practitioners – but there are also other versions, e.g. for schools, STEM Ambassadors and funders). You may also find it helpful to take the free, short asynchronous course on how to use the Compass, which will give you a good grounding in the ideas covered in this handbook.

An equity mindset can help you identify and avoid negative assumptions (known as deficit approach) of the ways in which particular young people might engage in a space, the reasons why some young people and communities are under-represented in makerspaces, and the possible courses of action that practitioners might take to try to address these issues. It foregrounds listening to, and learning from, those who experience injustices, and recognising and challenging your own privilege.

For instance, in the UK there has been a historic tendency for interventions aimed at widening participation in STEM to treat the issue as a deficit on the part of the community who are under-represented – such as due to a lack of confidence, information, motivation or aspiration. Mainstream practice and initiatives have often seen the 'problem' of under-representation as inherent to those who are under-represented (e.g. their attitudes, culture, attainment, and so on). In contrast, an equity mindset interpretation would recognise the role of dominant norms, values, systems, relations and social structures in excluding the community in question, and would recognise the value brought by excluded communities, including different (equally valuable) forms of knowledge, expertise and ways of engaging with STEM.

For instance, Maria – a practitioner who works with autistic young people – reflected on how some of her colleagues had previously expressed somewhat deficit views of the young people's capabilities within the space, such as by restricting their use of power tools due to assuming they could not understand or comply with health and safety protocols.

However, through careful and appropriate support, the young people were able to work safely with tools, challenging previous assumptions.

> **Just out of protectiveness of the students, there was a lot of 'they can't do this, they can't do that'. But now I see how carefully the young people work with the tools as they have been guided carefully and transparently about the safety regulations, and the utilities of each power tool.**
>
> **Maria, Practitioner**

You can develop your equity mindset and understanding through wider reading – we have provided a list at the end of this section . You can also use reflective tools like the Equity Compass. It can also be useful to listen to the views and experiences of those from under-represented communities to better understand the challenges they face. You can hear from some of the youth co-researchers in the Making Spaces study and learn about the barriers they found here.
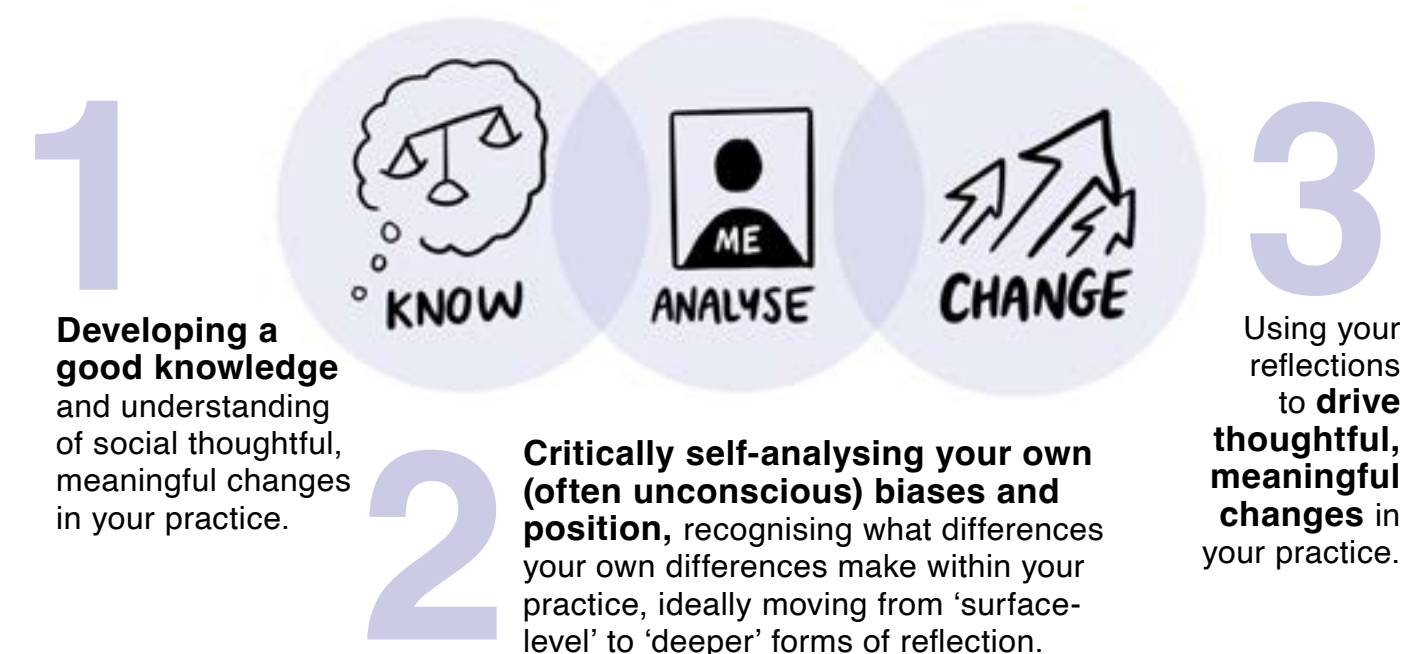
## KEY ISSUE

A key issue to remember, however, is that developing an equity mindset is not a simple, quick tick-box exercise. It is both a journey and a work in progress. It means recognising that social injustices and inequities are contextual – they are not caused or experienced in exactly the same way by everyone, and may vary across time, person, space and place. For instance, when we looked at experiences of gender inequities in makerspaces in the Making Spaces project, we noted different issues and inflections between different types of makerspace – particularly between Global South and Global North settings. It is also important to recognise the complexity of inequities and the intersectional nature of injustice (e.g. how race interacts with social class, gender, disability, and so on).



WE'RE WORKS IN PROGRESS!

"An EQUITY MINDSET is a JOURNEY"

# Critical reflective practice

The second key element of preparation is developing the habit of critical reflective practice within your work. Critical reflective practice involves questioning your own assumptions and engaging with issues of power in relation to your practice[1].

**Research[2] has identified three key aspects of critical reflective practice:**



KNOW    ANALYSE    CHANGE

**1** **Developing a good knowledge** and understanding of social thoughtful, meaningful changes in your practice.

**2** **Critically self-analysing your own (often unconscious) biases and position,** recognising what differences your own differences make within your practice, ideally moving from 'surface-level' to 'deeper' forms of reflection.

**3** Using your reflections to **drive thoughtful, meaningful changes** in your practice.

[1] Thompson, N. and Pascal, J. (2012) Developing critically reflective practice, Reflective Practice, (13)2, pp. 311-325, DOI: 10.1080/14623943.2012.657795

[2] Archer, L., Godec, S., Patel U., Dawson, E. and Calabrese Barton, A. (2022) 'It really has made me think': Exploring how informal STEM learning practitioners developed critical reflective practice for social justice using the Equity Compass tool, Pedagogy, Culture & Society, DOI: 10.1080/14681366.2022.2159504

It has been suggested that productive critical reflection embraces openness and humility[3], accepting that there are things that are unknown and that could be improved (even for the most experienced and expert practitioner), as opposed to being defensive about your own privilege and/or trying to excuse yourself from responsibility for challenging or acting on inequities[4].

An important challenge for practitioners who are from privileged communities (e.g. Global North, cis-male, middle-class, white, non-disabled, etc.) is to recognise and critically reflect on their privileged position and to listen to, and learn from, others – not seek to speak over, or for, them and not to do 'for' or 'to' them. The ways in which privilege works can be hard for those from privileged communities to identify – privilege (and its tendency to 'push back' at change) also often makes it difficult for equitable interventions and initiatives to 'stick'.

## THE VALUE OF DISCOMFORT

Engaging in critical reflection can sometimes feel uncomfortable for many reasons. For instance, if you are from a more privileged background, then it can feel uncomfortable to recognise the many ways in which you benefit from existing power relations, particularly when this is at the expense of others. It can also be an uncomfortable reminder of painful experiences for those who suffer from societal injustices. As a professional, it can also feel uncomfortable to have your usual way of doing things questioned.

But discomfort can be hugely productive and a welcome sign that you are on the right track. When you embrace this discomfort and bravely engage in thoughtful critical reflection it can greatly deepen your practice and understanding. However, we recognise that this process takes time and commitment – equity work is a journey and an ongoing process, it is not a simple tick-box exercise.

Critical reflective practice can also be enriching and rewarding – as recounted by practitioners in the Making Spaces project:

*I think in terms of our team's development, we've really benefited [from] that questioning of why we do things in different ways through this process and how we bring people in – it has really developed.*

**May, Practitioner**

[3] Bondy, E., B. Beck, R. Curcio, and S. Schroeder. (2017). Dispositions for Critical Social Justice Teaching and Learning. Journal of Critical Thought and Praxis 6 (3). https://doi.org/10.31274/jctp-180810-81.

[4] Aronson, B., & Meyers, L. (2022). Critical race theory and the teacher education curriculum: challenging understandings of racism, whiteness, and white supremacy. Whiteness and Education, 7(1), 32-57. https://doi.org/10.1080/23793406.2020.1812109.

# Case Study 1.1:

## Reflecting on equity within youth programmes

**Makerspace G runs short programmes and one-off workshop sessions in conjunction with two local schools. The schools typically publicise the offer to parents/carers and children, and invite those who are interested to sign-up. The schools also arrange transport from school to the makerspace for after-school sessions. Participants have tended to be boys from relatively privileged backgrounds. The makerspace now wants to widen participation so that diverse learners – particularly girls and those from less affluent communities – can access STEM learning and careers. They are keen to embed equity throughout their organisation and programmes, but they 'don't know where to start'.**

The format and content of the workshops tend to follow a standardised curriculum that is geared towards developing young people's science and engineering skills, reflecting the equipment and expertise within the makerspace. The sessions regularly receive positive feedback from attendees. Staff felt that participants were learning new skills and engaging well, but they were not sure how equitable their current offer was, and wanted to develop this further.

One of the members of staff, Anita, began by taking the Equity Compass online learning course in the hope that this might help give her a better understanding of the issues and some ideas on how to start. She found some of the comments made by other course participants very useful, and particularly enjoyed reflecting on her own practice and seeing how other practitioners were using the tool in a range of contexts. She found all the dimensions of the Equity Compass useful and applicable to her context, but was particularly drawn to implementing ideas from the 'participating with' and 'asset-based' dimensions within the youth programme that she runs, as she felt the course lacked this element. After a week or two, she shared this reflection with her colleagues.

Anita and her colleagues realised that, while they often worked together to design and deliver workshops, they had never properly discussed or reflected meaningfully together on the approach to delivery. They used the compass prompts to consider 'why' and 'for whom' they designed and ran their programmes. They started to hold regular reflection meetings and began to thread the approach through their ways of working.

Towards the end of the first year, Anita reflected on how this "has made a huge difference to the way we work in our team". For instance, they set up some sessions just for girls and non-binary/trans young people, began to regularly add in 'pauses' and feedback/reflection moments within all programmes, and started to routinely welcome and value young people's ideas and experiences within sessions, designing activities and approaches to elicit, value and work with these insights.

In this way, they started to change and iterate the focus and nature of the workshops in more youth-centred ways. Anita also described how she felt she and her colleagues had grown in confidence over time as they got to grips with the ideas and began to embed reflective and assets-based approaches across their practice.

As Anita and her colleagues became more comfortable with the approach, they initiated professional development sessions on it with the other staff. They continued to hold regular open reflection meetings across all their youth programme sessions and created end-of-session reflective 'check-ins' with programme leads, youth mentors and the programme director to think about equity and consider what was going well and what could be improved. As Anita explained, this slowly created more of a 'listening, learning and modelling' environment within the organisation, embedding equity principles, not just in youth programmes, but also in institutional ways of working.

Anita was delighted with the positive impact on their own practice and the young people's experiences and outcomes, with the latter being revealed through use of 'quick check' surveys **(see Step 3: Evaluate)** and informal youth voice feedback. In particular, she felt that levels of trust within, and between, young people and staff had increased considerably, based on feedback from practitioners, survey data and informal discussions with young people. As she explained, the idea of open, honest sharing of views was no longer an aspiration but is now engrained in the way the organisation works. When asked by researchers what her advice would be to other makerspace practitioners who are just starting to think about equity issues, Anita said, "Don't get overwhelmed! You can start small, based on where you are."



# Reflections

**As a research team, we reflected on Anita's case study and concluded that the following points may be especially helpful for makerspaces who are starting to embed equity in their practice:**

**1** *We thought it was a good idea to use a tool like the Equity Compass as a starting point.* Reflective tools like this can provide a practical starting point as they offer a structure for identifying and thinking about equity issues, and come with a set of structured questions to work with. Anita can use this tool to map progress and identify further areas for development. Tools that specifically foreground equity can help Anita and her team to keep on track, as we know how easy it is to drift off into a more familiar focus, such as the knowledge or skills content of sessions.

**2** *We appreciate the way in which Anita recognises that, even though their usual sessions are of a high quality and well received, they can be improved even further from an equity perspective.* We think her case study offers a clear example of honest, brave and open critical reflective practice.

**3** *We like that Anita doesn't try and do too much at the start but keeps things manageable and then keeps building and extending over time.* We feel this is a sensible and pragmatic approach, focusing on a couple of key ideas and trying these out in a manageable way, listening and learning through the process. This helps the team to build confidence and momentum, rather than being overambitious and then feeling disappointed when it becomes unmanageable.

**4** *We are impressed that Anita and her makerspace are prepared and supported to take risks in their practice and try out new ideas.* They are not afraid to learn from mistakes and keep developing. This approach is valuable for supporting innovation in practice.

**The case study provides a great example of the value of embedding equity and turning critical reflection into both a personal and a collective 'habit'.**

Anita recognises that equity work is always a work in progress – she doesn't approach it as a one-off activity or consider it 'done'. She and her colleagues keep critically reflecting and iterating their practice, embedding a strong 'listening and learning' approach that spreads across their organisation.

# Case Study 1.2:

## Continued critical reflection

**Makerspace H is situated in area of high social deprivation and has been working with young people from the local community for over a decade. Their programmes are widely recognised as being highly equitable and inclusive.**

For example, they embed participatory and co-design approaches throughout all their offers (see Step 2: Co-production), are successful in attracting and working with diverse, under-served communities, and have a strong social justice ethos and culture across the organisation that is backed up with inclusive pedagogy (see Step 2: Equitable Pedagogy) and extensive professional development (see Step 2: Equitable Governance). However, they are always keen to keep extending their practice. Using the Equity Compass, practitioners at Makerspace H identified that, while young people were recording excellent outcomes from participation in their youth programmes, they wanted to do more to support their transitions beyond the end of the programmes and to create progression pathways. As Mardhu, a member of the team, reflected:

**"I feel like the 'successful' young people, who get the most from our programmes, are often those who take the initiative to pursue things beyond the course. But I wonder how to engage with those who are not as proactive, and who fall through the cracks once the course is over."**

**Mardhu, practitioner**

Over several months of collective critical reflection and planning, they created a new transition programme for those who had finished their youth programme and were interested in continuing their engagement with the makerspace in some way. This programme offered young people experience of working directly with makers and supported participants to explore potential STEM careers (e.g. support with subject choices, access to further/higher education, apprenticeships, CV development, applying for internships, and so on). Participants were also offered the chance to become a mentor or facilitator on the youth programmes (a voluntary support role providing additional help and peer learning on workshop programmes, for which the makerspace offered five weeks of support and training). While it was still relatively early days to evaluate the impact of the course, initial indications were that it was positively received by young people and supported their educational and work transitions. The team continued to regularly review and reflect, so as to keep tweaking and improving the course. As one of the practitioners, Wren, reflected: "We can already see the benefits, but we don't want to become complacent!"

## Reflective questions

**1** Which dimension(s) of the Equity Compass do you think helped the team most in identifying and planning the new transition programme?

**2** What do you feel is key and important to have in place within a makerspace to ensure that equity is central, embedded and always on the agenda (to help avoid complacency)?

SPACE to REFLECT

# Activity 1.1:
## Getting started with critical reflection

**Who:** Practitioners, makerspace leaders

**Time:** 30-40 minutes

**Resources:** Equity Compass summary and worksheet, video access, means for working on the worksheet (hard copy or on device)

**What to do:**

1. Read the case studies and introduction to Step 1 to learn about the Equity Compass.

2. Read the Equity Compass summary for practitioners and watch the two-minute video.

3. Use this worksheet to critically reflect on, and map, your own practice using the Equity Compass.

4. You may also want to use the funders version of the summary to reflect on your organisational strategy using the Equity Compass.

5. Develop a plan for one change that you would like to make to your practice as a result of this reflection and mapping. You may want to use the template in the Next Steps worksheet for this.

# Activity 1.2:
## Moving to deeper critical reflection

**Who:** Everyone

**Time:** 30-40 minutes

**Resources:** Hard or electronic copies of the boxed practitioner statements, which are printed and cut up into individual statements that can be grouped or sorted

**What to do:**

1. Read the following reflections from a group of practitioners who have completed the Equity Compass Activity 1.1:

> I'm not a stupid or bad person, but this activity made me feel both stupid and remiss for not having thought about these issues before. I don't like how I'm feeling and I'm not sure I want to continue.

