

The STEAMingful Design Tool

Practical guidance for developing meaningful STEAM-based workshops for children aged 8 -12 years.

Colophon

A tool to support the development of meaningful STEAM-based workshops for children aged 8-12 years.

Show case

by Janna Cornelia van der Jagt
June 2025

Design for Interaction

Faculty of Industrial Design Engineering
Delft University of Technology

Supervisory team

Arnold Vermeeren	Chair
Aadjan van der Helm	Mentor
Tanja Klop	TU Delft Science Centre

Introduction

Organising a STEAM workshop for children? While the workshop should be fun and engaging, you also would like the children to learn something new. But how do you ensure that the children gain valuable insights, while still having a great time?

This booklet will help you to get started. Step by step, it will guide you through a process of shaping your workshop. First, assisting you to understand what kind of workshop you want to set up and which target group you want to address. Then, presenting 14 guidelines that will help you develop the workshop and make thoughtful design decisions. All together this will support you in creating the right conditions for your workshop to be a meaningful experience for the participants.

The 14 guidelines cover the entire workshop experience, including the before and after phase. Each guideline consists of a short explanation, action points and an example to clarify. These guidelines are developed to be used as an addition to organisational standards or even an existing workshop format. They are therefore formulated flexible so that you can give them your own interpretation.

Who are these guidelines for?

These guidelines are designed for anyone who is planning to develop an out-of-school learning experience * STEAM based workshop for children around 8 to 12 years old. Whether you're an experienced workshop developer, a professional educator or designing your first STEAM workshop. They are applicable for any organisation interested in STEAM-based activities.**

How to use these guidelines?

Are there any elements in your workshop that are already fixed, such as the materials or the room in which it is given? It is likely that some organisations regularly organise workshops for children and therefore already follow a standard approach. You may already have your own facilitators, preferred materials, use of space, or perhaps even an existing framework to rely on.

For that reason, these design guidelines do not aim to explain every step of designing a workshop from the ground up. Instead, they are intended as a complementary tool that could fit with any organisation.

In case you do not have any standards yet, the steps and examples will guide you with questions. They help you reflect and work on your own basic set-up.***

How were they developed?

These guidelines are originally the outcome of a master's thesis for the Design for Interaction program at TU Delft. They were developed using a Research Through Design approach, combining literature review, field research, and real-world testing within a case study. The case study involved the development of a workshop itself within the context of a science centre.

Disclaimers

*These guidelines were developed using a case study. The workshop within this case study was primarily focused on out-of-school, informal learning experiences. Where having fun and learning something new are balanced. When you are applying them to a more formal, curriculum-based or school-related educational contexts, these guidelines may need further adaptation.

**While the tool was tested in the context of a science centre, its applicability in other cultural or linguistic contexts has not yet been evaluated. Further testing may be required before implementation in significantly different settings.

*** The workshop in the case study that informed these guidelines made use of existing materials. Therefore, this booklet does not go into detail about the making of new workshop materials.

Getting started

There are some key instructions that should be followed before using the design guidelines. The goal of this instruction is to help gain a better understanding of your workshop's context and its boundaries. This prior knowledge is essential because you will use it across multiple guidelines.

I. Overall

When designing a new workshop, it is very important to firstly have an overall understanding of what kind of workshop it will be. Nothing has to be set in stone yet.

Try to roughly answer the following question before moving on to the next step.

1. Define the goal of the workshop:

Start by understanding the purpose of your workshop.

- What do you want the participants to learn? In a later step, V. Define the workshop's goal, will help you detailing out the goal with criteria.
- What do you want participants to experience?

2. Know your target group

These guidelines are built around children aged 8–12, but you may aim for a more niche target group.

- Who is your target group?
- What is their level of knowledge?
- What are their soft and hard skills?
- What topics suit them?
- What pace within activities suits them?
- What will they expect from a workshop?

3. Know the facilitator

A workshop will be given by a facilitator that will guide the participants throughout the workshop. It is important to know what kind of facilitator will oversee the workshop you are designing.

- What kind of facilitator will give the workshop?
- A professional who knows a lot about education? Or a student who is close to the children?
- How might their background influence the design and tone?

II. Organisational standards

It's helpful to identify whether your organisation already follows a standard process for developing and delivering workshops. This prior knowledge will help you apply the guidelines more effectively and ensure they complement existing practices.

If no standard process exists, this step will still help you understand your context better.

Try to roughly answer the following question before moving on to the next step.

1. Workshop location & facilities

- Where will your workshop take place?
- What kind of facilities are in the room?
- Can your materials be fixed to the space, or do they need to be mobile and adaptable for different rooms?

2. Time & Participation Constraints

- How much time is available?
- How many children can participate at once?
- At what time of day will the workshop take place (morning, afternoon)?
- Are there specific time constraints or scheduling considerations?

3. Style

- Is there a particular tone, atmosphere, or educational style that aligns with your organisation's identity?
- In what way is the workshop communicated with the facilitator? Will there be a manual?

4. Sustainability

- Are there any set sustainability constraints?

5. Inclusivity

- Does your organisation have inclusivity standards for workshops?

III. Guiding principles

Before you start selecting and applying the guidelines, consider the following principles. They will help to ensure the guidelines you select work well together and support your overall workshop goals.

Read through the following information before moving on to the next step.

Amount of design guidelines

As Bastiaansen and Duerden mentioned, there is not a minimum amount of constellations or strategies needed to reach a meaningful experience (2024).

Tip: Apply an amount of guidelines that helps to design the workshop in a way that integrates fun and learning naturally. Moreover, it is important that the guidelines chosen should complement each other.

Balancing fun and seriousness

The guidelines should contribute to both the enjoyment and the overall purpose of the workshop. Especially since the focus is on out-of-school learning experiences, making it important for the children to not focus on the learning goals and reflection all the time.