> I have felt uncomfortable over issues of race in the past and, having reflected on this, I can see that my discomfort at the time was helpful because it did provoke a response in me, which led me to improve my knowledge and future practice.

> I don't think it is helpful to classify people by their background characteristics – that just reinforces inequities. I prefer to just treat everybody the same. It's the fairest way. It doesn't matter to me if you are black, white or an alien with purple and green spots!

> I've always prided myself on my sessions being really fun and engaging, but I'm starting to wonder if they were always actually equitable or inclusive?

> I realise I am a white, middle-class man but I can't physically change who I am. So, I have decided am going to start showing some photos of more diverse engineers and computer scientists in my maker sessions, so the young people can see that anyone can work in this field, not just people who look like me.

> I worry that I've been too complacent.

> It's not easy to give up the familiar.

> don't mind doing this sort of activity myself, but most of my team are volunteers and I don't think it's fair to make them do this sort of stuff. They're doing the best they can – they're only human. I can't risk them leaving by making them feel inadequate or giving them masses more work to do and telling them to change what they do.

2. Consider or discuss the following questions (you may find it helpful to have the statements on separate pieces of paper/card so you can sort and group them as part of the discussion):

   - To what extent do these practitioner comments resonate, or not, with your own experiences?

   - How and why do you think the comments indicate either surface-level or deeper critical reflection? (E.g. what power relations and aspects of their own privilege are they considering? Are there any indications of defensiveness?)

   - How might you help encourage even deeper critical reflection among these colleagues?

# Activity 1.3:
## Extension activity - personal reflection

**Who:** Practitioners/staff

**Time:** 15-20 minutes

**Resources:** Note-taking materials

**What to do:**

Think about a time from your own professional experience when you have felt uncomfortable in relation to issues of power/privilege (e.g. race, class, gender, disability, sexuality, etc.). Try to consider:

- What power relations are at play?
- What helped open up or close down the potential for critically reflecting on, and engaging with, the issues in this moment?
- How might you address this sort of issue more productively in the future?

SPACE to REFLECT

## Further resources

Making Spaces 1 – Visual Summary 1: Developing a Social Justice Mindset and Organisational Culture

Equity Compass – find more information and the tools suggested here

"White talk" as a barrier to understanding the problem with Whiteness – Alison Bailey (2016). Paper can be downloaded for free here

Getting comfortable with discomfort: supporting primary science teacher educators' capacity for socially just pedagogy – Meghna Nag Chowdhuri and Louise Archer (2023)

STEM-rich maker learning: Designing for equity with youth of color – book by Barton, A. C., & Tan, E. (2018).
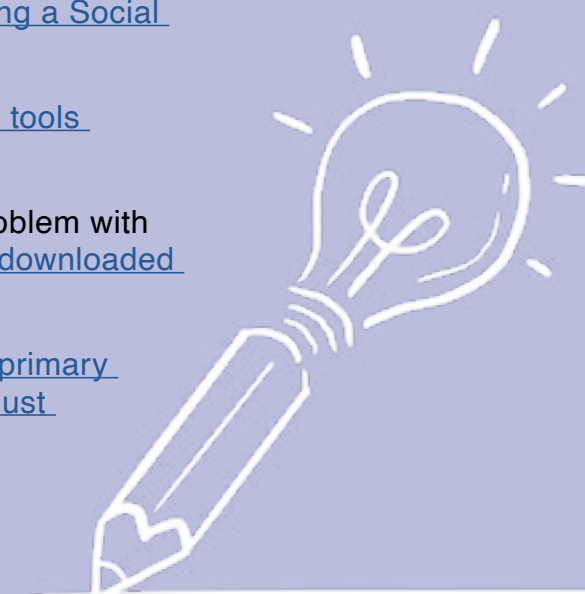
# STEP 2: Do

## In this second step, you are now ready to take action.

The **DO** step considers how to embed equity into your day-to-day practice, including organisational governance and programme delivery, and supports you in identifying key ideas for equitable practice. This step has four key ideas for fostering equitable practice in makerspaces: co-production, equitable governance, inclusive access and outreach, and equitable pedagogy.

In **STEP 2: DO** there is no specific order in which you need to work through the sections, so we encourage you to start with the section of most interest to you and the young people in your makerspace. As the 3-STEP approach is an iterative process, there is no need to go through all the ideas in Step 2 at the same time – take your time and do what you can manage. Use the Next Steps table to document your reflections and ideas for change at the end of this step.

**The following summaries of each key idea may help you to choose where to start:**

**Co-production** is a participatory approach that values youth voice and agency.

Co-production involves practitioners and young people working together in an equal partnership to co-create and co-deliver an activity, programme or output.

Using co-production is not only equitable, but it can also help make your programmes more meaningful and relevant to young people, particularly those who are under-represented in STEM and their communities.

**Equitable governance** is about embedding equity within a makerspace's leadership and governance structures.

It can help you to strategically promote equity at the organisational level, and consider whose interests are being served through your offer – funders, industry, staff, youth, and so on.

Including youth meaningfully in governance can be both highly beneficial and an important way of mainstreaming equity in your setting.

**Inclusive access and outreach** involves considering issues of equity when you recruit staff, volunteers and participants.

It means thinking about how you reach out to audiences effectively, appropriately and ethically, paying particular attention to how you welcome those from marginalised and under-represented communities.

**Equitable pedagogy** refers to an approach to teaching and learning that places inclusion at its centre.

Equitable pedagogy is key for ensuring that under-served young people feel welcome, included, comfortable and valued in your setting. This involves critically reflecting on 'why' and 'how' youth programmes are run and delivered.

# Co-production
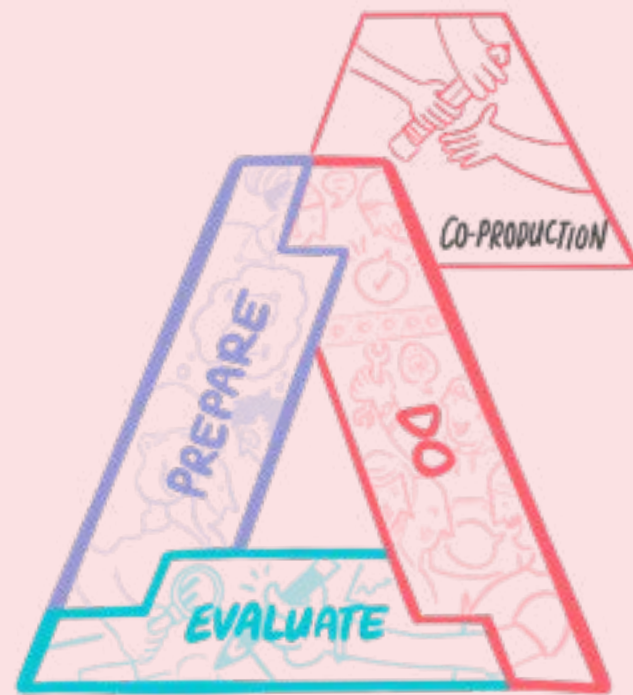


**Makerspaces can use participatory approaches to work with young people in equitable and inclusive ways. Participatory methods involve stakeholders (such as young people) in the design, delivery and evaluation of activities.**

For example, a youth programme might work in participatory ways by involving young people in identifying the topic or focus for a workshop or programme (to reflect young people's needs and interests), co-delivery of the programme and activities, and co-designing/conducting evaluation, afterwards. Participatory approaches seek to build participants' ownership and agency by involving them in the process and delivery of a project.

Different techniques and processes can be used to engage young people in participatory ways, so it is useful to consider how you are working with young people and for what purposes, in order to choose an approach that works for your setting. These approaches support all young people to engage authentically and meaningfully with a makerspace. In addition, they particularly benefit young people who are traditionally excluded from STEM learning spaces, as they give equal voice and space for them to inform makerspace activities and agendas. Two common participatory approaches are consultation and co-production, each of which have different strengths and weaknesses.

**Consultation** involves asking people for their opinions, advice and/or feedback on something that has already been developed or is being planned, which can be a time-effective way to gather input. However, it does not offer young people agency to make meaningful decisions on the programme, and outputs are less likely to be driven by the participants' true needs and wants.





**Co-production** (sometimes called co-creation or co-design: we use co-production as an overarching term that can encompass both these approaches) is less rigid than consultation and offers young people a more meaningful way of co-creating an activity, programme or output. It involves working with young people to collaborate in equal partnership, bringing together and valuing different forms of lived knowledge. Co-production is therefore more likely to result in outputs that are genuinely informed by young people's experiences. It can be difficult, however, to realise co-production authentically because of long-established unequal power relationships between adults and young people.

**Whilst consultation has its place, we see co-production as a more equitable way of engaging young people in participatory approaches.**



**What took us the longest time was designing an adjustable headrest [for an adapted design for a disabled child] and that was a full week of just brainstorming. We'd spend an hour each day finding the best and cheapest solution. And he [the practitioner – Sam] treated me like an equal, and [other practitioner – Mark] did too, you know, valuing my ideas and input. And we ended up coming out with a great final result. Which I don't think would have happened if it was just Sam on his own, or Mark on his own, or me on my own. I think all of us working together created something special.**

**Cillian, youth intern**

# Case Study 2.1

## Laying the foundations for co-production

**Makerspace A had only recently started running youth programmes and was relatively new to ideas of equity and co-production, but they were keen to develop their practice in this area. The practitioners wanted young people's input to help them design a series of workshops for young people from under-served backgrounds.**

They advertised their plan in a local school and a group of young people soon signed up. The team invited the students to a planning and ideas workshop, with the expectation that by the end of the session the young people would have come up with ideas for what they wanted to learn and make over a five-week programme. However, the practitioners found that the session hard to run – trying to get input from the young people was laboured and not as participatory as they might have liked. For example, the participants did not offer ideas readily and were hesitant to engage in discussion with each other or the practitioners. They also seemed to engage with the practitioners as if they were school teachers as Nabina reflected:

> I **WASN'T** expecting the young people to be so **OBEDIENT**.
>
> Even when I said they didn't have to call me my formal name and stand up to answer, **THEY DID!**

In a meeting after the workshop, the practitioners reflected together on why this might have been and identified that the format of the session might have been part of the problem. For instance, the instructor had talked from the front of the room, with the young people sitting at tables arranged in a traditional classroom format. They realised that maybe the atmosphere they had created had encouraged the young people to follow usual school behaviours such as standing up to answer questions and addressing practitioners using formal titles, which had surprised the practitioners. This may have contributed to students not feeling comfortable to share and discuss ideas openly, as they did not want to say 'the wrong thing'. In addition, Nabina and her colleagues reflected that perhaps they had been overambitious about what they were expecting in this first workshop and needed to first build the foundations of a participatory approach with the new young people, before jumping into a fuller attempt at co-production.

By engaging in an open and honest discussion with her colleagues, the practitioners in Makerspace A were able to critically reflect on the workshop and see how they could improve their practice. They decided to focus on creating a more relaxed and equitable space that could help build trust and rapport with the young people. This entailed:

**Inviting young mentors to facilitate the next session to help reduce perceived power and status differentials.**

**Adopting an assets-based approach to the activities, where young people can share their own knowledge and experiences.**

The practitioners worked with the young mentors to plan an activity during which the participants could explore a range of familiar objects made in the makerspace and stimulate discussion on what kinds of making the young people are interested in. The team laid out a range of objects on tables, such as a bangle that had been press moulded, for the young people to freely explore. The young mentors participated in the activity alongside the new young people, encouraging them to write their thoughts on sticky notes, such as what they found interesting, or not, about the objects and their own experiences of similar objects. For example, one young person talked about where they had seen the moulding of bangles before, and another shared their expertise in using a hook, resembling one of the objects, when trekking with their family. Towards the end of the session, the young mentors facilitated an animated and engaged group discussion, during which participants offered a range of views to inform future workshops, explaining what they were interested in making and curious to learn more about.

The young people responded positively and enthusiastically to the changes in the session, and discussed the impact of the young mentors:

*When one of the mentors, Max, talked about his experiences, he was so enthusiastic, and it made me want to take part. Knowing there's someone here who's similar to me – it's less intimidating.*

**Ethan, young person**

*I think the mentors bring a realistic perspective. They are like role models, and they understand my background, like not being privileged growing up and not having many resources. They understand that and can relate to you.*

**Jamila, young person**

The practitioners were pleased with the session outcomes and now felt they had a better understanding of the backgrounds of the young people they were working with, in addition to ideas from the young people about what they wanted to do in the makerspace. They felt they had learnt a lot from their first attempts at participatory practice and felt that it was important to build in more time to get to know new groups of young people. The practitioners reflected that re-designing the activities to follow a consultation approach had helped the group get started with coming up with ideas for the new youth programme, and having built these foundations they could extend towards co-production. When a colleague from another space asked for her advice on how to start thinking about introducing co-production in their space, Nabina told them:

It's **OK** to start small, and to (LEARN) from your MISTAIKEZS

## Reflective questions 2.1

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** Why do you think the initial attempt at co-production was not very successful?

**2** What ideas could you suggest for how the makerspace in this example might continue their co-production journey?

**3** How might you develop (or continue to develop) an environment in which young people can participate meaningfully in co-production?

SPACE to REFLECT

# Case Study 2.2

## Changing 'who has power in the room'

Makerspace B is experienced in creating environments where young people are valued as equal partners, and meaningful co-production is supported on a day-to-day basis. One way the practitioners do this is through an assets-based 'coaching' approach in their practice, which aims to value the knowledge and expertise that young people bring to the makerspace and create "an equal learning relationship between young people and practitioners".

As two practitioners explained:

*We're also learning as we go – you're informing us, and we're informing you... the young people are training me while I'm helping to facilitate the session.*

**Kelly, practitioner**

*[Our approach involves] being open to listening to young people and just trying things out. The idea that we don't have the answers and we're all in this shared space together – that, I think, empowers the young people so much.*

**Erkhan, practitioner**

Challenging power and status hierarchies between adults and young people is also key to their approach, while also ensuring the safety of the young people. As another practitioner, Míla, said:

*Often there isn't necessarily one answer to doing something. So we are trying to change who has the power in the room. Sometimes this is difficult to remove completely – for example, if you consider health and safety and the pedagogies we want to follow – but challenging power structures really is part of our mission here.*

**Mila, practitioner**

The sharing of power is also important to the young people in the makerspace, as one of them explained:

*Staff and young people should have the same amount of power, and no one should be overruling anyone else, so it just makes things even and fair.*

**Anna, young person**

The makerspace put these ideas into practice in a range of ways, varying from smaller implementations, such as inviting young people to choose and run icebreaker games at the start of sessions, to bigger picture ideas, like supporting young people to co-develop the session programming and deliver youth-led sessions. The experience and impact of being involved in the design and production of their makerspace sessions was described by two young people:

*Everyone is collaborating at the same time, and it feels like we are on equal ground. Everyone can voice their opinion.*

**Zahra, young person**

*I feel like the staff treat everyone equally and to the same level, and they have time for everyone – we are respected.*

**Shashi, young person**

Encouraging young people to work together to develop their projects is another way that Makerspace B creates a collaborative and inclusive environment, as peer support sees that different perspectives and ideas are valued (see page 48 for a youth mentor's view on the value of peer-to-peer learning), as this young person explained:

> *Today, we were making prototypes and everyone is gathered around helping each other out and it makes you feel included. Everyone's in a group and working together to solve the same thing.*
>
> **Mikey, young person**

More recently, after seeing how well the young people took to being given more responsibility in the sessions, the makerspace created a 'mini-manager' role, as described by one of the young people:

> *Three people are chosen out of a hat and you are given these tags. So, if you need help, you would go to a mini-manager who can try help you and then, if not, they go to the adult. And when it's near the end of the session, someone designates tidying up, someone else does the evaluation and someone else does a game– each mini-manager has a role. It really does improve your teamwork… and gets people more involved. I think it helps people get more confident – and also helps the staff out!*
>
> **Katie, young person**

Makerspace B sees co-producing evaluation as particularly important, and young people are encouraged to lead on evaluation tasks, which take place at the end of each session. The mini-manager leads a small group of young people to decide which techniques they would like to use during that session (by designing a quick worksheet, online quiz or using an existing strategy) and will facilitate the other participants to participate in the activity **(see Step 3: Evaluate for more).** Through these different approaches, young people are positioned to be able to play an active role in co-producing all aspects of the programme, from design to delivery, facilitation and evaluation.

## Reflective questions 2.2

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** What strikes you most about the makerspace's approach to co-production?

**2** What do you think is key to the success of attempts at co-production? What needs to be in place for it to work well?

**3** How might you change 'who has power in the room' in your own setting?

SPACE to REFLECT

## Valuing young people's knowledge through peer-to-peer learning

YOUTH VOICE

We are youth mentors (aged 15 and 16) who used to be participants in our makerspace, but now we help facilitate the workshops ourselves. From our experience, we find that peer-to-peer learning is a great way to get young people engaged in our workshops, and we think it's important for the following reasons:

Participants can share their own knowledges with each other, and it is relevant to them.