Tip: Don't force reflection, allow insights to emerge naturally.

Designing for children

Because children have a unique mindset and way of viewing the world, it is expected that the outcome can sometimes be quite different from what theory had expected. The designer should anticipate on this.

Tip: Do not designing too strictly. Keep testing and adjusting the workshop multiple times.

Tip: Explain to the facilitators they should remain flexible and observe how children respond to different elements of the workshop. Then they can make adjustments if needed.

IV. Understanding the materials

The workshop you will develop using this booklet focuses on learning about the STEAM disciplines through hands-on activities. Obviously, this means participants will engage with tangible materials throughout the workshop. Therefore, it's needed to know whether you will be using materials that already exist or that the development of these materials are part of the workshop design. In second case, read VII. Designing the materials.

If the workshop materials are already identified, please read through the following information before moving on to the next step.

It is important to take a moment to understand the materials before starting the design process. This will help you gain a solid grasp of them, both theoretically and physically, so you can apply them effectively and find the right fit for your target group.

Explore the materials yourself

- How do they work?
- What can you do with them?

Observe how children interact with them

- Test with your target audience!
- Do they understand how it works?
 - Is it safe to use unsupervised?
 - Do they need instruction to get started?

Quantity vs. Variety

- Are there enough materials to explore?
- Is it possible the children get bored?
- Is it possible they get overwhelmed?

Intuitive use

- Are the materials intuitive to use?
- Is there a need for guidance?

Fitting for STEAM

- Can you already tell what forms the theoretical basis, and what could be used as a creative extension?
- Are STEM and the arts balanced?
- Are the materials more STEM? Consider if they still fit the children more drawn to the Arts. And the other way around.

V. Define the workshop's goal

When using this booklet, your overall aim with the workshop design is to create a meaningful experience for children. Further defining this goal will support you in applying the design guidelines more effectively and help in making focused, relevant design choices during the process.

First, some background information about 'meaningful' designing is needed to understand and establishing your workshop's goal.

There are three different levels of experiences that range from simple and memorable to deeply meaningful and even transformational (Duerden et al., 2018). Figure I shows this original framework of experiences. The layers in this model build on each other: the higher you go, the more impactful, but also the rarer the experiences become.

An extended version of this model, shown in Figure III, is developed for this booklet. It has more layers within these experience levels for the specific context of a hands-on workshop for children. They go from triggering the participants emotions, to making them feel proudness, to making them have more insights and finally maybe even trigger an ongoing interest.

The goal of the workshop design is to create the conditions that make these meaningful experiences more likely. That's where the design guidelines come in. They are designed to enhance the chance of going to the next level in the model.

It should be noted that meaningful experiences can still occur without explicitly using these guidelines. However, using the guidelines is recommended, as it can help expand the top of the pyramid, as shown in Figure II. Thus, designing with these guidelines will likely increase the number of children who experience the workshop as meaningful.



Figure II: Section of the pyramid. Pointing to the aimed version where the top expands.

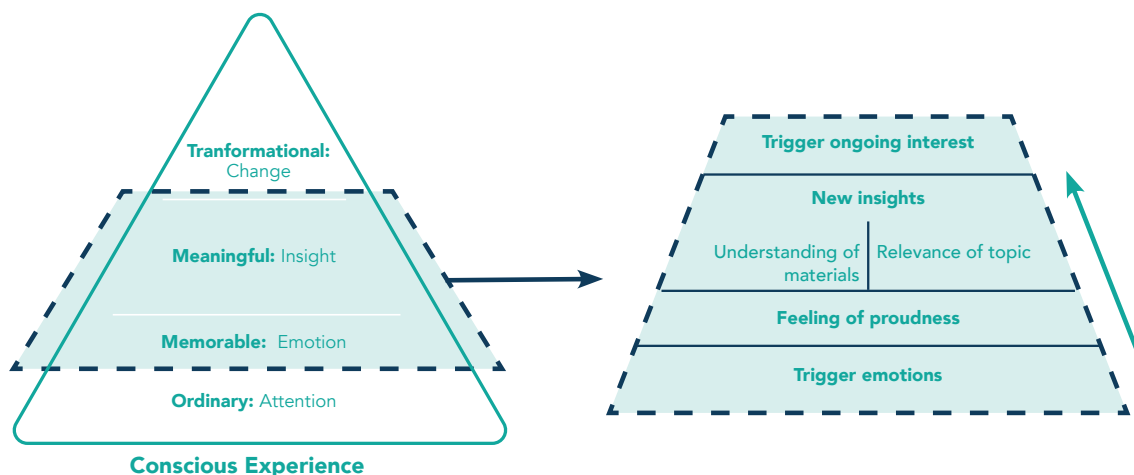


Figure I: Original framework of experience types from Duerden et al., with a dotted line highlighting the Memorable and Meaningful stages (2018).

Figure III: Extended framework with multiple levels specific for the context of a hands-on workshop for children

Now you understand the background of this model, it is time to apply the detailed version, shown in Figure IV, to your own workshop.

When to use?

- 1. This model can be used as a preparation before using the guidelines. They will help you understand what the overall aim of your workshop is.
- 2. Later in the process, when testing the workshop, it can be used as a checkpoint. It helps to evaluate if the aimed effect of the workshop is reached.

How to use?

The model has ‘to fill in’ gaps. Here, ‘the topic of the workshop’ can be filled in. This is the topic about which the participants will gain insights about.

If the topic of the workshop is not defined yet, use design guideline 1.Topic of the workshop.

If the topic of the workshop is defined, fill in the workshop’s topic into the gaps and read through the layers of experience.

From this point on, the guidelines can be used to develop a new workshop and reach these layers.

It should be noted that it is not expected that the more guidelines you use, the higher level of experience people will have. Whether someone has a higher level of experience is dependent on a broad range of factors that also go beyond the design process and these guidelines. However, the better you make the design guidelines fit with your target audience, the more likely the workshop’s participants will reach a higher level within this model.

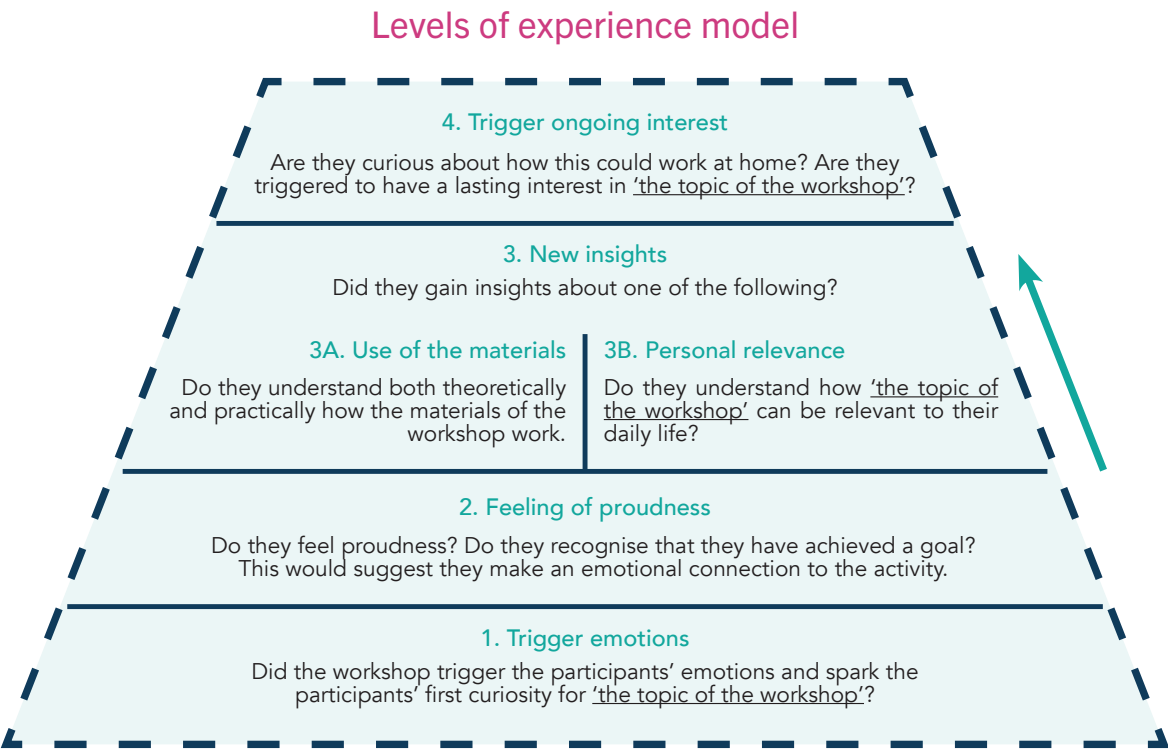


Figure IV: Extended framework with multiple levels. Including questions to understand the aim of the workshop

VI. Define the learning goals

With all the gathered information and a clear overall goal of the workshop, you will be able to set-up a few learning goals. These learning goals are about what you aim for the children to learn by participating in the workshop. This is important since they will be needed within the use of a few design guidelines. Having clear learning goals not only helps you design the workshop but also helps you evaluate its success afterward.

Take a moment to make a list of the learning goals before moving on to the next step. You can use the following questions:

- What do you hope the children will learn?
- Are there specific skills, insights or attitudes you want them to develop?
- Do you want them to learn about the materials, or only use the materials?
- What kind of learning goals align with your organisation's overall mission?
- What do you think the children and their parents expect to learn during the workshop?

Note: You don't need many goals, just a few strong ones can guide your design effectively.

VII. Designing the materials

If the materials for your workshop still need to be selected or developed, start by looking at your overall workshop goal and the learning goals. What kind of materials would help children explore these ideas in a hands-on, engaging way?

Important note: This booklet is composed through the use of a case study. In this case study, the materials were already known. Since the development of materials comes with a whole process, the guidance within this section does not provide a full step-by-step approach for developing new materials from scratch. Instead, it offers reflection questions and considerations to help you choose or shape materials.

You can use the following questions to guide your material selection or development:

- What should the materials help the children understand or do?
- Do the materials invite for exploration or creativity?
- Do they support a balance between STEM and the Arts?
- Are the materials age-appropriate and safe for independent use? Is it not too childish?
- Do they encourage trial-and-error, problem-solving?
- Can children make their own choices with them?
- Do they allow for the process of making to be more important than the final result?

Whether you are designing materials yourself or use existing materials, make sure to test early and often with your target audience. **You can use 'IV. Understanding the materials' when testing.**

General Tips

There are some general tips to consider regarding sustainability and inclusiveness when designing a new workshop. These can be especially useful if your organisation does not yet have established standards in these areas. **You can revisit these tips throughout the design process.**

Design for inclusiveness:

Design with inclusiveness in mind by considering the diversity of children and parents who may attend the workshop.

- Are the workshop activities accessible to children with different physical, sensory, or cognitive abilities?
- Are the instructions and communication styles inclusive and age-appropriate?
- When the participants are addressed, is it in an inclusive way?
- Use diverse examples and visuals (people, places, stories) to help all children feel represented

Design for sustainability:

Think about sustainability when setting up the workshop and choosing and organising all the materials.