Young people are more receptive to learning from their peers.

It removes teacher/student power dynamics, where teachers are 'higher' in their positioning.

In this way, peer-to-peer learning establishes the value of young people's own knowledge and experiences. In addition to this, it is important that the staff members or mentors also respect and value the knowledge of the young people, as this mentor/practitioner shared:

The most important thing in teaching well or mentoring is not so much that you know everything, but that you know how to motivate the participants so that they somehow find a solution, even if you do not know what it is. Then, if I don't know something, I... push them forward, and they figure out for themselves what it is.

**Peter, mentor**

**We share 'power' in our makerspace by changing the way knowledge is exchanged. How can you change the way knowledge is shared in your makerspace?**

# Activity 2.1:
## Workshop reflection for co-production

**Who:** This activity is aimed at session facilitators and is suitable for individuals or groups

**Time:** 15-20 minutes

**Resources:** Printed or digital copy of a workshop or session plan; pen or electronic device

**What to do:**

1. Choose a workshop session plan or programme plan from your youth programme (or any other outreach programme). If working in a group, it may be helpful to print this out on a large piece of paper or project it onto a screen.

2. Work individually or in a team to highlight any existing parts of the session or plan where young people are consulted or involved in co-production. This could reflect their involvement in the design, delivery or evaluation of all or any of the activities.

3. Next, annotate the plan (perhaps using a different colour) to identify further opportunities for co-production. You may find it helpful to refer to the case study examples to spark ideas for what these might look like in practice.

4. Discuss the annotated plan with others (even better if you can also involve young people in this) to further iterate and reflect on potential changes and identify steps that will need to be taken to realise co-production. For instance, it may be helpful to consider:

   • Do staff have the resources and time required to facilitate participatory approaches with young people? If not, what could be put in place to help?

   • How might practitioners be supported to balance power relations between adults and young people in the programme/session?

   • Are the changes identified one-off/short-term or longer-term solutions? If the former, how might they be extended and more deeply embedded into everyday systems and practices?

# Activity 2.2:
## Try out some of our ideas for everyday co-production

**Who:** Practitioners and young people

**Time:** 10-30 minutes, depending on the idea

1. **Resources:** Depends on the chosen activity – see list in Appendix D; workshop reflection form in Appendix E.

**What to do:**

1. Read Appendix D and select one of the activity ideas that you would like to try out to support co-production with young people (you are also welcome to use your own ideas).

2. Try out the idea in your makerspace.

3. Use the workshop reflection form in Appendix E.1 to critically reflect on how it went and what you could do to improve it next time. Don't worry if things don't go as planned the first time around – continue to reflect on the process and build on what you have learnt.

4. Continue building more ideas into to the workshops, reflecting on how the young people and other practitioners respond.

### Further resources

- Idea 3: working in participatory ways with young people – see the Making Spaces 1 report (2022) (page 39) and visual summary 3

- Making Spaces 1 – Visual Summary 5: Supporting Young People's Agency and Social Action through Making

- UCL Co-production collective

- Tips for co-designing with young people – Snook

- How co-designing/co-production with young people can change your practice – Inclusion as Prevention

- Co-production: what it is and how to do it – Social Care Institute for Excellence

# Equitable governance
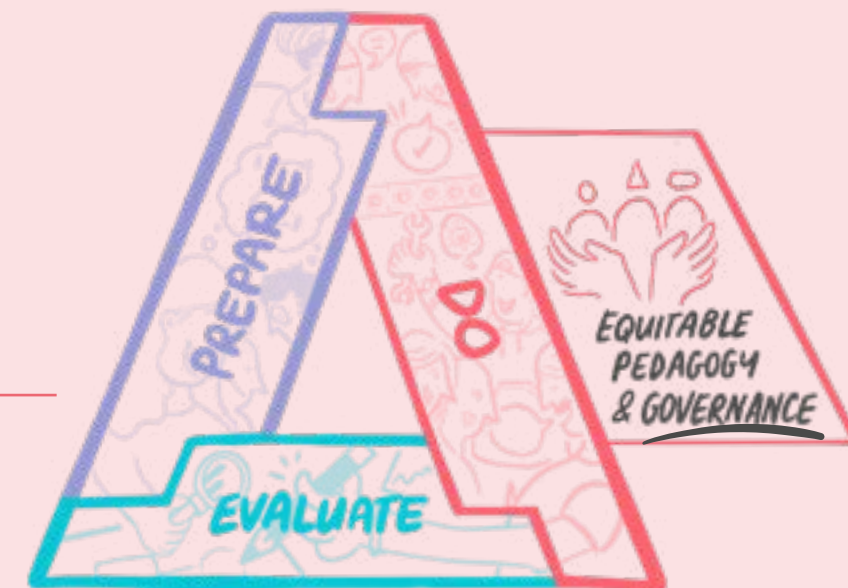


**As highlighted earlier, equity is not an 'add on' ideal that can be an afterthought for a makerspace. Equity needs to be embedded across the governance, strategy and practices of a makerspace.**

In turn, this impacts the ways in which youth programmes (and other programmes) are delivered, run and experienced. The more leadership within a makerspace can bring an equity lens to bear on governance, the greater the potential for supporting equitable youth outcomes (see Appendix A: Equitable Youth Outcomes Framework). Using an equity lens can also help leaders to ensure a strong alignment between the needs of young people and local communities, and the aims and offer of the makerspace, resulting in meaningful youth programmes and positive outcomes.
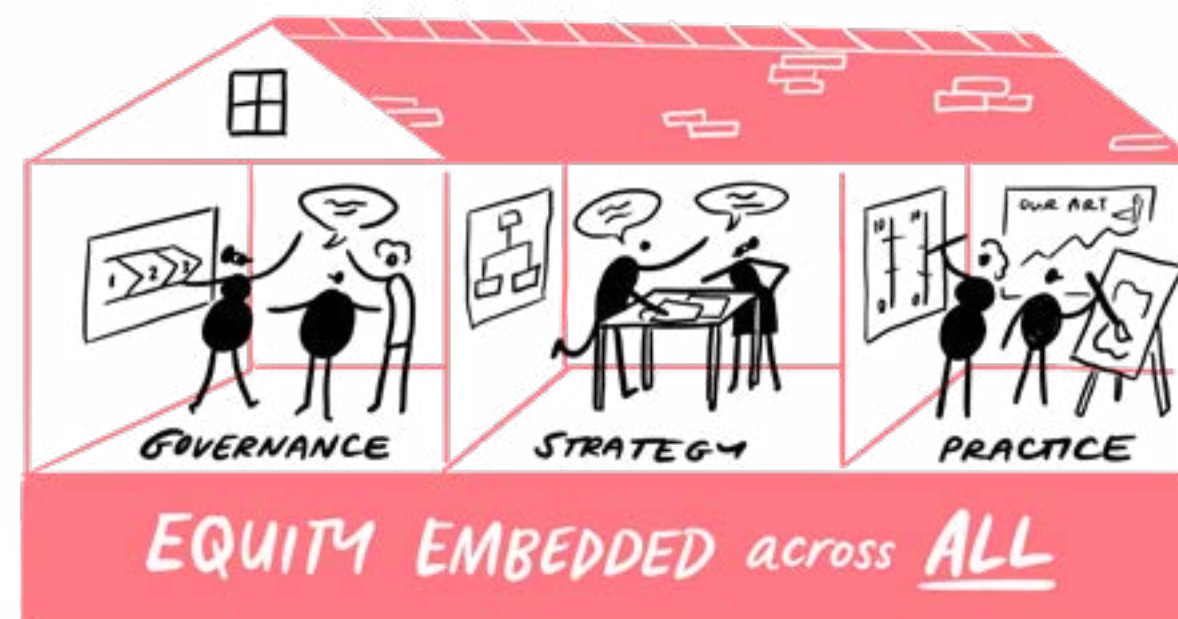
# Case Study 2.3

## Exploring equitable staffing

**Makerspace J focuses on fostering a space for innovators, entrepreneurs and makers, to create innovative products for sustainability. They wanted to start an education programme for diverse young people in the local community, but they recognised that they would need to expand their staffing and acquire additional expertise to help with this. They were not sure who best to hire or involve in this venture, as youth programming was new to them.**

Before starting the recruitment process, they decided to reflect on their current organisational structures, including the ways in which decisions are made in the organisation, and who holds key decision-making powers. They recognised that, while there was some diversity among lower management colleagues, centre leaders were from white, middle-class (socially privileged) backgrounds. They felt that their senior staff profile did not fully represent the community that they wanted to work with, which includes working-class communities and young people of colour. They also noted that technical staff in the organisation were often middle-class cisgender males, and that administrative staff were middle-class cisgender females.

They decided to make three significant changes to their ways of working to address these issues in their staffing and governance. First, they adopted a staff development mindset focusing on the strengths of their current staff. They spent time collectively workshopping ideas with all staff regarding the aims and goals of the youth programme. This revealed hidden expertise within the staff, such as the youth work background of a colleague who usually coordinated adult programmes and enabled this member of staff to contribute valuable ideas for creating a youth-centred programme. It also helped others to rethink their roles and strengths:

*As a project coordinator, I wasn't sure how I fit into a makerspace – I wasn't really into making. But this experience has made me think of my role as a 'facilitator' of making. I have realised that my strength lies in creating an environment where the best of everyone can come out.*

**Tara, practitioner**

It also helped highlight areas for further development. Together, the team created a staff development plan that was both ambitious and achievable. Through this programme, all members of staff were supported to learn more about, and reflect critically on, equity issues in relation to their own practice. As one of the technical staff reflected:

*I always saw myself primarily as a 'maker' – passionate about the process, the possibilities of making, and creating new technologies. This experience of working together to come up with an equitable youth programme has impacted the way I see my own craft, and the importance of thinking about who gets to do this or who doesn't, and why? It has made me aware of how alienating some of the technical language we use can be, and made me think about finding more relatable ways of discussing the making process. I believe this has made me a better designer/maker.*

**John, practitioner**

Second, they reached out to other organisations with relevant expertise in areas in which Makerspace J felt less strong, such as a local charity that worked with families of under-served youth. Through this partnership they learned more about the needs of the local community and were able to draw on valuable insights to inform their third change, which was the planning of an active staff recruitment strategy, to diversify their organisational profile and governance to better represent their local communities. This strategy was applied to the recruitment of full-time staff, volunteers, mentors and trustees, and was also used to identify external collaborators and funders. While the makerspace recognised that this would be a long-term strategy, they were delighted to see tangible changes within a relatively short time frame.

Use the following questions to reflect on your own makerspace, either individually or with colleagues:

**1** How do you think each of the changes brought in by this makerspace would impact the planned youth programme?

**2** How does equitable governance within your organisation relate to equity within a youth programme (or other outreach programmes)?

SPACE to REFLECT

# Case Study 2.4

## Including youth in organisational governance

**Makerspace K is a community-based makerspace, serving a community with high levels of socio-economic deprivation. The makerspace already regularly consulted with youth to gather their feedback on specific programmes and sessions, but they now wanted to extend their equitable practice, particularly in relation to their governance. They decided to reflect on how they could further augment youth voice within their governance and include young people as key partners within their organisational strategy and processes (see page 58 for young people's opinions on why youth voice is important).**

The makerspace set up a youth board consisting of students who were current and past makerspace participants. They held weekly youth board meetings that directly informed and fed into the organisation's strategic planning, using principles of co-production. The youth board were also actively involved in key areas, such as the recruitment of new staff and community relations. As one young person explained:

> *It's about young people's opinions and then the staff's opinions, so it's being inclusive of both. They're listening to you and you're listening to them – [we have] equal opinions.*
>
> **Eshan, young person**

For instance, when hiring a new programme manager for the youth programme, the youth board were part of the entire process, from co-creating the job description to supporting with the interviews and the induction of the new staff hired. This not only meant that the person who was hired was an excellent fit with the young people with whom they would work, but also the culture and ethos of the organisation was clear to the new employee, who equally valued this approach to supporting youth agency. A practitioner described the impact of this initiative:

> *This has been such a great learning experience for our team. We've always taken youth feedback on board, but I think this effort has taken that to a whole new level. We've discovered ways of working collaboratively with young people to shape what we're doing in every aspect of our work. We've ended up with this cyclical or symbiotic nature where, obviously, we've got our current programme that we're planning, but also the sessions led by young people that they've completely designed from scratch.*

**Adwoa, practitioner**

As the young people became more familiar and comfortable with their role in governance, they also started proactively identifying areas that they felt could be improved within, and beyond, their youth programme. For instance, they suggested that they would like to design a summer holiday two-day taster 'making and wellbeing' workshop. The idea arose from reflection within the youth board, during which they identified what they found most valuable during their makerspace experiences. These workshops were not only welcomed and enjoyed by the young people who attended them, but also helped the makerspace practitioners to understand what young people found most meaningful within their space, and further informed their own recruitment strategies. The workshop also brought more diverse young people into the space, further supporting the organisation's aims. As one young person reflected:

> *Being a part of the youth advisory board has been an intriguing opportunity for a lot of us. It has given us a sense of doing something that feels purposeful. A lot of us don't have that. We're facing challenges with our mental health or dealing with other instability in life. Something's gone wrong along the way for us. It helps us find that piece of purpose.*

**Farah, Youth Advisory Board**

## Reflective questions 2.4

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** In what ways can involving young people in organisational governance benefit a makerspace?

**2** Thinking about different approaches to including young people in governance, reflect on what type of co-production strategy this makerspace used – why did it opt for this approach?

**3** What other ways can you think of to include young people in governance that might be useful for this makerspace?

SPACE to REFLECT

## Why is youth voice important?

Equitable makerspaces welcome and value youth voice in meaningful ways. They ensure that young people's views translate into action (through co-production) and are not treated in empty or tokenistic ways.

YOUTH VOICE

*We need the voice of youth for the development of the nation. It's important to have the involvement of young people for the nation's development."*

**Aravi, youth co-researcher**

*"Youth are energetic, they can do anything. Like, if you ask us to do anything – we won't be able to say no out of passion. We have the passion to say, 'we can do it'."*

**Riddhi, youth co-researcher**

*Youth voice is a platform for young people to express themselves and their opinions on different matters. It is important as a platform for young people to be heard, as we are often disregarded."*

**Nik, youth co-researcher**

*"I guess if you're not willing to include young people, it's like you're essentially turning a blind eye or closing yourself off... Because you're just erasing that perspective completely by not having young people. The best perspective that you can get is from the actual source. So, if you want information about young people, just go straight to the source."*

**Zara, youth co-researcher**

# Activity 2.3:
## Exploring your governance through an equity lens
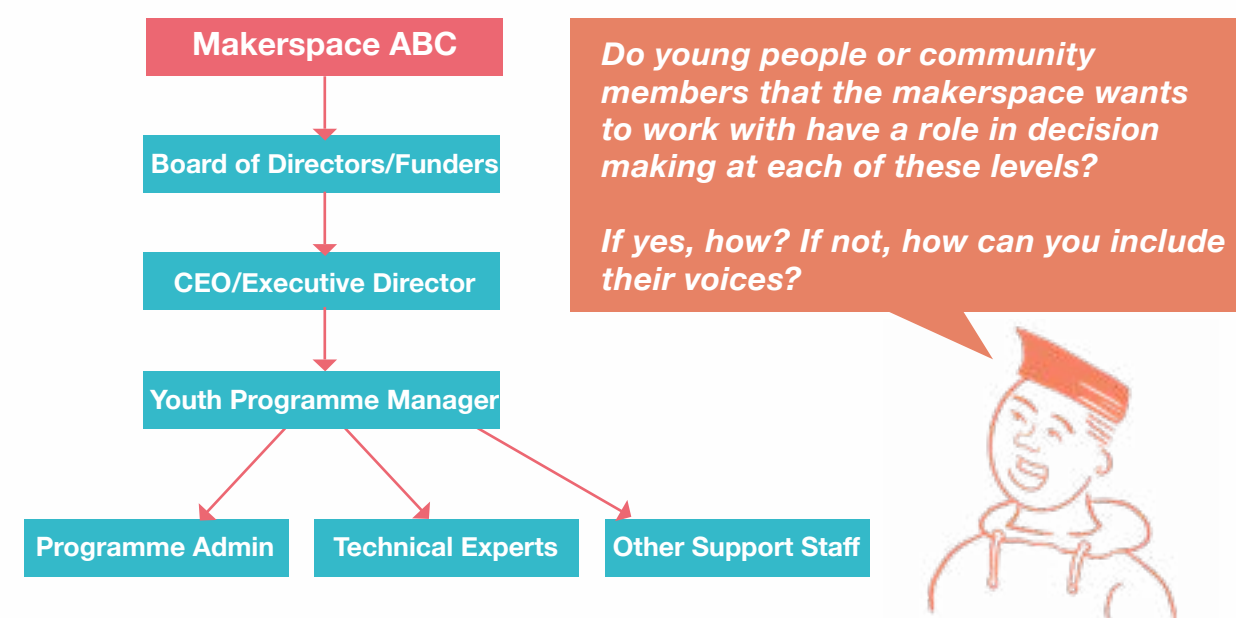
**Who:** Practitioners and young people – all relevant leadership

**Time:** 30-40 minutes, group activity

**Resources:** Paper and pens or digital writing/mapping tool (e.g. PowerPoint)
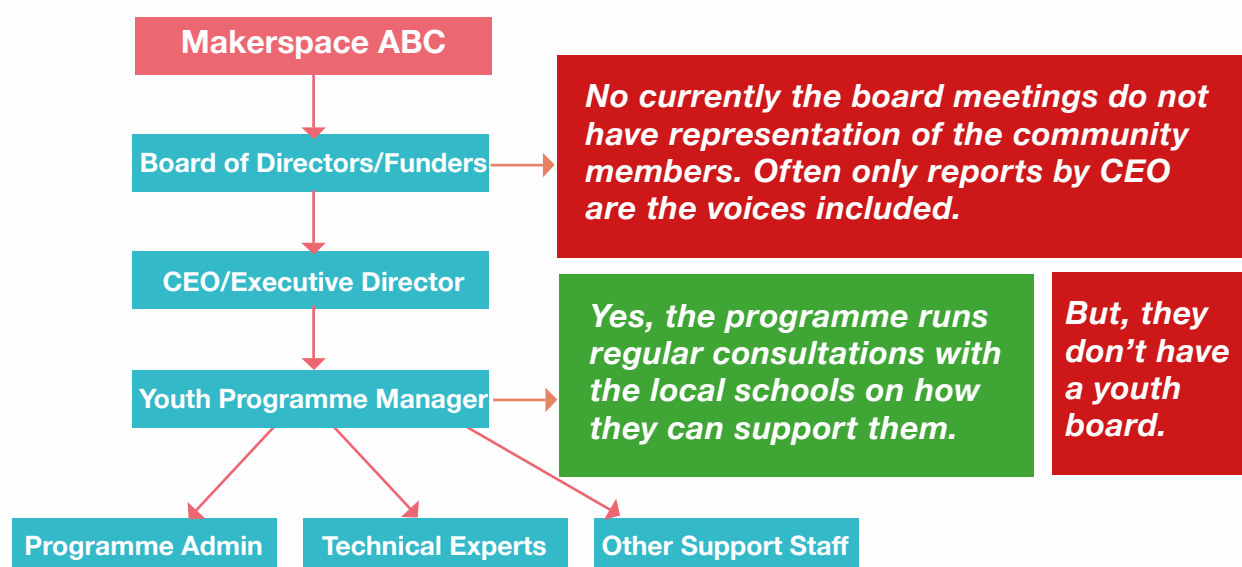
**What to do:**

1. Understanding your decision-making structure:
   Create a map of your organisation's governance and staffing structure detailing how decision-making takes place (see diagrams below). Note: this is not a standard structure that we are recommending – just a typical example for reference.

```
Makerspace ABC
      │
      ▼
Board of Directors/Funders
      │
      ▼
CEO/Executive Director
      │
      ▼
Youth Programme Manager
   ┌──┼──┐
   ▼  ▼  ▼
Programme Admin  Technical Experts  Other Support Staff
```

*Do young people or community members that the makerspace wants to work with have a role in decision making at each of these levels?*

*If yes, how? If not, how can you include their voices?*

2. Identifying the role of equity at different decision-making stages:
   For each level, identify how and to what extent (a) equity is core or peripheral to the post/role in question, (b) the extent to which staff at each level are supported and equipped to address equity issues, and (c) the voices of young people and their communities are involved in decision-making. For example, if you have youth representatives on a board, or a youth advisory panel, what level of power and accountability does this structure have?

Note: You may find it helpful to refer to the Equity Compass dimensions with regard to mainstreaming equity (from tokenistic to mainstream) and this summary document on how to set up an equitable youth advisory board. Note that youth and community voice not only needs to include young people who attend your setting, but may include young people from local schools, colleges, job centres, charities and grassroots organisations.



**Makerspace ABC**

*No currently the board meetings do not have representation of the community members. Often only reports by CEO are the voices included.*

Board of Directors/Funders

CEO/Executive Director

*Yes, the programme runs regular consultations with the local schools on how they can support them.*

*But, they don't have a youth board.*

Youth Programme Manager

Programme Admin        Technical Experts        Other Support Staff

3. Planning to embed youth and community voices within your governance structure

If this review has helped in identifying areas for development, you can now start to plan ahead. For instance, you may decide to instigate some organisational professional development to support the understanding of equity issues. There may be interest in setting up a working group to further embed and maximise the impact of youth voice across the organisation. We suggest working collectively and using relevant resources and networks, where possible.

## Further resources

- Learn more about how to set up youth advisory boards

- A checklist to support greater diversity in makerspace staffing

# Inclusive access and outreach
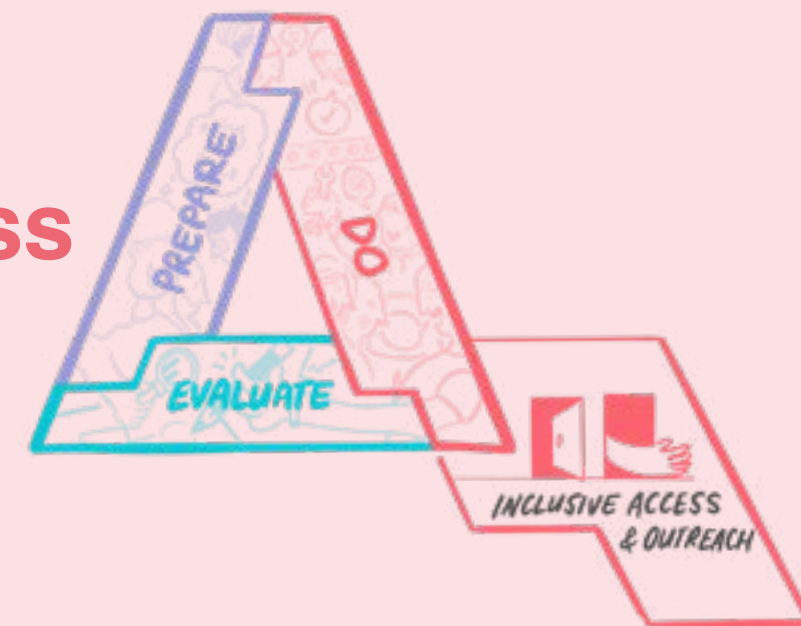


**Many STEM learning materials and spaces are designed from a privileged (e.g. White, cisgender male, Global North) perspective, by which some young people (e.g. racially minoritised, female, non-binary, trans, disabled, Global South) may feel excluded and marginalised.**

Their own STEM-related interests, talents and skills are, in turn, undervalued. Equitable practice requires makerspaces to welcome, understand and value those who are excluded from STEM learning experiences and put in place the support and changes that are needed for them to be able to participate in meaningful ways.

Reaching out to under-served young people from marginalised and minoritised communities can involve a range of challenges. For instance, how might excluded communities find out about your offer? Why should they trust you? How can you ensure that the programmes and activities that you offer are relevant to their interests, needs, experiences and trajectories?

While this may seem most relevant to outreach officers, it is also an issue for everyone in the organisation (CEOs, managers/education directors, mentors, technical staff etc.). While it is not uncommon to hear reference made to 'hard-to-reach communities', an equity approach challenges this assumption. Equitable and inclusive ways of outreach and access recognise that it is the ongoing dominant contexts, practices and systems that exclude particular young people and communities from participation, rather than the communities themselves being 'distant' or 'the problem'. A social justice approach can help create the conditions for more inclusive participation.

# Case Study 2.5

## Noticing, understanding and prioritising under-served young people's needs

**Makerspace C is an online and grassroots makerspace that offers free and accessible coding and digital skills programmes to increase unemployed and under-employed young people's employability, and develop their career prospects. After delivering several virtual and self-paced programmes, the practitioners found they were mainly attracting white male participants – a similar demographic trend to that found more widely within computer science education and industry.**

**The team used the Equity Compass to reflect and decide how to focus on challenging the status quo and engaging under-represented and under-served young people from local communities. In addition to targeting the people aged 18-30 who were not in full-time education, work or training, they also widened their recruitment focus to target women, non-binary, transgender and racially minoritised young people.**

The practitioners used a range of outreaching strategies to increase the visibility of their web development programme, both online and via youth networks. These included

(1) promoting their online website, newsletter and social media;
(2) sharing flyers and posters at career centres and community libraries;
(3) seeking referrals from past participants and local organisations; and
(4) delivering in-person introductions, talks and taster sessions at local job centres, job clubs, council departments and job fairs.

However, they recognised that simply reaching out to marginalised communities would not ensure that their programmes would be relevant to young people and address their real needs and aspirations. They therefore devised a plan to listen to, and learn from, their target communities to enable a more iterative programme development process. For instance, young people who applied to the programme were invited to a one-to-one informal online chat with the programme leader, in order to learn more about their interests, needs, strengths and potential barriers, using an assets-based approach. This led to young people raising and sharing concerns about being able to access laptops, the accessibility and openness of learning resources, transport costs, social interactions, specific barriers faced by autistic participants, language barriers for English as an additional language (EAL) participants and some participants' concerns about their attention span (see page 65 to find out more about the different barriers young people can face taking part in a makerspace).

These concerns were carefully listened to and considered by practitioners, who then adapted the programme content and delivery approach prior to the start of the course.

In response to the concerns, Makerspace C decided to bring in a 'no barriers' policy – offering financial support to those who needed assistance with travel or childcare costs and providing access to a laptop or computer, where needed. Learning from young people's feedback, Makerspace C also changed the content and images used in their promotional materials to make these more gender- and racially inclusive. They also provided a quiet room apart from the main delivery room for those with sensory requirements, and were careful to pair second-language learners who had concerns about their fluency with bilingual peers. The team also encouraged young people to express their 'real' needs. These included additional career support within the programme, such as CV editing support and inviting near peers who had recently completed prior programmes to share their experiences of accessing jobs, and their industry expertise and experiences. As one of the practitioners, Kirsty, reflected:

> **I enjoyed hearing people's stories and getting to know them better by conducting the interviews myself. It meant I could build relationships. During the first in-person session, I knew everyone entering the room by name. I think this helped them feel welcomed and 'seen'. I also remembered those with support needs, and it allowed me to quickly check in with them, which I think was appreciated.**
>
> **Kirsty, practitioner**

The programme achieved an equal ratio of participants who identified as male to those who identified as female and non-binary, while half of the cohort were from racially minoritised communities. This diversity of participants was frequently identified by participants as a strength of the programme. As one young person, Omena, shared:

> **Learning [with people] from different backgrounds is lovely. You learn things from different people and how different people work, but also… we all came for the same thing.**
>
> **Omena, young person**

## Reflective questions 2.5

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** Reflect on the 'no barriers' policy taken by this makerspace. Can you think of ways in which this can be implemented in your makerspace?

**2** Reflect on the needs and goals of this makerspace, and how they may differ from the needs and goals of the young people they want to engage. How can these differences be addressed?

**3** What ideas and learnings can you take from this case study that could inform equitable outreach and recruitment in your own space?

SPACE to REFLECT

This list from our Youth Co-Researchers is not exhaustive, but captures ideas from those we worked with. Use this list to reflect on the barriers young people in your makerspace might face.

*I'M SO UNSURE of MYSELF*

### Personal/emotional

- Feeling worried
- No motivation
- Feeling shy/fearful of speaking out
- Nervous/scared
- Unconfident/lacking self-confidence
- Not understanding what is being taught
- Low self-esteem
- Worry about being criticised

*How do I know if they can MEET MY NEEDS?*

### Social

- Being in loud spaces, and there not being a quiet area
- Not having people to work with/not knowing how to make friends/nervous to talk to people
- Feeling concerned about who you can be friends with/having problems with friends
- Feeling uncomfortable in social situations/unwelcome groups
- Lack of family support/judgments from those around
- Other responsibilities at home – cooking/cleaning/looking after children

*BARRIERS to MAKER SPACE PARTICIPATION FOR YOUNG PEOPLE*

### Disability

- Lack of adjustment to activities
- Having additional needs that might not be met or considered
- Not knowing if you will get support for your disability
- Accessibility issues of the makerspace
- Lack of accessible transport to the space

*My BUS DOESN'T ALWAYS RUN!*

### Transportation

- Might not have a way to get there or back home
- Location or proximity to makerspace
  Safety during travel – e.g. people having to walk in the dark/ feel unsafe on public transport.

### Mental health

- Struggles with mental health
- Lack of understanding from staff or other young people of mental health issues
- Anxiety/ social anxiety

*Will I feel like I BELONG?*

### Discrimination

- Racism
- Having an accent and different culture/cultural problems
- Concerns around dressing differently
- Having negative past experiences
- Language barriers/lacking dominant language speaking skills

# Case Study 2.6

## 'Meeting youth in their own communities'

**There are many barriers that prevent or make it difficult for young people from under-served communities to access makerspaces.**

As one young person, Alex, explained:

*I do know that for a lot of people from more disadvantaged backgrounds, a barrier they often face is the fact that they have never seen anyone at a makerspace who came from where they are from.*

**Alex, young person**

**Makerspace D used this insight to proactively adapt their provision, using their outreach to go beyond their physical space, and to run programmes in places where under-represented communities felt comfortable and a sense of belonging, rather than expecting young people to come to the makerspace.**

As Nadia, a practitioner, reflected:

**The rationale to this approach is that we extend equity by going to people in their own communities, their safe or known spaces, rather than them coming to us. It will also help us to develop relationships with people in some of the most deprived areas in the region/country, and open up different types/levels of engagement.**

**Nadia, practitioner**

Makerspace D established partnerships with local council departments, job centres, and organisations and charities that support under-represented groups. They acted as referral partners to widely advertise their programmes to target participants. They also built partnerships with schools and parents/guardians. In order to engage with more young women, the makerspace decided to change their promotional material in terms of language and images, as explained by a practitioner, Luka:

**I've become much more aware of people's approach to gender equity. When we announce the workshops, we make sure that it is written with the female gender in mind, and that we make a particular point of saying that we want more young women in our programme.**

**Luka, practitioner**

In addition, they recognised that for young women from a particular community, parental concerns about their safety and lack of reliable, affordable transport made participation in makerspace programmes risky and unattractive. The makerspace decided to "bring our tools to schools [and] go to where people cannot come to us", as one practitioner, Ben, put it.

They established a partnership with one school and talked with teachers, parents and female students, as well as neighbourhood communities and other youth organisations, about young women's needs and what would make them feel comfortable. As a result, they developed a programme that could be delivered during school hours at the school and/or with free transportation provided to the makerspace

They also set up a mother-and-daughter workshop, in which parents and children worked together to co-design and co-develop a community project. After the success of the programme, the team decided to expand the offer to more schools, with the intention to offer participating young women an opportunity to broaden their social networks and develop new friendships.

SPACE to REFLECT

## Overcoming barriers for women, girls and non-binary participants attending makerspaces

As a youth co-researcher, I conducted research in my makerspace to understand the different ways that makerspaces can encourage the participation of women and non-binary people in their programmes. Because the makerspace I was researching had achieved a gender split of 50/50 women to men, with three people identifying as non-binary, I thought it served as a good setting to analyse strategies that encourage young people of diverse gender to take part. These are the strategies that I identified:

**Using gender-neutral language in promotional materials** – language can be impactful to young people who are considering whether a course is for them, or not.

**Encouraging people to add pronouns to their name badges** – this normalises the practice and shows respect for individuals' gender identities. It creates a safe space for transgender and non-binary people **and** reduces the likelihood of mis-gendering.

**Using diverse examples of people in pictures, as speakers and as the course lead** – this enables students to better relate to individuals and imagine themselves in those positions, challenging stereotypes.

**Having members of staff that young people can relate to as their first point of contact** – for me, this was really important, as seeing someone who is also a woman and a person of colour enabled me to have someone I could relate to and build a stronger connection to my cohort.

I identified two additional ways in which my makerspace could continue with breaking down barriers to participation:

**1** Consider intersectionality (see glossary) and cater to the needs of individuals who may identify with multiple characteristics.

**2** Focus outreach efforts in more marginalised neighbourhoods and perhaps collaborate with community centres in such areas, to attract students to the programme.

# Activity 2.4:
## Reflecting on and iterating promotional materials

**Who:** Practitioners and young people, particularly staff working on promotional materials, and marketing and communications for the makerspace.

**Time:** 30-60 minutes

**Resources:** A selection of recent promotional materials for your makerspace and youth programmes; informal promotional efforts (social media, word of mouth etc.); tools to aid discussion (e.g. paper, pens, sticky notes or online discussion board)

**What to do:**

1. Look through the promotional materials (e.g. flyers, posters, application forms, social media, website text) used for your makerspace and youth programmes.

2. Identify and articulate both formal and informal ways in which the makerspace conducts its outreach activities. Who creates these materials/ makes these decisions?

3. Discuss:
   What visuals are used?
   Who is, and is not, represented?
   What messages might the visuals convey (e.g. in terms of who they are aimed at and what is shown about the space and the activities and programmes)?
   What sort of language is used in the text?
   Who might feel included/excluded by the style and choice of language?
   Whose voices are represented?