- Are the materials used multiple times?
- Can you minimise single-use?
- Do they need to be thrown away after?
- Is there a more sustainable way?
- Where do the materials come from? Can you source them locally
- Can leftover materials be repurposed in future workshop.

Using the guidelines

With your goals defined and materials considered, you are ready to move on to the next step: using the design guidelines. These guidelines are here to support your process and help you make thoughtful design decisions that increase the amount of children that experience the workshop as meaningful.

You don't need to apply every single guideline. Instead, select the ones that best match your goals and context. They are there to guide, while still leaving room for your own creativity, expertise and intuition.

The following page gives an example framework overview of a workshop. Here you can see that the workshop experience you will be designing is not just the workshop itself. It already starts before and may end long after the actual workshop itself. For example, signing-up and receiving information before the workshop are also part of the experience. The guidelines include these phases as well.

How to read

An overview of all design guidelines, including their corresponding experience stage and page number, can be found after the example. This makes it easier for you to navigate and find the guidelines you need. The order of the guidelines follows the general steps you are likely to take when designing the workshop.

Each guideline starts with a brief introduction explaining when and how to use it, along with any requirements before applying it. Following this, the action points are clearly summarized and accompanied by a small icon. This icon indicates the guideline's role in the design process. This will help to understand when it can be applied best.

Lastly, each guideline concludes with either a real workshop example using the guideline or an important note.

Legend

- 

Do this, prior to the main activity point of this design guideline.
- 

Main activity point.
- 

Consider this detail, when working on the main activity point.
- 

Use this when setting up the workshop's steps
- 

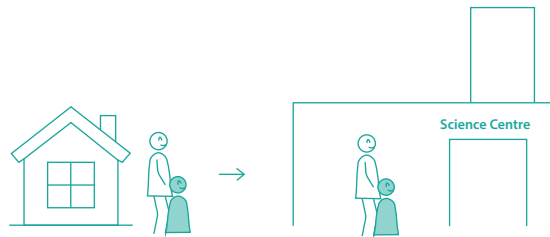
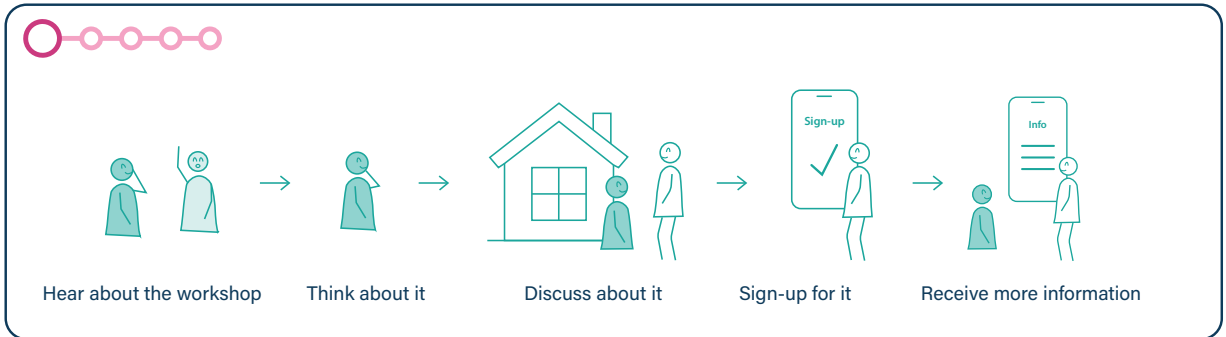
Go over the workshop's steps. Consider if you have already done this.
- 

Use this when developing the facilitator's manual.
- 

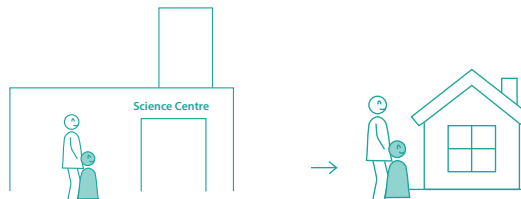
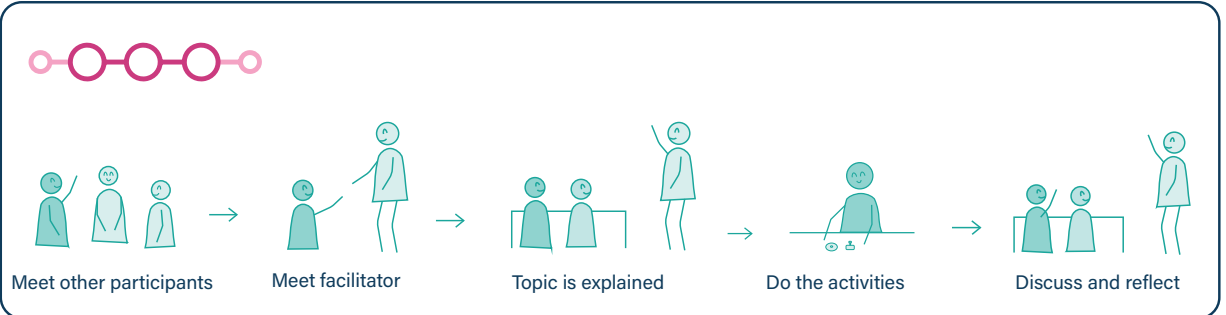
Do this, after the main activity point of this design guideline.
- 

Example matching the guideline.