4. Collectively discuss and identify ways of developing promotional materials that are more inclusive and engaging for your target audiences.

# Activity 2.5:
## Collecting multiple perspectives on barriers to access

**The aim of this activity is to understand multiple perspectives on barriers that young people might face in terms of accessing the makerspace, and to generate ideas for addressing these barriers equitably.**

**Who:** Practitioners and young people; community members plus professionals with responsibilities for marketing, communications and outreach; leadership

**Time:** 1-2 hours

**Resources:** Pen, paper, flip chart paper, or online note taking resources

**What to do:**

1. Working with your makerspace team, identify and discuss the potential barriers to participation, from the perspectives of multiple stakeholders. (Barriers could include social, individual, systemic, school, family, communities, geographical etc.).

2. Convene working groups, potentially comprising relevant key stakeholders, and run similar sessions with each working group to identify what they perceive as the key barriers (e.g. young people and community members, families, stakeholders, funders etc.).

3. Through discussion, you may want to map different stakeholders' views using a grid, to help see where there are areas of agreement and specificity.

4. Identify the key issues that emerge – both common ones and unique ones identified by different stakeholders.

5. Develop an action plan based on the findings of the mapping, devising both short-term and long-term plans for addressing the barriers to access.

### Further resources

Checklist to find out if your makerspace is accessible for diverse audiences

Gender in the making: An empirical approach to understand gender relations in the maker movement (2021) – by Jennifer Eckhardt, Christoph Kaletka, Bastian Pelka, Elisabeth Unterfrauner, Christian Voigt, Marthe Zirngiebl

Making Spaces 1 – Visual Summary 2: Creating, Safe, Welcoming, Inclusive Spaces

# Equitable pedagogy



**Equitable pedagogy refers to the inclusive ways in which teaching and learning-orientated interactions with young people (within workshops and beyond) are conducted.**

Pedagogy refers not only to the techniques used to facilitate and support learning and engagement, but also the values and principles that underly practice.

Makerspaces have the potential to support equitable engagement among young people. Positioned outside of the 'formal' education sector, they enjoy opportunities to explore more creative and inclusive pedagogical approaches. For instance, whereas schools and colleges are often constrained by the demands of high-stakes national examinations, limiting options for exploration and risk-taking, makerspaces have more freedom to explore more innovative, 'hands-on' and experimentation-based ways of facilitating learning. However, just because a pedagogical approach may be exciting or engaging (or even spectacular), this does not necessarily mean that it is inclusive or equitable. This is particularly important when considering engaging marginalised young people with STEM making. In essence, it's not so much about what you do, but why and how you do it.
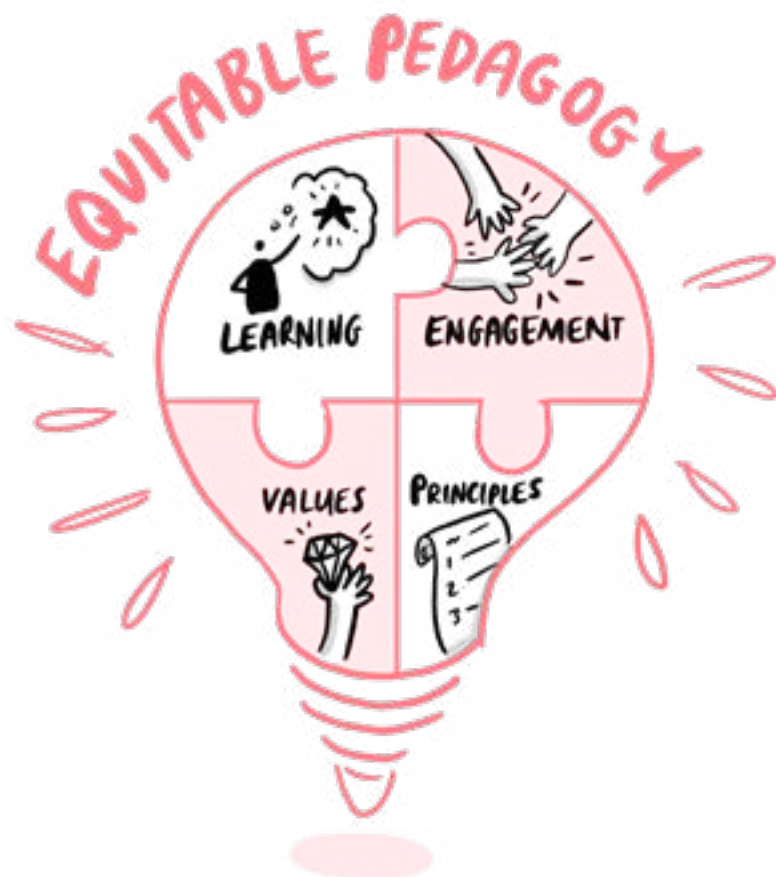
**Makerspace L is strongly committed to 'caring pedagogy' within their makerspace. They recognise that the young people who participate in the makerspace often come with self-perceptions that reflect negative experiences within mainstream schooling and/or the impact of wider social inequities. For instance, young people often came to the space identifying themselves as "disruptive", "not clever" and/or "not sci-ence-y" (or, as some youth put it, "I am always making trouble in school", "I'm not good at anything", "science is not for me"). The practitioners noticed that such views were particularly prevalent among children from marginalised communities.**

**They wanted to encourage young people to explore, rethink and value different sides of themselves, for which they used a care- and trust-based (trauma-informed) relationship-building pedagogical approach.**

The approach foregrounded the importance of facilitators taking a non-judgmental, child-centred approach, prioritising their needs, emotions and contributions, rather than the session content to be covered. For example, if a young person seemed distracted or disruptive, practitioners tried to understand this behavioural response (e.g. what was causing this response? How could it be mitigated? What support might the young person want/need?), rather than penalise it. They were alert to potential indicators of experiences of trauma and injustice (e.g. how young people's identities and responses were shaped by experiences of racism, poverty, sexism, homophobia, etc.). They also valued and respected individual differences – for instance, if there was a particularly quiet student, or one who needed less sensory input, the facilitators gave them space and respected their needs and/or interactional style, instead of requiring everyone to participate in the same way. Through this approach, young people's different ways of being were accommodated within the makerspace, creating a safe, caring and trusting environment.

A caring environment was also supported by the careful organisation of physical space within the makerspace (for further reading, see 'creating safe, welcoming, inclusive spaces – visual summary' from Making Spaces 1). For example, one young woman, Elaine, found that the 'relaxation area' provided an important, safe space to process her feelings.

> *If I'm stressed out of something during the session, I'm allowed to go out and sit on these sofas. I like to sit out there because it's a nice space to chill - it's like my little corner I can go to.*
>
> **Elaine, young person**

During a makerspace session, Elaine had an argument with her friend, another participant. As the session continued, Elaine appeared distracted and sulky. She then got up, left the activity and went to sit in the relaxation area. The facilitator noticed but, rather than asking Elaine to come back and focus on what they were doing, she gave her some time. After a while, the facilitator went and sat with Elaine on the sofa, asking her how she was feeling and what she needed. After their chat, Elaine decided to rejoin the session activity. The relaxation area offered young people like Elaine a space to be themselves, and take time out to regulate and express their emotions. While Elaine missed a small part of one activity, she was able to catch up by following what her peers were doing and with the help of the facilitator, who provided additional support.

Taking this approach was not always easy, as one facilitator reflected:

> **I realise that I tend to focus on those students whose energy and enthusiasm matches mine. I have, however, become much more aware of this and try to get a sense of different students' energy and starting points, and approach them where they are.**
>
> **Maja, practitioner**

## Reflective questions 2.7

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** Why is it important to create a space where young people can 'be themselves' and/or express negative emotions in ways that are recognised and supported in caring ways, rather than being penalised?

**2** Why might caring pedagogy be particularly important for young people from marginalised/minoritised communities?

**3** What might practitioners need to know, have and do in order to build safe, caring relationships with young people?

SPACE to REFLECT

## Caring practitioners

We (youth co-researchers) interviewed practitioners as part of our research. We found out that our practitioners focus on the ways that they engage with young people (their practices) and not just the things they want to 'teach' us. For example, Deb told us how she supports young people:

> I try to help young people by offering a safe space by learn and grow and explore.
>
> **Deb, practitioner**

She also told us how she values the skills and knowledge young people already have:

> I engage with the young people by meeting them wherever they are at. I like to find out what skills they are interested in, what skills they already have and what skills they would like to learn
>
> **Deb, practitioner**

We also asked young people what they think makes a good practitioner. The image below represents our research findings – the words in the middle are the characteristics that we and other young people think make a good practitioner (kind, creative, loving, welcoming, listening, caring) and the bubbles around are things they do:

## Embedding critical reflective practice to support equitable pedagogy

**Makerspace M is keen to both sustain and enhance equitable practice, and its leadership decided that embedding and mainstreaming critical reflective practice was key to their aims. They decided to critically reflect together on their youth pedagogy. To do this, they used two tools: the Equity Compass and a briefing on how to share authority with young people within informal STEM learning programmes.**

They brought together facilitators, senior staff, administrators and young people to discuss a recent robotics workshop. The workshop had been video recorded and shared with all attendees before the meeting. At the meeting, participants collectively reflected on what they felt had gone well, what they saw as the main challenges, and what could be improved.

They focused their attention through an equity lens on particular aspects of the workshop. Using the reflective questions detailed in the tools, they collectively identified a number of areas that went well, including positive comments about the welcoming and relaxed personal style of the facilitator, and the equal numbers of male and female attendees of the workshop.

They also identified some challenges, such as: the young men in the workshop appeared to be keener and more enthusiastic than the young women; a lack of movement around the space (most activities were conducted with participants seated at tables); the reduced engagement of two young women who did not have computers (many of the session activities were computer-based); and the didactic style of delivery, where the facilitator had a lot of content to deliver and there were not many opportunities for young people to contribute beyond responding to the facilitator's content or task-related questions.

Together, meeting attendees used the tools to identify a number of areas for improvement, which included: focusing on opportunities for bringing in co-design of the workshops; supporting facilitators to make more regular use of assets-based approaches; and ensuring that all participants have access to the tools/technology required to participate. They also identified an overarching desire to shift the delivery mindset in the programme, so that the content and skills associated with a workshop become a vehicle to support young people's identities, needs and lives, rather than being a goal or 'destination' in their own right. As a result, the team decided to rework the focus of the workshop, reducing the amount of 'explaining/telling' and allocating more time for young people to share and explore their own ideas and questions, both in relation to the workshop content and also to its format, delivery and direction.

All the staff found the collective reflective session valuable and came away with ideas to inform their own sessions and programmes. They set up regular collective reflection meetings, which they found enhanced both the quality and the equity of their programmes, and enabled them to continue evolving their practice.

**The more you use an equity-oriented pedagogical approach, the more you realise how important it is for young people. They can learn the 'hard skills' of machines, coding etc. from anywhere (online, or any other course), but these interactions with people, sharing ideas and being yourself are so much more valuable for them.**

**I think being yourself is something that young people don't learn in traditional school, and it is the hardest part. It is difficult to convince yourself that you are capable of doing things, so I hope that is something they take away from this programme. Before the end of the project, they will be able to say, 'you know what – I am proud of what I did, I love being myself and I want to be a better version of myself'.**

**That is going to have so much impact on their lives, future choices and career opportunities – particularly girls!**

**Yashoda, practitioner**

## Reflective questions 2.8

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** What ideas from this case study do you think were the most valuable to the makerspace in their reflections on the session, and for informing their ideas for improvement?

**2** What would you need to consider in order to embed regular, collective critical reflection in your own makerspace?

SPACE to REFLECT

# Activity 2.6:
## Embedding equitable pedagogy in your sessions

**Engaging in critical professional reflection is an invaluable part of equitable practice. This activity can be undertaken as a one-off, but is most powerful when repeated, becoming a regular 'habit'.**

**Who:** One or more practitioners

**Time:** 5-10 minutes

**Resources:** Printed or online version of the workshop reflection sheet – equitable pedagogy in Appendix E.2

**What to do:**

1. Invite your colleagues to observe one of the sessions you are running for young people (this could be a series of sessions).

2. After observing the session, take 5-10 minutes to reflect on how it went, using the workshop reflection form (Appendix E.2) to document what went well and what could be improved in terms of equity in pedagogy.

3. Similarly, observe other sessions run by other colleagues and reflect critically on their equitable practices.

4. Using peer observations of each other's practice, reflect together on areas of equitable pedagogy that are working well, and those areas that need further development.

### Further resources

- Learn about authority roles in a learning environment and how to practice more equitable authority sharing – YESTEM project brief

- List of core equitable practices to support young people's STEM learning – Equitable practice toolkit – YESTEM Project

- List of reflective questions for teachers using the equity compass – Teachers' edition of equity compass

- Making Spaces 1 – Visual Summary 4: Fostering Caring Pedagogies and Relationships

# STEP 3: Evaluate

**Step 3: Evaluate explores how you can evaluate your programmes to continue to improve equitable practices with young people in makerspaces.**

In this step, we introduce different evaluation tools that you can use to evaluate equitable outcomes for young people in your makerspace programmes. The case studies in this section demonstrate how these tools might be used in practice and how you might develop your own creative solutions for evaluation, including co-developing evaluation with young people. Engage with the activities to reflect on the evaluation tools you currently use, and to trial new ideas. It is crucial that your journey doesn't end after this step. How you implement the understanding you have developed through equitable evaluation is vital to continuing to develop your makerspace programmes towards more equitable ends. We recommend that you use the **Next Steps table** to record your ideas for evaluation as you read through this section.

## Equitable spaces and outcomes

### Evaluation is part of the work of makerspace practitioners.

In this module we provide information that can help you evaluate your practice and understand the extent to which your space and programmes are progressing towards equity. The first step of any evaluation begins with thinking about what it is you want to find out. In the Making Spaces project, we wanted to measure the extent to which makerspace practices and environments were perceived as equitable, and whether equitable outcomes were being achieved. By equitable outcomes we mean outcomes that challenge traditional or stereotypical notions of what 'counts' as STEM or who belongs in STEM, and result in benefits for individuals and communities under-represented in STEM (see Appendix A: Equitable Youth Outcomes Framework). To support evaluation of equitable spaces and outcomes, we created two tools: the Equity Survey (see Appendix F), which looked at makerspace practices and environments overall, and a 'quick check' pre and post questionnaire (see Appendix G), which focused on equitable outcomes of programmes. You can observe your own (or colleagues') sessions and explore how everyday pedagogical practices support equitable youth outcomes (Appendix E.1).

Evaluation objectives are generally tied to what you want to achieve with a programme or activity, so it is important to consider this from the outset. When you are aiming for equitable experiences and outcomes, measuring these will be the focus of your evaluation. However, there is no one 'right way' to approach evaluation and a range of methods can be used to conduct evaluation in an equitable manner, by respectfully capturing the voices and perspectives of participants. Likewise, you will want to consider what would work best for your participants. (See Appendix F.1 for how one of our makerspace partners adapted the Equity Survey for their young people.)

# Case Study 3.1

## Getting started with evaluation

**Although Makerspace E had been running sessions with young people for several years, evaluation was relatively new for them. Programme leaders wanted to incorporate evaluation into their practice, but they were unsure where to start. Having looked up evaluation information online, they decided to start with a simple rating scale activity, to gather feedback from young people at the end of a session.**

Although Makerspace E had been running sessions with young people for several years, evaluation was relatively new for them. Programme leaders wanted to incorporate evaluation into their practice, but they were unsure where to start. Having looked up evaluation information online, they decided to start with a simple rating scale activity, to gather feedback from young people at the end of a session. They drew two rating scales on a flip chart, and asked participants, as they walked past on their way out, to use a pen to mark the extent to which they had enjoyed the session (scale 1) and learnt anything from it (scale 2).

Looking at the responses afterwards, the staff could see that most young people had enjoyed the session and felt they learnt something from it. While this was a useful starting point, they realised that they needed more information in order to learn how to improve the programme and understand its strengths and weaknesses. For example, they wanted to know which workshop activities participants found more or less interesting and/or relatable. To expand their evaluation, they adopted a workshop reflection sheet (see Appendix E.1). This sheet helped them to record structured observations of the session, related to session and programme aims. They used these sheets during weekly staff meetings to reflect on their own practice and improvements that they could make to upcoming sessions and the overall programme. The sheet also served as a record of progress and helped staff create a narrative of the programme, log participant numbers and keep track of activities.

Next, the team started trying out other evaluation tools, too. They introduced pre- and post-programme Quick Check Surveys (see Appendix G) to capture youth outcomes, and began using different creative evaluation methods (see Appendix H). For instance, to explore whether young people had felt welcome and comfortable in a session, they used a 'pebbles in a jar' activity. As young people left the room at the end of the session, they

indicated the extent to which they felt welcome, or not, in the session by placing their marble in one of the differently labelled jars. The jars were covered, so no one could see how their peers had voted. This offered the team some insights, and they then tried a 'head-hands-heart' activity. A silhouette of a person was drawn on a large sheet of paper and young people were given post-it notes, on which they could write what they felt they had learned from the session (head), what they felt about the session (heart) and what they would like to do next to follow up (hands).