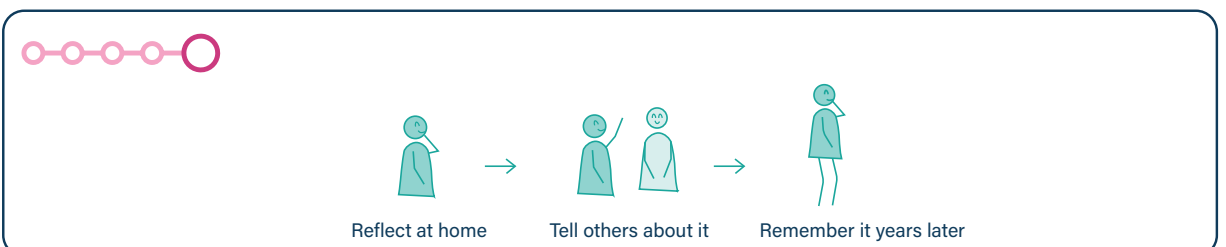
Example framework

















Travel to the workshop



Go back home



Overview of the guidelines

Timeline	Guideline	Page
	1. Topic of the workshop	13
	2. Personal value	14
	3. Sharedness	15
	4. Make it new but relatable	16
	5. Achievable and challenging goals	17
	6. Creative process & hands-on	18
	7. Teamwork	19
	8. Preflection	20
	9. Skill development	21
	10. Concluding the work	22
	11. Physical reminder	23
	12. Communicating the goal	24
	13. Reflection	25
	14. Sharing achievements	26



Topic of the workshop

1



The topic of the workshop will draw the attention of your audience and should interest them to apply. Rather than focusing on concrete skills, like learning to work with new materials, the topic can be framed more abstractly or thematically. Through hands-on engagement with the materials, the participants can naturally develop a better understanding of both the topic and the tools.

When to use?

When you are setting the overall goal of the workshop and are ready to decide on the workshop's topic.

What do you need?

An overall idea of the workshop's goal

Action points



Understand the prerequisite level of knowledge about the topic of the participants (Bastiaansen & Duerden, 2024). Consider that this can differ per participant on the STEAM disciplines (Riley, n.d.).



Choose a topic that fits the participants' personal interests and/or goals (Little et al., 2024). This will trigger their intrinsic motivation (Packer, 2006).



Make sure the topic of the workshop is not only discussed at the beginning but is repeated multiple times throughout the workshop.



Make clear the topic is about one or multiple of the STEM disciplines in a combination with Arts to appeal a broader range of participants (Riley, n.d.).



The terminology used to explain the topic, should be directly linked to the activity of the workshop.



A first try out will help understand whether the children understand the topic. Does it fit their level?

→ **Linked instruction:** V. Define the workshop's goal

Example



Figure V: The picture communicated on the Science Centre social media fitting the topic 'experimenting with technology in a creative way'.

Experimenting with technology in a creative way

On social media the following is communicated: "You will creatively work with technical elements, taken from the artwork, to create your own dream creatures that could live in the artwork." Including the picture in Figure V.

In the workshop the facilitator introduces the topic 'experimenting with technology in a creative way'. With it, a few examples of familiar products or activities that fit (e.g. designing with a 3D printer). The facilitator asks the children if they can give more examples from daily life where they recognise this. This was found very joyful for the children, being able to tell the facilitator about their own experiences at home or at school. The topic is revisited throughout the workshop as they reflect on their creations.



Personal value

2



The workshop should be designed to align with the participant's values. Three main values are highlighted in this guideline. These fit with the general age group of this booklet, children aged 8-12 years. However, if you have a more niche target audience, it is important to find their specific values.

When to use?

After you have defined the overall goal and the workshop's topic and you are about to set the outlines of the workshop.

What do you need?

Know the values of your target audience.

Action points

Target group specific values

- Think about how to take these values into account while developing the workshop.

Having fun

- Use a theme that is perceived as fun by the target group you aim for.

- ⦿ Let the facilitator ask simple answerable knowledge questions. This gives some children the opportunity to answer and excel above others.

- Find or design a way for the facilitator to get excited about the topic as well.

Magical experience

- Give the children a magical experience through the workshop.

- ⦿ Design for a surprise moment or effect.

- ⦿ Design for the children to have a sense of discovery and fascination (Packer, 2006).



Reflect on the way you want to convey this 'magical' touch. It should fit with the intentions of the organisation and the target group itself.

Contribution

- The participants should feel like they can contribute to something bigger than themselves (Bastiaansen & Duerden, 2024). This contribution should match their personal value (Bastiaansen & Duerden, 2024).

- ⦿ Find a way to ensure that this sense of having contributed to a bigger purpose, stays with participants throughout the workshop.

Example



Figure VI: The magical creature that is used to show how you can use inspiration from nature.

Storytelling

The use of a storyline is how the example workshop uses a magical experience and telling the children they are contributing to a bigger purpose. Iterating on this story by testing and adjusting it helped to reach something fitting for the target group.

Children design and build creatures inspired by nature. Nature is a good theme that fits all children in which they can use their own inspiration and imagination. Figure VI on the left, is the example that is shown to them. This taps into children's natural curiosity about animals and the environment. In the creative part of the workshop, they engage with materials like 3d-printed rings, pipe cleaners, and motors, in a playful, hands-on way.



Sharedness

3



Fostering social connection before the workshop like being able to sign up together with friends or family will enhance the experience.

When to use?

When deciding on the base of the workshop and filling in the steps further.

What do you need?

Know the target group

Action points

- Allow your participants to share the experience with others they already know. For example, make it possible to sign up together with friends.
- Design for shared anticipation among the participants before the workshop starts. In that way, there can be a collective expectation and excitement about the workshop (Bastiaansen & Duerden, 2024).

→ **Linked guideline:** DG7. Teamwork

Note

For this guideline, the use of the communications functions within your organisation will play an important role. Within the test workshop, this was not tested.

It is therefore recommended that you interpret the guidelines in the way that best aligns with your workshop.



Make it new but relatable

4



Most participants will join a STEAM workshop to learn something new. Nevertheless, it is important to make this new topic or skill relatable to something the participants are already familiar with in daily life.