The team found these evaluation activities to be relatively quick, unintrusive and easy to integrate into a session. When combined with reflection, they set the makerspace on a good footing for future evaluation.

## Reflective questions 3.1

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** Why is it important to collect feedback from participating young people, as well as from practitioners? What different insights might each of these sources of data bring?

**2** What are the pros and cons of using simple evaluation tools like those first tried by Makerspace E (e.g. placing dots on a rating scale)?

**3** Thinking of a programme in your space, which of the tools described above (rating scales, pebbles in a jar, head-hands-heart, pre/post Quick Check Surveys) might be useful/appropriate?

# Case Study 3.2

## Moving towards youth-led evaluation



**Makerspace F has a weekly youth programme, which introduces young people (ages 10-15) to digital manufacturing technologies, such as laser cutting and 3-D printing. Practitioners had been running and evaluating their youth programmes for many years, often utilising creative evaluation approaches. They wanted to take their practice further by involving young people in co-designing and trialling potential evaluation tools.**

To start, practitioners ran a series of evaluation workshops with young people. They first introduced young people to examples of evaluation tools (e.g. smiley face rating scales, icons, number and word scales, drawings) and invited them to design their own evaluation forms . As one practitioner reflected afterwards, young people loved the session and 'got really carried away', producing a range of 'beautiful' tools, including a tree where youth reflections were written on the leaves, with branches added for the dimensions being evaluated (images below).





In the next workshop, young people reflected on the evaluation tools created in the previous session and discussed what they liked, and did not like, about the various tools:



*My favourite was the end one [drawing response] because you get to doodle with it and draw what you did… sometimes it's hard to explain in words what you're feeling, but if you doodle it, it's easier.*

**Irena, young person**



*I just find it easier to write it. I think it's good to have the option to draw it, but when they say 'just draw it', I dunno – drawing with a marker pen is not that easy!*

**Malik, young person**

While young people's preferences varied (e.g. paper vs online tools that don't waste paper, forms vs post-it notes, drawing vs writing), participants agreed on the importance of evaluation, and that it needed to be quick and easy to do. At the end of the session, participants voted for their six favourite evaluation tools to be implemented in future sessions. A final workshop focused on the six tools chosen, which were trialled after a regular session in the space, inviting a wider group of young people to provide feedback via post-it notes and to vote on their preferred tools. This was followed by a reflective discussion to understand why participants preferred certain tools and what the advantages and disadvantages of the tools were.

Through this process, a range of evaluation tools were developed and employed. Sometimes the tools were quantitative (such as surveys and evaluation sheets), but often they were qualitative and creative approaches, including journey mapping, photography, filmmaking, journaling and reflective discussions. Staff found that these methods were minimally intrusive and quick to implement while capturing the perspectives of young people on a range of dimensions, offering rich and useful evaluation data. The makerspace embedded these approaches in their usual evaluation approach and planned next to involve young people in analysing and interpreting the data collected.

## Reflective questions 3.2

**Use the following questions to reflect on your own makerspace, either individually or with colleagues:**

**1** What are the benefits of co-developing evaluation with young people? For example, how does it benefit your space, programme, or young people?

**2** What are some of the challenges of working in this way?

**3** In the case study, the young people were involved in developing methods to collect data. How might they be involved in other stages of the evaluation process?

SPACE to REFLECT

## Young people's tips for making an evaluation sheet

The last thing we (young people) want to do at the end of a session is a long evaluation activity – we want to do something that is quick, simple and where you don't have to think too much. Here are our tips on creating an evaluation sheet that young people actually want to do:

**1** **Make options for circling an answer or writing one word.** These questions are easy, quick and it shows a lot from a tiny thing!

**2** **Make it colourful and interesting** – how it looks is important.

**3** **Keep it short.** We think five short questions work well, or you could have fewer longer ones.

**4** **Give the option of writing a longer answer.** So, if people have more to say, then they can, but if they're tired, they don't have to.

**5** **Let people draw or write their answers** – some people find it easier to write and others find it easier to draw!

Here's an evaluation sheet we made for one session – we tried to make different types of questions for people to answer and used coloured boxes to make it more engaging to do:
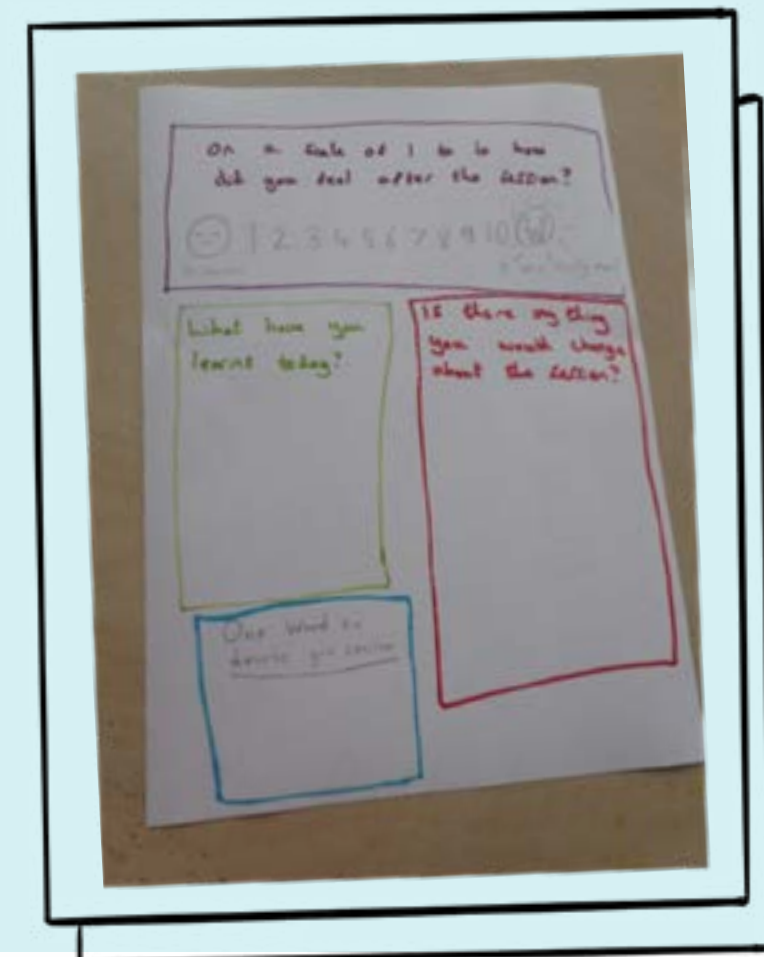
# Activity 3.1:
## Current evaluation practice

**The outcomes you are trying to achieve are among the most important drivers of evaluation. This activity will help you to reflect on what you are measuring, and why. It can be undertaken individually, but can be even more effective when discussed collectively with other members of staff.**

**Who:** One or more practitioners

**Time:** 1 hour

**Resources:** A current evaluation tool (printed or digital) used in your space, and the means to annotate it

**What to do:**

1. Select one of your current evaluation tools (e.g. a feedback form).

2. Annotate the form with the outcomes that you intend to measure with it. (Some people find it easiest to print a larger copy of the form and use post-it notes to annotate outcomes). As you do this, discuss/reflect on why you are aiming to capture these outcomes?

3. Next consider the extent to which the annotated outcomes reflect equitable outcomes. You may find it helpful to look at the Equitable Youth Outcomes Framework (Appendix A).

4. Discuss/reflect using another round of annotation (e.g. in a different colour) to identify how and where you could adapt the evaluation tool in question to capture more equitable outcomes.

5. You may wish to relate the annotated equitable outcomes to the aims of your programme. To what extent might these offer opportunities for further alignment?

6. To extend the activity further still, you may wish to explore ways to share your reflections and insights, using them to inform the review and iteration of current programmes.

# Activity 3.2:
## Trialling a tool

**Who:** One or more practitioners

**Time:** 2+ hours

**Resources:** Quick Check Survey, Equity Barometer Survey, devices or means to deliver and capture data and feedback from the chosen evaluation method

**What to do:**

1. Read the pre/post Quick Check Survey and the Equity Barometer Survey. There are guides in the appendices of this resource to support you in using these two tools.

2. With colleagues, if possible, choose one of these tools to try out, adapting it if necessary to fit your space and programme.

3. After trying out the approach, arrange a discussion with those involved to consider how it went, considering:
   To what extent did participants find the tool was easy or difficult to use? Why?
   To what extent do you feel the tool fits into the flow of the programme? What would need to be changed/improved to make it more effective?

## Further resources

- The Making Spaces 1 report (2022) Evaluate section (pp 68-72), for more on the creation of the Equity Survey

- Making Spaces 1 – Visual Summary 6: Build Capital Skills and Progression, as well as the Making Spaces 1 report (2022) (pp 78-79), for more about equitable outcomes for young people

# Activity 3.3:
## Co-producing evaluation

**Co-producing evaluation – or supporting young people to design their own evaluation tools – is a valuable way to not only capture youth voice and support young people's agency, but also to embed equity into the design and delivery of evaluation.**

**Who:** Practitioners, young people

**Time:** 2+ hours

**Resources:** Examples of current evaluation tools used in your space; means to record and share young people's thoughts (e.g. written notes, mind map tools); examples of other evaluation approaches; tools to record thoughts and ideas (e.g. pens, paper, stickers, computers)

**What to do:**

1. Organise a discussion with young people to explore their views and experiences of evaluation. It may be helpful to collect and share some of the tools that you currently use for evaluation as discussion prompts.

2. Record young people's views on these, thinking about:
   To what extent do they feel that existing tools capture their experiences and feelings about a programme?
   What works well?
   What is missing?
   What needs more/less detail?
   What do they think are the most important things that practitioners need to understand about their experiences in the space/on the programme?
   How might these be best captured?

3. Invite the young people to share their ideas and designs for adapting or changing existing evaluation tools and/or creating new ones. You may find it helpful to share with them some examples of different evaluation approaches, such as creative approaches (Appendix H), Quick Check feedback forms (Appendix G) or the Equity Barometer Survey (Appendix F).

4. Support young people to try the co-produced tools, gather feedback and use this to develop a next version. For example, consider the extent to which the tool captures equitable youth outcomes and ask what is important to young people.

# Next steps

In this guidebook, we have shared the 3-STEP approach to support your journey towards a more equitable and inclusive makerspace. We hope you now feel ready to put these ideas into practice.



As you begin to try out and embed the 3-STEP approach in your makerspace, you may find the following template useful for organising your ideas and planning your next steps. Remember that this is an iterative and evolving process – you may find it easiest to start with just one of the 'do' areas, embedding and refining your practice through this reflective process before moving on to try another area.

The template can also help you to keep track of which sections in the guidebook you have covered as you work through it over time.

You can also find a worked example of how a practitioner might use the form in

## Next Steps Table: Planning & Reflection

|  | Key reflections after reading the introductory sections to this step | Key thoughts after doing the case study reflective questions | Reflection on the activity - what do I want to try? How do I need to adapt it? How did it go? | How can I take this step further? What do I want to develop/improve/test next? How can I enhance equity ? |
|---|---|---|---|---|
| **PREPARE**<br><br>Equitable mindset and critical reflective practice | | | | |
| **DO**<br>**(Tick all that apply)**<br><br>• Co-production<br>• Equitable governance<br>• Inclusive access and outreach<br>• Equitable pedagogy | | | | |
| **EVALUATE**<br><br>Equitable spaces and outcomes | | | | |

# Acknowledgements

# Appendices

# Appendix A: Equitable Youth Outcomes Framework

This framework was co-produced with young people and practitioners from our partner makerspaces, as well as our advisory group. The framework represents what we see as equitable outcomes for young people attending makerspaces.

| Equitable Outcome | Detailed equitable outcome areas |
|---|---|
| **(STEM and general) Capital\* skills** | STEM-specific: New/improved STEM skills and knowledge, such as: problem-solving; using specific skills and tools/machines; measuring; design; critical thinking; STEM-related knowledge/understanding (e.g. coding, fabrication) |
| | General: New/enhanced cultural capital (e.g. useful forms of knowledge, understanding, insights) |
| | General: New/enhanced social capital (e.g. new social contacts and networks) |
| | General: Improved employability and life skills (e.g. communication, teamwork, leadership, social skills) |
| **(STEM and general) Educational and occupational trajectories** | STEM-specific: New STEM futures/aspirations |
| | STEM-specific: STEM-related job readiness |
| | General: Improved experiences/engagement in formal education (e.g. school, college) |
| | General: Improved experiences/engagement in informal education (e.g. out-of-school settings) |
| | General: Improved pathway/progression in formal education |
| | General: Improved pathway/progression in informal learning (e.g. out-of-school settings) |
| | General: Increased attainment in formal education |
| | General: Job progression/trajectory (e.g. secures new employment) |
| | General: Improved transitional learning/support for transitions (e.g. from education to jobs) |
| | General: Increased earning (actual or potential) |
| **Personal and community agency and social action** | Increased personal agency (e.g. confidence, capacity to act, take ownership, etc.) |
| | Increased community capacity to use STEM skills to challenge injustices and/or benefit communities (e.g. socially, environmentally, etc.) |
| | Meaningful, mutually beneficial relationships between young people, makerspace and community |
| **Personal and community identity (general and STEM specific)** | Increased learner confidence/identity/self-efficacy |
| | Feeling recognised, respected and valued (under-represented local community members are recognised for their STEM-rich making in, and beyond, the makerspace) |
| | Young people feel that they and the communities they represent are valued for their knowledge, skills and expertise |
| | Sense of community and belonging |
| | Broader understanding of STEM identities and representations |
| | Improved STEM identity (e.g. sees self and/or is recognised by others as 'good at STEM', 'a STEM person', etc.) |
| **Wider wellbeing outcomes** | Improved mental health |
| | Improved community/personal relationships |

\*Capital refers to a range of cultural and social resources, e.g. types of knowledge, understanding and skills

# Appendix B: Background of the project (more information)

This guidebook is based on a four-year research project 'Making Spaces' (2020-2024), led by Professor Louise Archer at UCL, and funded by Lloyd's Register Foundation. It aimed to identify equitable practices which support diverse young people's engagement with STEM (Science, Technology, Engineering and Mathematics), as well as address societal challenges, and empower learners and communities.

Making Spaces Phase 1 (2020-2022) worked closely with three UK-based makerspaces (See report to learn more about Phase 1). Based on the impact of the first phase of the project, Making Spaces Phase 2 (2022-2024) expanded its partnerships to collaborate with practitioners and young people from seven international makerspaces in the UK, USA, Nepal, Slovenia, and Palestine. The project sought to extend understanding of what socially just makerspace youth practice entails, and translate insights into co-produced, practical and accessible resources that can inform and improve international STEM education policy and practice, in and beyond makerspaces.

Valuing co-agency and co-contributions, Making Spaces Phase 2 worked closely with several partners, participants and advisory board members around the world. In particular, the project involved:

- 7 makerspaces
- 21 practitioners
- 32 youth co-researchers (YCRs)
- 1542+ participating young people
- 5 UCL researchers
- 10 advisory board members

Collaborative planning, trialling and evidence-informed reflection were key features while developing equitable practices with partner makerspaces. Table 4/5 presents various qualitative and quantitative data collected by the UCL researchers and YCRs.

## Data collected in the Making Spaces 2 Project

| Data Source | Total |
|---|---|
| Practitioner interviews by UCL team | 29 |
| Practitioner interviews by YCR | 4 |
| Practitioner surveys | 24 |
| Youth interviews conducted by UCL | 24 |
| Youth interviews conducted by YCR | 70 |
| Parent interviews conducted by YCR | 6 |
| Youth Quick Check Surveys | 119 |
| Youth Equity Surveys | 80 |
| Workshop observations by UCL | 52 |
| Workshop observations by YCR | 8 |
| Practitioner reflection forms | 26 |
| Youth co-researcher workshops | 25 |
| Regular meetings for programme planning and reflection | 100+ |

With youth voice and agency valued, the project involved youth co-researchers from the partner makerspaces. This helped to understand ideas of equitable practices in makerspace from young people's perspectives and to co-produce research together. The UCL research team designed and delivered workshops covering themes such as gender and STEM, inclusion, and research skills (e.g. formulating research questions, interview method, data analysis). In the workshops, the YCRs were supported to express their ideas in interactive activities, and to develop research skills. In addition, the young people were given 'fieldwork tasks' where they could put their new skills into practice by researching ideas in their makerspace and community.

Based on rich data and practices across global contexts, the project aimed to translate ideas into engaged and accessible practical resources to support practitioners of makerspaces. The 3-STEP approach was developed, informing practical approaches to preparing, performing and evaluating equitable practice within and beyond makerspaces. Built on the approach, this guidebook was produced by the UCL research team, with more contextual and concrete case studies and activities exemplified. In addition, the multimedia online course was developed in alignment with the guidebook.

This project was driven by the passion to provide more opportunities for young people, particularly those from under-served and under-represented communities, to showcase and celebrate innovative, STEM-rich ideas and designs that challenge social injustice. The Making Good Prize offered just such a platform to highlight the value of inclusive STEM participation and the inspiring role that young people can play in creating safe, sustainable and socially just communities.

**See what some of our youth co-researchers had to say about inequities:**

*In society*

- Stereotypes and societal expectations about gender roles, race and age can create a self-perpetuating cycle where these groups are not encouraged or supported to pursue tech education and careers.

- Society expects less from women. Society doesn't expect women to become a scientist or an astronaut, they are just expected to be cooking at home.

*In schools*

- In school, we see that STEM subjects are very male-dominated.

- Women and girls are seen to be better at other subjects at school, not STEM. We also see that young girls do not have the same opportunities as young men throughout the fields of STEM education.

- Sometimes, places on education programmes are fewer for women and girls, or they are not eligible.

*In industry*

- It is difficult for women to get into the STEM sector, and women face many barriers in the STEM field because of their gender.

- The manufacturing industry is seen to be for men, and if women would like to work in these industries they face discrimination… like being told by men that they can't do it because they are 'weak' and 'should work in an office'.

- I think one significant factor is the lack of representation and inclusivity in the technology industry itself. Many women of colour, disabled women and older women may feel discouraged from pursuing careers in tech due to the lack of diversity and representation in the industry, which can lead to feelings of isolation and exclusion.

The following is a worked example of how to use the form, using the illustrative case of Oliver, a youth workshop facilitator in a makerspace, who has recently begun engaging with issues of equity in his practice.

| | Key reflections after reading the introductory sections to this step | Key thoughts after doing the case study reflective questions | Reflection on the activity - what do I want to try? How do I need to adapt it? How did it go? | How can I take this step further? What do I want to develop/improve/test next? How can I enhance equity ? |
|---|---|---|---|---|
| **PREPARE**<br><br>Equitable mindset and critical reflective practice | This made me think about the fact that most of the young people in my electronics workshops are boys. The few girls we do get tend to be quiet and are not as vocal in group discussions.<br><br>The idea of equity was new to me. Previously, my approach has been to treat all young people the same. But now I think my 'equality' approach was not ideal. I'd like to understand some more about how to use an equity approach in my workshops. | I liked the way the team evolved their practice in the case study – they didn't try to change everything at once. I recognised the same gender imbalance as the case study makerspace. I like how the Equity Compass framework gave the team a structured way to think about improving their programme. 'Assets-based' learning is a new term for me and sounds interesting – I'm going to look at the Equity Compass summary link and read a bit more to better understand it. | I read the Equity Compass summary and tried the activity with a colleague. We focused on the 'assets-based' approach and decided to just try a small change first – asking workshop participants about their own experiences of electronics and adding in more discussion and opportunities for young people to tell us their ideas about what they would like to create in the work-shops, so we can identify ways we can move away from a 'recipe' approach to what we make in the sessions. It went well! The participants had interesting ideas. | We are thinking about running an 'open lab' programme this summer, where we can support participants to apply the knowledge and skills they have developed in the workshops to making and designing their own ideas. I'm going to discuss funding with the director and look at some frameworks for how we might structure and run the sessions. We are also going to get some input from the young people on the current workshop on what they would like. |
| **DO**<br>**(Tick all that apply)**<br><br>• Co-production<br>• Equitable governance<br>• Inclusive access and outreach<br>• Equitable pedagogy | I have always put a lot of thought and effort into making my workshop sessions fun and engaging. But I've never really got young people's direct input, or got their feedback on draft ideas or content. I have tended to be guided by what I felt went well and comments from the course evaluation forms. But I can see that this would be helpful. | I'd like to set up a staff meeting or staff training on participatory ways of working with young people – I think that would be very useful. We could all read the case study and discuss it. I'm interested in the idea of challenging power differences between myself and the young people – but I do worry about the health and safety aspect. I found Mila's quote reassuring on this point. | I decided to ask the young people at the end of the workshop for their ideas for what they want to do next. They had loads of ideas, so we've decided to hold an additional group planning session where I will invite female colleagues and youth mentors to join, to help break down power hierarchies. | I think I'm using a consultation approach, so I'd like to try and develop it more into co-production. I'm going to discuss with colleagues and see if we can look again at the guide to get some ideas on how to develop this further. It's also made me think that we might want to look at our outreach next because I think there is more we could do to make our sessions more attractive and engaging for girls and non-binary young people – so I will read that section next. |

| | Key reflections after reading the introductory sections to this step | Key thoughts after doing the case study reflective questions | Reflection on the activity - what do I want to try? How do I need to adapt it? How did it go? | How can I take this step further? What do I want to develop/improve/test next? How can I enhance equity ? |
|---|---|---|---|---|
| **EVALUATE**<br><br>Equitable spaces and outcomes | I realised that I have never thought about 'equity' before in relation to outcomes! The sort of outcomes that I've tended to measure have focused on whether young people have enjoyed my workshop, what skills they have learned and if they would recommend us or come back again. | I found it interesting to think about aspects like 'relatability' as a way of understanding how sessions go. | I wanted to try out some more creative approaches to evaluation that could also help me to get young people's input into session planning. I really liked the 'graffiti wall' idea, which I adapted. We used it to get young people's ideas for future workshops and what they want to see improved.<br><br>It worked really well. I noticed that the girls especially enjoyed adding and drawing their ideas on the wall. I'll work these ideas up and will set up another meeting to get their feedback on what we develop, to check we all feel it is on the right lines. | It's been great getting the young people's ideas – they are really creative! They've come up with amazing ideas that I wouldn't have thought of. It's also given me a better idea of how girls experience our programme. I'd like to extend these input sessions – I'm going to read the governance section next, as my colleague said it has material about youth advisory boards, and I think this is something that might benefit our makerspace. |

# Appendix D: Activity ideas for co-production

### Youth-led icebreaker (10mins)
Ask young people to choose and facilitate an icebreaker activity for the first part of a session. If you have a large group of young people, you might find it easier to involve a smaller number of young people to begin with – however, be careful not to only select more confident voices. You could try selecting randomly, or you might want to ask someone who is usually not as confident or engaged. Icebreaker activities can be any warm-up game to get the young people energised and interacting with each other in a fun way. Leave space for the young people to explain the rules of the icebreaker to the group and let them run the activity/game. You can help by making sure all the young people are taking part in the icebreaker, and that everyone understands the rules, or help the young people to make sure everyone is listening.

### Youth facilitation roles/'mini-managers' (variable)
Discuss with young people if they would like to take on specific roles and responsibilities (these could be within a particular session or more generally across a programme). Collectively generate a list of possible roles (e.g. timekeeping; scribing; giving out snacks during breaks; welcoming new members; hosting visitors; signing young people in and out; tidying up, running games, conducting course evaluations; generating ideas for the programme). Then agree a system that they would like to use to volunteer for these roles. Make sure everyone can have a say and agree ways forward.

### Peer feedback activity (c.10-15mins)
Encourage collaboration and peer feedback by asking young people to spend 5-10 minutes in pairs, finding out about projects that they are each working on and any future development ideas they may have. Invite one of each pair to then tell the group about what they have learned about their partner's work and their discussion. (see mentors view's on the value of peer-to-peer learning).

### Sharing/showcasing work (15mins)
Leave time at the end of each session for young people to take turns sharing what they have done/made in the workshop. You may want to ask for volunteers to share, or you may prefer to select young people who have done particularly well in that workshop. Remember to consider young people's needs – for instance, some young people may need more support than others to participate in sharing. It can be useful to ask a young person what support they need to be able to share with the group, or use the peer feedback activity so a peer can share, if helpful.

### Championing young people as experts (5-10mins)
Make time for young people to demonstrate, explain and share their skills, ideas and experiences with the group, as part of an assets-based approach. For instance, ask a young person to demonstrate using a machine or tool that they like to use; share a skill, hobby or interest that they have from outside the space (e.g. knitting, sports, gardening); or present an idea or topic that they are interested in.

### Develop ideas for co-production in a group discussion (30mins)
Facilitate a discussion with young people to plan and map additional ways they can be involved in co-producing the workshops. Explore with young people how they could be involved in the design, delivery, facilitation and evaluation of the sessions. Ask young people for their ideas on how to make the space and their experiences on the programme even better.

# Appendix E: Practitioner reflection sheets

### Appendix E.1 Workshop reflection sheet - equitable student outcomes

| Guiding questions | Notes |
|---|---|
| Date/time/location of session | |
| What is the session/activity being observed? Aims/objectives? | |
| Who is taking part and what are their roles (e.g. staff, volunteers, young people, others – with demographics)? | |
| What is the space like? | |
| Brief description of the structure/ format of the session | |
| Any notable features or significant events? What stood out most about the session? What might its main significance be for our project? | |
| **Capturing youth outcomes Observation prompts** | **Notes** |
| Who has voice, agency, authority, and power within the session? (In general, and specific examples) | |
| Examples of STEM-specific capital and skills being supported | |
| Examples of general capital/skills being supported | |
| Examples of support for youth trajectories/outcomes | |
| Examples of identity outcomes (e.g. relating to confidence, mental health, sense of community, belonging) | |
| Examples of STEM-specific identity outcomes (e.g. recognition as 'a STEM person', relatable representations of STEM, etc.) | |
| In what ways can we see the presence or absence of considerations of equity in the session (in what is said, done, relationships, resources, practices, etc.)? Any examples of authority-sharing, co-design or participatory approaches? Assets-based pedagogy? Explicit statements, etc.? | |
| **Overall observation** | **Notes** |
| What works well | |
| Challenges | |
| Even better if… | |

| Name of the makerspace: | | Name of the facilitator: | |
|---|---|---|---|
| Topic of the session: | | Number of young people: | |
| **Description of the session:** | | | |
| | | | |

| Ideas for equitable pedagogy: | To what extent did this happen in the session? (Identify specific examples of interactions) | How could it be improved? (Identify areas within the session where this could be extended) |
|---|---|---|
| **Recognising young people's knowledge and lived experiences** | | |
| **Accommodating young people's emotional wellbeing** | | |
| **Sharing authority roles with young people in terms of decision-making** | | |
| **Personalising and localising the content** | | |
| **Developing a caring and trusting relationship** | | |

# Appendix F: Equity Barometer Survey

**Guidelines for conducting the Equity Barometer Survey**

The Equity Barometer Survey has been designed in collaboration with practitioners in our partner makerspaces and participating young people. It aims to give you insight into your makerspace's equitable practices, as viewed through the eyes of young people. It is also intended to support reflection on your practice, and identification of strengths to build on and areas for improvement.

The survey has 31 main questions, plus two optional questions: one about how closely young people feel the activities in the makerspace are to school subjects, and one asking for any further comments. When preparing the survey to give out, you can drop the optional page if you prefer not to ask these questions.

There is a space at the top of the survey to enter the name of your makerspace (or, if more appropriate, your programme). We suggest that you enter this before copying and handing out the survey.

The survey begins with seven questions about the activities that young people do in the space. This is followed by twelve questions about the staff or practitioners in the space. You may need to clarify to young people that we are referring to the staff (or volunteers, if applicable) who they interact with when undertaking activities in the makerspace. They can also think about the members of staff with whom they have the most frequent interactions. Next, there are six questions about how the young people experience the space, and the final section has five items focused on the relationship between what they do in the makerspace and the world beyond, as well as a question about learning. This is followed by the optional questions, though please make sure to remind your young people that they can skip any question if they prefer not to answer it.

The survey should be completed individually, rather than in groups, in order to capture the perceptions of each young person directly. However, please support young people in understanding the questions when needed, especially in terms of what the items refer to (e.g. the space, activities, staff, and so forth – rather than in general, or activities they do elsewhere). You may also want to read the questions to the group and you may wish to remind them that they can skip any questions they would prefer not to answer. It is up to you to choose when you would like to implement the survey. That said, it is likely to be more useful if done closer to the end of a series of sessions, or after young people have been coming to the makerspace for a while, so that they have enough experience of the space, people and activities to feel confident in answering the questions.

**Using the Equity Barometer Survey as a reflective tool**

This survey is not to be used as a test, but rather as a tool that can help you reflect on young people's experience and perceptions of your space. It will be useful in identifying areas that may need attention, and will also help you to see how your own practice and your space are evolving towards equity. It can also be useful to supplement other, more qualitative, ways of gathering feedback.

The survey captures eight key areas related to equitable practices and spaces. There are also three further areas that are represented by single questions. We encourage you to look through the survey responses to help you reflect on which area, or areas, you may want to focus on in your practice, moving forward.

| Area | Definition | Questions |
|------|-----------|-----------|
| 1. Equitable, enjoyable and meaningful experiences | The extent to which young people have enjoyable, interesting experiences that connect to their identity, community and things that are important to them. | Q1: I find most sessions or activities interesting.<br>Q2: I make and/or do things here that are important to me.<br>Q3: I do things here that will help me in the future.<br>Q4: I do things here that make me feel confident. |
| 2. Equitable approaches to developing and using STEM knowledge and skills | Whether and how young people's STEM capital is being valued, supported and enhanced –including their perceptions of whether their skills are appreciated and used. | Q23: I get to use my knowledge and skills to help others.<br>Q25: Young people at the makerspace appreciate each other's knowledge and skills. |
| 3. Supporting equitable STEM trajectories | The extent to which young people's STEM trajectories and path-making through STEM are being supported. | Q15: They have helped me to make useful contacts and expand my support network.<br>Q16: They have told me about other activities, services or opportunities that might interest me. |
| 4. Inclusive approaches to supporting young people's identities in STEM | Young people being able to express themselves and feeling comfortable and valued for who they are in the space. | Q21: I feel valued for who I am here.<br>Q22: I feel I fit in here.<br>Q24: I feel safe here. |
| 5. Supporting young people's agency and social action | The extent to which young people feel that their agency is developed and supported, within the makerspace itself and in the wider community and beyond. | Q5: We can do things here that try to challenge inequities in society.<br>Q6: Some things I do or make here could help people in the community.<br>Q7: Some things I do or make here could help the environment.<br>Q26: Some things I learn and do at the makerspace will help me at school or in other educational settings.<br>Q27: The knowledge and skills I've developed here will help me achieve my goals in life.<br>Q28: The activities I do here will help me get into work I want to do in the future. |

| Area | Definition | Questions |
|------|-----------|-----------|
| 6. Inclusive views of STEM | The extent to which the makerspace programme has broadened or changed young people's views around STEM. | Q29: The makerspace has broadened my views about who does science, computing and/or engineering.<br>Q30: Coming here has helped me feel connected to science, computing and/or engineering. |
| 7. Caring and supportive relationships | The extent to which young people perceive they are treated by staff with caring, respect and support. | Q8: They care about me as a person.<br>Q9: They know me well.<br>Q11: They are happy for me to share what's important to me.<br>Q17: I would feel comfortable talking with someone who works here if something upset me.<br>Q18: I would feel comfortable talking with someone who works here about my mental health.<br>Q19: I can trust people who work here. |
| 8. Inclusive makerspace structures and spaces | Perceptions of how equitable and participatory the practices of makerspace staff are. | Q10: They listen to my views.<br>Q14: They make sure that everyone taking part has a say, and that everyone's opinions count.<br>Q20: My ideas and opinions are taken seriously here. |
| Staff emphasis on equity | A single item about whether staff directly raise or foreground equity-related issues. | Q13: They raise and discuss issues of inequity (e.g. racism, homophobia). |
| Staff knowledge of community | A single item about whether staff understand young people's communities. | Q12: They understand my community. |
| Perceptions of learning | A single item about the extent to which young people feel they learnt from makerspace activities, which is a part of STEM capital. | Q31: How much do you feel you have learned from activities in the makerspace? |

**Scoring the Equity Barometer Survey**

In addition to looking over the completed surveys and reflecting on how young people have responded to individual items, you may wish to calculate scores for the eight areas of equitable practice (Equitable, enjoyable and meaningful experiences; Equitable approaches to developing and using STEM knowledge and skills; and so forth). Scores are calculated by adding up the score for each young person for each question in each area and this total is compared to the maximum possible score for the area. Please download this Excel spreadsheet to enter your data, and have the scores for your space calculated automatically and expressed as graphs. The scores (i.e. proportions of max possible for each area) are expressed as percentages (see the Excel spreadsheet for more details). The closer an area's score is to 100%, the more equitable your space and practice is perceived to be by participating young people.

If you choose to use the Excel spreadsheet to calculate survey scores for your space, you may want to share the findings with other members of staff to further support reflection. You may find it easiest to look at the graphs generated and you could consider questions such as:

- What surprised us about the findings?
- What findings were in line with what we'd expected?
- In which areas are we further along in our equity journey?
- What further actions could we take to build on this good foundation?
- Which areas need additional attention or focus?
- What steps might we take to support equity in these areas?

Looking at specific items within the areas may also spark ideas about where to place your efforts or what actions to take.

Building equitable practice is a journey and one that takes time. In line with this, we encourage you to use the equity survey sparingly – perhaps once a year. While you are likely to observe progress along the way, quantitative measures, like this survey, can only ever provide a snapshot and may miss some of the nuance of your practice. This is why we encourage use of the survey as a reflective tool to support your journey, rather than a summative assessment of your practice.