When to use?

When setting up the outline of the workshop and when detailing out the steps.

What do you need?

- Learning goals
- Overview of the workshop's steps

Action points

-  Understand the participants level of skills and prerequisite knowledge.
-  The participants should be offered to learn something that is new for them.
-  Use examples from daily life to explain new information. This will catch the children's attention and help them understand the main theme of the workshop
-  Let the facilitator ask simple questions about prior experiences / familiar topics as a start that is connected to the workshop's topic. Being able to answer will give a confidence boost.
-  Make sure the facilitator has the needed examples in the manual, of what you should recognise from at home. These can be used in the explanation to the children.

→ **Linked guideline:** DG 12. Communicating the goal

Example



Figure VII: The slide showing the components the children will work with.

Comparing with home

To explain the function of the materials the children use in the workshop, the facilitator uses the accompanying slide. The first explanation tells how the spotlight works. To clarify, the facilitator clarifies how a spotlight works at home with a light switch on the wall. This comes with an explanation of how the workshop's spotlight should be connected and to make the current flow. Later also other components are mentioned, see Figure VII. The children are asked if they can name devices from home that use those components. E.g. Mixer, spinning motor; Washing machine, spinning motor; Electric toothbrush, vibration motor.



Achievable and challenging goals

5



It is important for a child to feel some sort of challenge in an achievable task, to have a feeling of success (Kohnstamm, 2009; Little et al., 2024). This will support meaningful learning. The following action point will help to balance the difficulty and accessibility.

When to use?

When designing the steps and looking at their details.

What do you need?

Understanding of the materials

Action points

Skill levels



Get an understanding of the variety of skill and knowledge level within the target group. Do the set learning goals fit within the participants abilities? (Bastiaansen & Duerden, 2024).



Keep in mind that some children are more skilled in the STEM disciplines and less in arts, or the other way around. Try to find the right balance for every individual participant.



Consider that some children will finish much faster than others. A facilitator will benefit from a list of extra tasks to give the children.

Break it down



Use scaffolding: break down challenges into smaller steps to offer varying skill levels and allow each child to progress at their own pace.



Make sure it does not take effort to learn something new during the workshop (Packer, 2006).



When using a lot of new materials or information that is new to the children, make sure they do not get overwhelmed by this. For example, don't introduce all the new materials at the same time, but over a wider time span.

Personalise



Design for the availability of choice. This allows participants to personalise and provide themselves with the appropriate level (Packer, 2006).

Guidance

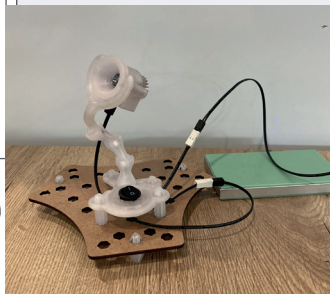
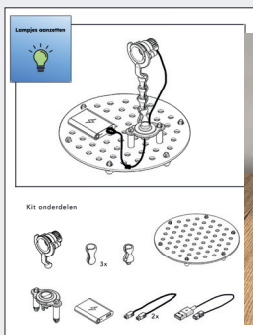


Think about how, in the difficult parts, the children can help each other. Or if the workshop is set-up with the presence of a parent, they can help the children with difficult activities.



When participants are given a broad assignment they may need more guidance. This guidance can be done through the facilitator or through the design of extra tools.

Example



Steps of the workshop

In the example workshop, children are challenged to use several technical materials to build their own assembly.

Here, scaffolding is used. The children will firstly learn how the light component works. In this step, they can use a guiding manual showing how to do this. This is shown in Figure VIII on the left.

Secondly, they can figure out themselves how the other components work. Some more difficult than others. Again, they can use a manual to do it.

Figure VIII: On the left, the manual on building a lighth. On the right, a light assabled as explained.



Creative process & hands-on



One of the most important parts of a STEAM workshop for children is directly applying new knowledge in a hands-on way. This will make it fun and help them with insightful learning. Meaning is created when participants can play an active role in the experience (Bastiaansen & Duerden, 2024).

When to use?

When designing the steps of the workshop. Especially the ones in which the materials are used.

What do you need?

Understanding of the materials

Action points

□ Let the participants work hands-on and try out what works for themselves. They will learn by doing (McRaine & Russick, 2016).

□ Make sure the workshop focusses on the children's process of making and not the perfect outcome of what they make.

○○○ Although the focus is not necessarily on the result, having a tangible outcome will help reach a feeling of proudness among the participants (Little et al., 2024)

⦿ Explaining new theory, should be followed by a hands-on way of learning to make connections between the two (Eason & Linn, 1976).

⦿ Appeal to multiple senses. Think about not only seeing the materials, but also feeling the materials (Packer, 2006).

STEAM

○○○ Keep going back and forth from the chosen STEM topic(s) of the workshop to the arts, and connect the two through the activities (Riley, n.d.).

⦿ Realise that some children will be more interested in one of the STEM disciplines, and some more on the creative part. Find the right balance for your target group and enable personalised focus or use of time.

⦿ When testing the workshop, try to discover the children's need for open creative activities. How big is their attention span to work on them?

Example



Figure IX: Children making their own creature using the creative materials

Creative activity

In the example workshop, after understanding the technical materials, the children will start making their own creature. Figure IX shows how this is done. This should be an open activity where they can make whatever they imagine. Therefore it is found fitting if they can dig through the materials and feel like there are infinite possibilities. This is done with the creative box. One big box for each table, including all the fun materials that can be attached to each other so they can make anything they like. Since they already know the materials, they will not get overwhelmed anymore.



Teamwork



Working in teams is a big benefit for the participants, making them feel part of a community. Here it is important to reflect on how teamwork helps their project (Bastiaansen & Duerden, 2024). Having this experience with friends can fit their personal values.

When to use?

When filling in the steps one by one.

What do you need?

Know the target group

Action points

- Consider whether and where teamwork could be useful for the children. How can it be implemented into the workshop's steps?
- For teamwork, look for tasks that require the children to discuss their plan together. Do not just give each participant a task they can do next to each other.
- ☰ Do not expect for teamwork to occur spontaneously, really think and try out moments in which participants can do a task together. And clearly explain this to the facilitator.

Important to note:

- When children do not know each other yet, it might not go smooth if they are forced to work together. Testing will help discover what will be a moment in the workshop for children to be able to work together. But don't force it.
- Within a group, each participant should have the opportunity to feel they are responsible for a part of the project. In this way they can feel proud of having contributed to the group (Little et al., 2024).
- The participants should have the possibility to excel. The participants benefit from the feeling they perform better than others.

Note

For the following guideline, teamwork did not play a role and was therefore not assessed. It is recommended that you interpret the guidelines in the way that best aligns with your workshop.



Preflection

8



This design guideline helps to design a good and clear introduction of the workshop, where preflection plays a central role. Preflection is about discussing the learning goals of the workshop to align expectations and increase motivation before the workshop kicks off (Bastiaansen & Duerden, 2024).

When to use?

When the outline and the steps have been set-up and the start of the workshop can be designed.

What do you need?

- Set of learning goals
- An overview of the workshop's steps

Action points

Learning goals



Translate the learning goals into a non-educative perspective. Making it fun to talk about which will help to increase the children's intrinsic motivation (Packer, 2006).



Design for the facilitator to be supported in discussing the learning goals with the children. This can be done through the manual or a tool they can use.



Let the facilitator take some time to discuss these goals and new skills with the children. This will encourage participants to think beforehand what they hope to learn (Bastiaansen & Duerden, 2024).

Overview of the steps



Have a way to present the steps of the workshop, giving the children a clear overview.



Consider the medium through which the steps will be presented (e.g. slides, poster, hand-outs). It should fit with the participants.



Make sure the way this overview is presented blends in with the workshop activities and style.



Make the steps visually clear and keep it simple. Focus on the main elements.



Linked guideline: DG9. Skill development

Example



Figure X: Slide showing the step-by-step path.

Step by step path

The example workshop makes use of slides that show the steps of the activities in the workshop, like shown in Figure X. This helps to better guide the children in following their learning path. They are named 'activities' or 'workshop goals' to make it non educative.

The colours within the path show the difference between topics: blue 'technology' steps and pink 'creativity' steps with in between green for 'testing their creations'. This helps to clarify the structure of the workshop, making the balance between creative and technical phases more visible and help to identify the different learning phases.

It also guides the facilitator in explaining the steps. Each step has its own slide with more explanation on it.



Skill development

9



It is time to boost the participants' confidence. Receiving positive feedback is always useful. Making new learning points insightful, will happen when the participant recognise their ability to develop new skills in the past and present. Giving them the opportunity for improvement (Little et al., 2024).











When to use?

When you are detailing out the workshop's steps.

What do you need?

Optional to use the outcome of 4. Preflection in the following action points.

Action points

-  Acknowledged that the strengths and values are different for every child.
-  Make sure to repeat what they are learning several times throughout the workshop.
-  Repetition of their new knowledge is valuable for remembering later (Kohnstamm, 2009).
-  Design so that participants can easily track their progress over time and are encouraged to do this (Bastiaansen & Duerden, 2024).
- Reflecting**
-  Design for guidance in reflecting on new skills and a way to understand how these can be used in other situations (Bastiaansen & Duerden, 2024). For example, what can they do with this skill at home?
-  Have a way for the facilitator or other participants to give positive feedback (Little et al., 2024; Bastiaansen & Duerden, 2024).
-  Make a clear structure with repeating moments so it is obvious for the facilitator when the tool should be used.
-  Consider the medium through which the positive feedback and an explanation about their new skills can be communicated. (e.g. reading text, audio, video)
-  The moment of receiving feedback should not be too short, the children should have the chance to have a moment of reflection.
-  Standardised feedback might not have much impact. Remind / guide the facilitator in giving personalised compliments as well.

Example



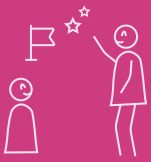
Figure XI: The light token with the shadow behind on the designated spot.

Feedback token

Creating shadows is one of the activities within the example workshop. By using 'shadow making' to receive feedback as well, this activity is linked to the workshop.

The group gets a token, as shown in Figure XI on the left, every time they finish one of the main tasks. The facilitator hands out the token to one child and a flashlight to another.

Within the slides there are open spots to aim for to show they have finished. When the children aim right together audio starts playing. In this way, the whole group receives positive feedback and an explanation about their new skills. The audio uses the same voice that tells the story throughout the workshop.



Concluding the work

10



This guideline will help to think about how the workshop can be concluded. With all the new learnings and insights, the participants have gained during the workshop, it is important to have a small reflection moment at the end of the workshop. This will help to strengthen the insight.

When to use?

When detailing out the final steps of the workshop.

What do you need?

- Steps of the workshop
- Overall idea of what the children will learn

Action points

- Give participants the opportunity to receive summative feedback about their work (Bastiaansen & Duerden, 2024).

Let the participants look back at the tool that will show the steps of the workshop in the prefection phase. It will be beneficial to go over them and find out if they understood the key aspects of the workshop (Riley, n.d.) Once again, repetition can help in strengthening their insights (Kohnstamm, 2009).

- Give the participants time to tell about their failures and be reminded of how mistakes are a natural part of growth (Bastiaansen & Duerden, 2024).