**MAKING SPACES**

**Equity Barometer Survey**

**Your views of _____[Makerspace]**

**This is a survey to collect your feedback on your experiences at the makerspace named above.**

We want to hear your feelings and thoughts about the things you do there and the team who work there so we can keep improving. No one will be able to identify you from your answers, so please feel free to be honest! Please leave blank any questions that do not apply to you or that you would prefer not to answer.

**Activities**

**How much do you agree or disagree with these statements about what you do here at this makerspace?**

|  | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| 1. I find most sessions or activities interesting. |  |  |  |  |  |
| 2. I make and/or do things here that are important to me. |  |  |  |  |  |
| 3. I do things here that will help me in the future. |  |  |  |  |  |
| 4. I do things here that make me feel confident. |  |  |  |  |  |
| 5. We can do things here that try to Challenge inequities in society. |  |  |  |  |  |
| 6. Some things I do or make here could help people in the community. |  |  |  |  |  |
| 7. Some things I do or make here could help the environment. |  |  |  |  |  |

## Staff in the space
**How much do you agree or disagree with these statements about people and staff who work here at this makerspace and help with activities?**

|  | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| 8. They care about me as a person. |  |  |  |  |  |
| 9. They know me well. |  |  |  |  |  |
| 10. They listen to my views. |  |  |  |  |  |
| 11. They are happy for me to share what's important to me. |  |  |  |  |  |
| 12. They understand my community. |  |  |  |  |  |
| 13. They raise and discuss issues of inequity (e.g. racism, homophobia). |  |  |  |  |  |
| 14. They make sure that everyone taking part has a say, and that everyone's opinions count. |  |  |  |  |  |
| 15. They have helped me to make useful contacts and expand my support network. |  |  |  |  |  |
| 16. They have told me about other activities, services or opportunities that might interest me. |  |  |  |  |  |
| 17. I would feel comfortable talking with someone who works here if something upset me. |  |  |  |  |  |
| 18. I would feel comfortable talking with someone who works here about my mental health. |  |  |  |  |  |
| 19. I can trust people who work here. |  |  |  |  |  |

## My experience in the space
**How much do you agree or disagree with these statements about your experience in the makerspace?**

|  | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| 20. My ideas and opinions are taken seriously here. |  |  |  |  |  |
| 21. I feel valued for who I am here. |  |  |  |  |  |
| 22. I feel I fit in here. |  |  |  |  |  |
| 23. I get to use my knowledge and skills to help others. |  |  |  |  |  |
| 24. I feel safe here. |  |  |  |  |  |
| 25. Young people at the makerspace appreciate each other's knowledge and skills. |  |  |  |  |  |

## Myself, the makerspace and beyond
**How much do you agree or disagree with these statements about how the makerspace might connect with other parts of your life?**

|  | Strongly agree | Agree | Neither agree nor disagree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| 26. Some things I learn and do at the makerspace will help me at school or in other educational settings. |  |  |  |  |  |
| 27. The knowledge and skills I've developed here will help me achieve my goals in life. |  |  |  |  |  |
| 28. The activities I do here will help me get into work I want to do in the future. |  |  |  |  |  |
| 29. The makerspace has broadened my views about who does science, computing and/or engineering. |  |  |  |  |  |
| 30. Coming here has helped me feel connected to science, computing and/or engineering. |  |  |  |  |  |

How much do you feel you have learned from activities in the makerspace? (Circle it)   Alot **I** Some **I** A little bit **I** Not at all **I** I'm not sure

**To what extent do you feel that the activities you do at the makerspace relate to the following subjects?**

**MAKING SPACES**

| | A lot | Some | A little bit | Not at all | Not sure |
|---|---|---|---|---|---|
| Science | | | | | |
| Technology/computing | | | | | |
| Engineering | | | | | |
| Art | | | | | |
| Maths | | | | | |
| Other subject (Which one: _____) | | | | | |

**Any other comments you would like to share?**

*Thank you for sharing your ideas!*

# Appendix F.1: Equity Barometer Survey (PECS version)

One of our Making Spaces project partners has created a Picture Exchange Communication System (PECS) version of the Equity Barometer Survey. PECS can be used by disabled people (including autistic people) who struggle with verbal communication and is an important tool for the young people who attend the space that created the survey. To create the survey, a makerspace practitioner worked with a teacher to select several items from the wider Equity Barometer Survey that could be re-recreated using PECS. Although PECS was developed in the United States and is not universally used, we include the survey below as an example of how one space adapted the Equity Barometer Survey for use with the particular community of young people with whom they work. We hope it may encourage you to consider adaptations that you may want to make for your community, should that be appropriate.

Name: _____     Date: _____

1. Classes here are interesting.

Yes     Maybe     No

2. I make and do things that are important to me.

Yes     Maybe     No

3. I do things here that will help me in the future.

Yes     Maybe     No

4. My teachers help me learn.

Yes     Maybe     No

5. I can use what I learn here to help others.

Yes     Maybe     No

6. I use math, science, and engineering here.

Yes     Maybe     No

7. When you are here do you use ....

|  | a lot | sometimes | never | not sure |
|---|---|---|---|---|
| science |  |  |  |  |
| technology |  |  |  |  |
| engineering |  |  |  |  |
| art |  |  |  |  |
| math |  |  |  |  |

# Appendix G: Quick Check Surveys - equitable youth outcomes

## Guidelines for conducting Quick Check Surveys

The Making Spaces project emphasises equitable outcomes for young people. In order to gain insight into the extent to which equitable outcomes are being achieved by makerspaces, we have developed Quick Check Surveys which can be used with participating young people to gather feedback before and after a multi-session programme. These surveys cover:

- Capital and skills (STEM skills and knowledge, soft skills)
- Educational and occupational trajectories (aspirations, job progression, new futures, progression in formal and informal learning)
- Agency and social action (personal agency, challenging injustices)
- Identity (increased confidence, feeling valued, broader understanding of STEM identities, connections to STEM)
- Wellbeing.

The survey contains four sections: equitable outcomes (5 items), STEM skills (6 items), general skills (6 items), and demographics. The purpose of this is to get a snapshot of the impact of your programme/intervention on young people's equitable outcomes. Conducting the same survey at the beginning and end of your programme can help gain a sense of this impact.

In addition to these four sections, a further section dives into more depth on equitable outcomes (12 items) – these questions can be asked at the end of the intervention. See the table below for more detail.

The survey should be completed individually, rather than in groups, in order to capture the perceptions of each young person directly. However, you can support young people in understanding the questions, especially in terms of what the items refer to. You may also want to read the questions to the group. We suggest that the pre-survey be done before or after the first session, and the post-survey (the same questions as the pre-survey, plus the additional questions) after the final session. There is a space at the bottom of each page where each young person can put their initials. This will allow you to match responses from before and after. However, if this is too intrusive for the young people you work with, please remove or instruct them to leave the space blank.

## Reflecting on responses

There are no right or wrong answers to the survey – the intention is to use the surveys to help you consider where your programme seems to be doing well and what areas of your practice may need further attention. You may choose to focus on individual items, or you may wish to look at groups of items corresponding to particular outcome areas.

If having a numerical summary would be helpful, a simple approach would be to calculate the proportions of respondents agreeing/strongly agreeing (or feeling confident/very confident) with each item. For instance, 20 young people respond to an item as follows: 5 strongly agree, 7 agree, 3 neither, 3 disagree, 1 strongly disagrees and one prefers not to say. 12 of 20, or 60% agree/strongly agree. By comparing this proportion among different items, you can gain both a sense of how agreement shifts from pre- to post-survey (for items that are repeated), or how young people are responding in different areas.

## Outcome areas and questions

| Outcome area | Further detail | Questions |
|---|---|---|
| STEM and general capital and skills* | STEM skills and knowledge, general skills (e.g. communication, teamwork, social skills) and capital (e.g. networks) | Q6: Confidence in STEM skills (maths, engineering & construction, digital tech & machinery), computing, science, general STEM skills<br>Q7: Confidence in broader skills (art & design, personal skills, teamwork, social skills, thinking skills, job & career skills)<br>Post-only:<br>Q8: Through this programme I have met people I can ask for help in finding new training, education, or work opportunities (if applicable).<br>Q9: I have developed new skills and/or contacts in this programme that will help me to access future training, education, or work. |
| STEM and general educational and occupational trajectories | New futures/aspirations, improved progression in formal and informal education, job progression | Q2: I feel confident I will get a good job in the future.<br>Post-only:<br>Q10: The things I have learned in the programme will help me in the future.<br>Q11: I have become more interested in studying, training, or pursuing jobs related to science, technology or engineering in the future.<br>Q12: Coming to the programme has helped me do better in school. |
| Agency and social action | Increased personal agency, using STEM to challenge injustices and/or benefit community | Q1: I often make or do things that help people in my community or wider society.<br>Post-only:<br>Q13: In the programme, I did and/or made things that were meaningful to me.<br>Q14: Programme activities were focused on challenging inequities in society. |
| Identity (STEM and general) | Increased confidence, feeling recognised and valued, sense of community, broadened views of STEM, stronger STEM identity | Q3: People like me do science, computing or engineering activities or jobs.<br>Q4: Other people think I am good at science, computing or engineering.<br>Post-only:<br>Q15: Doing this programme has increased my self-confidence.<br>Q16: I feel my ideas, experiences and views were valued during the programme.<br>Q17: The programme has broadened my ideas about who does science, technology and/or engineering.<br>Q18: The programme has helped me feel more connected to science, technology and/or engineering. |
| Wider wellbeing | Improved mental health | Q5: I feel well supported in my life and wellbeing.<br>Post-only:<br>Q19: Coming to the programme has supported my mental health and wellbeing. |

* Some of the skills, particularly STEM skills, may not be addressed in your programme. In this instance, those items can be removed – or left in if the information would be useful to you.

# Quick Check Survey - equitable youth outcomes

Please use this form to tell us a bit about you and your experiences. This will help us find ways to make activities in your space even better! There are no right or wrong answers. We just want to know what you think!

(Please put your initials at the bottom of each page.)

**Which makerspace are you participating in?**

How much do you agree or disagree with the following statements? (Tick the appropriate box)

| About you | Strongly disagree | Disagree | Neither agree or disagree | Agree | Strongly agree | Prefer not to say |
|---|---|---|---|---|---|---|
| I often make or do things that help people in my community or wider society. | | | | | | |
| I feel confident I will get a good job in the future. | | | | | | |
| People like me do science, computing or engineering activities or jobs. | | | | | | |
| Other people think I am good at science, computing or engineering. | | | | | | |
| I feel well supported in my life and wellbeing. | | | | | | |

Below are some different types of skills. How confident do you currently feel with each of them? (Tick the appropriate box)

| Your skills | Not at all confident | Not confident | In the middle | Confident | Very confident |
|---|---|---|---|---|---|
| Maths skills – e.g. doing sums, calculating fractions, measuring, using a ruler, weighing/using scales, budgeting | | | | | |
| Engineering and construction skills – e.g. using building tools (T-square, utility knife, belt sander, glue, hammer) and materials (cardboard, wood) | | | | | |

**Initials:**

| Your skills | Not at all confident | Not confident | In the middle | Confident | Very confident |
|---|---|---|---|---|---|
| Using digital technology and machinery – e.g. digital embroidery, vinyl cutter, heat press, laser cutter, Spheros, 3D printer, 3D modelling, digital manufacturing | | | | | |
| Computing skills – e.g. coding, using software (Inkscape, Arduino, Tinkercad), robotics | | | | | |
| Science skills – e.g. electronics/electricity (making circuits, using sensors), using lab equipment (microscopes etc.) | | | | | |
| General skills – e.g. trial and error, design thinking, problem solving | | | | | |
| Art and design – e.g. painting, graphic design, making, crafting, working with different materials, being creative | | | | | |
| Personal skills – e.g. communication, organisation, showing initiative, time management, paying attention, completing tasks, self-expression, self-reflection | | | | | |
| Working with others – e.g. teamwork, presenting, speaking in a group | | | | | |
| Socialising and making friends | | | | | |
| Thinking creatively, imaginatively and/or critically | | | | | |
| Job and career skills – e.g. CV writing, interview preparation, job searching, writing cover letters | | | | | |

**Initials:**

## More about you

What are you hoping to get out of this programme/course? (e.g. make new friends; learn about science, technology or engineering; job skills; make a difference; have fun; something else?)

[ ]

### How old are you?

☐ 6-9 years
☐ 10-14 years
☐ 15-19 years
☐ 20-24 years
☐ 25-30 years

### How do you self-identify in terms of gender?

☐ Female
☐ Male
☐ Describe in another way _____
☐ Prefer not to say

### Do you identify as having a disability?

☐ Yes
☐ No
☐ Don't know
☐ Prefer not to say

### How long have you been coming to sessions at this space? (Please select ONE)

☐ This is my first session
☐ Less than a month
☐ 1-3 months
☐ 7 months - 1 year
☐ 1-3 years
☐ More than 3 years

### How did you find out about this programme? (Please select all that apply)

☐ School/teacher/other professional
☐ Friends
☐ Parents or other family members
☐ Advertisement (e.g. flyer)
☐ Other organisation (job centre/other charity, etc.)
☐ Social media

### Please tell us your name

| | |
|---|---|
| First name(s) | Last name |

## Post-intervention: Additionally reflect on the programme you participated in

How much do you agree or disagree with the following statements about the programme that you participated in? (Tick the appropriate box)

| | Strongly disagree | Disagree | Neither agree or disagree | Agree | Strongly agree | Prefer not to say |
|---|---|---|---|---|---|---|
| Through this programme I have met people I can ask for help in finding new training, education, or work opportunities (if applicable). | | | | | | |
| I have developed new skills and/or contacts in this programme that will help me to access future training, education, or work. | | | | | | |
| The things I have learned in the programme will help me in the future. | | | | | | |
| I have become more interested in studying, training, or pursuing jobs related to science, technology or engineering in the future. | | | | | | |
| Coming to the programme has helped me do better in school. | | | | | | |
| In the programme, I did and/or made things that were meaningful to me. | | | | | | |
| Programme activities were focused on challenging inequities in society. | | | | | | |
| Doing this programme has increased my self-confidence. | | | | | | |
| I feel my ideas, experiences and views were valued during the programme. | | | | | | |
| The programme has broadened my ideas about who does science, technology and/or engineering. | | | | | | |
| The programme has helped me feel more connected to science, technology and/or engineering. | | | | | | |
| Coming to the programme has supported my mental health and wellbeing. | | | | | | |

Initials: [ ]

# Appendix H: Creative evaluation tools

**While questionnaires or feedback forms (both on paper and online) are familiar ways of carrying out evaluation, there is a wide range of alternative – and creative – evaluation methods that you and the young people you work with may want to consider. Here are a few of our favourites:**

**Graffiti wall:** This is an open-ended tool that can be used to gather feedback about an activity or programme. You may find it helpful to include particular prompts or key questions – such as likes or dislikes about a programme, suggestions for making it more welcoming, or anything else you are interested in exploring. To make the wall, a large sheet of paper is attached to a wall or board, with prompts written on it. Young people can use post-it notes to write or draw their responses to the prompts. This activity can also be connected visually to a theme, such as drawing a tree (or making one) and inviting young people to respond on the 'leaves'.

**Head-hands-heart:** This visual tool is a fun way to gather feedback on an activity or programme. Draw an outline of a person on a large piece of paper. Young people can write or draw on post-it notes to reflect on what they thought about an activity (head), how they felt about it (heart) and what they would like to do next (hands – or feet). As an alternative, and depending on the preferences of the young people you work with, the outline could be printed onto smaller pieces of paper to allow for more private individual feedback.

**Pebbles in a jar:** This is a quick, easy and visual way for participants to provide feedback by voting on aspects of an activity. For example, they could respond to a question such as 'Did you feel listened to today?' with responses such as 'yes', 'a little bit', 'no'. It also has an advantage of being quite accessible to people who may struggle with literacy and can be anonymous. The jar (or box) can be covered so that young people cannot see how their peers are voting, or decorated to fit with the theme of a programme.

**Photographs and videos:** Participants can take photographs or videos, to capture elements of a programme or features within your space that are meaningful to them. While these would be challenging to evaluate by themselves, they are very useful as prompts in an interview or discussion. They also have the advantage of being usable by individuals who may struggle with literacy, and they can truly centre the voices of young people.

**Physical rating scales:** With this tool, participants stand along a line in response to a question. This could include expressing how much they enjoyed an activity, whether they agree or disagree with a statement, how interesting they find something, or how much they would like to repeat an activity. In a variation of this, young people could also stand next to a statement that they feel best describes how they feel. (Note that this is not a good tool for more sensitive topics, as there is no anonymity.)

**Sticky dot rating scales:** This is similar to physical rating scales but can be more anonymous. Participants use dot stickers to place themselves along a continuum (e.g. agree-disagree) in response to a prompt (e.g. 'I felt comfortable in today's activity'). A similar tool is the 'star diagram', on which young people used stickers to denote how far they felt they had progressed with particular skills.

# MAKING SPACES

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## Partners