A simple way to give feedback is talking about 'strengths and improvement points' on what they have made during the workshop. This can be done by other participants or the facilitator.



If you use a story, try to conclude it in the very last part of the workshop. Any reflectional moment can be done before that, to keep the magical and fun experience high.



Provide the facilitator with examples of what to discuss about the workshop's learning points.

Example

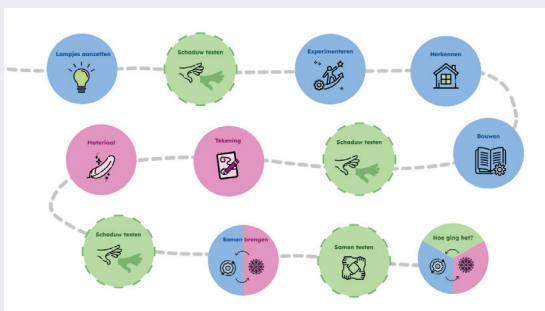


Figure XII: Slide showing the step-by-step path.

Step by step path

In the example workshop, the slide (Figure XII) was used to explain the steps to the children during the workshop. This is also the final slide, which can be used by the facilitator to reflect at the end of the workshop together with the children.

Questions can be asked like:

What was your favourite step?

In what step did you learn something new?

What step was the most difficult one?



Physical reminder

11



It can be very meaningful for the participants if they are provided with something tangible to take home after the workshop. This helps them to revisit the experience and reflect on it at moments later. It is also something they can show others to tell about the workshop they did.

When to use?

When detailing out the final steps of the workshop.

What do you need?

- Steps of the workshop
- Overall idea of what the children will learn

Action points

- A physical reminder, whether it's a self-made object, a small prototype, or even a piece of material will be fun for the children to take home.
- When deciding on the item, think about how it might trigger conversations with others, extending the impact of the workshop into the participant's personal environment.
- Incorporate some of the learning goals or overall workshop goal into the item, so when looking back, the knowledge is once more repeated.

- Make sure it does not take too much of the facilitators time to hand out, or explain the physical reminder.
- The physical reminder should fit with the workshop, the story and the activities.
- The item they bring home, should be valuable enough that they will not throw it away at home and also small that it does not take up too much space.

Example



Figure XIII: The 'take home' token with the shadow on the wall.

Take home token

Making shadows is one of the activities within the example workshop. To stimulate and remind the children they can play with shadows at home, they receive a token.

This token has a cut out figure of a creature that has been telling the workshop's story to the children. With a flashlight they can see what this creature's shadow looks like. This is shown in Figure XIII. They know how this works since they have used the same tokens during the workshop.

In this way, the token serves as a physical reminder of the workshop itself. It is also a simple tool that can trigger the conversation about the workshop afterwards with others.



Communicating the goal

12



Now you have almost finished the workshop and know its learning goals, it is time to let the participants know too! The participants will benefit from knowing what they can expect from the workshop before it actually starts. Not only about what they will do, but also about what they will learn. This allows them to mentally prepare for what they will learn beforehand.

When to use?

When the learning goals are clear, and it is time for sending publicity about the workshop to reach the target group.

What do you need?

- Learning goals
- Decision on the use of type of media

Action points



Set clear learning-goals for the workshop. Growth- and learning-oriented goals are often more effective than performance goals (Bastiaansen & Duerden, 2024).



Communicate them in a way that fits the purpose of 'having fun' and does not feel too educational.



Find a way to also communicate these with the facilitator. Enabling them to understand the aim of the workshop.

Note

For this guideline, the use of the communications functions within your organisation will play an important role. Within the test workshop, this was not tested.

It is therefore recommended that you interpret the guidelines in the way that best aligns with your workshop.



Reflection

13



Give the participants the opportunity to reflect after the workshop has finished, and in this way mentally reengage with their experience (Bastiaansen & Duerden, 2024).

When to use?

When detailing out the final steps of the workshop.

What do you need?

Know the target group

Action points

- ☐ Give the participants the tools to reflect on what they have done and achieved during the workshop. This can be through communication channels or a tool they bring home.
- ☒ Think about in what way they can share stories about their growth. And on how this can again be some sort of repetition of their new knowledge as a learning strategy.
- ☐ Make sure the facilitator can explain to the children how they can use their new learned skills at home. What materials can they use? Are there examples?

Note

For this guideline the use of the communications functions within your organisation will play an important role. Within the test workshop, this was not tested. It is therefore recommended that you interpret the guidelines in the way that best aligns with your workshop.



Sharing achievements

14



It is important to celebrate the achievements with others. This can be with other participants or people at home. Little et al. calls this the cheer squad (2024).

When to use?

After the workshop has been designed, and the before and after communications are developed.

What do you need?

Know what the children will create

Action points

- ☐ Think about a way the participants can share their work with others. This can facilitate as a moment of proudness (Little et al., 2024).
- ☐ In what way can the facilitator play a role in explaining this and putting them to the task to share their work with others?

Note

For this guideline the use of the communications functions within your organisation will play an important role. Within the test workshop, this was not tested. It is therefore recommended that you interpret the guidelines in the way that best aligns with your workshop.

Since this is about the communication the participants have after the workshop with others about their experience. If your organisation depends on word of mouth, make sure you keep this in mind while using these final design guidelines.

Testing

Testing your workshop is essential. It helps you spot what works, what doesn't, and why. By observing participants and gathering feedback, you gain insights to refine your workshop and ensure it delivers meaningful, engaging learning for your target group.

Why test:

- **Improve your flow.** Do the steps flow over in each other and is the order logical?
- **Spot practical issues.** Do the materials work as planned? Are instructions clear?
- **Discover how the children experience the workshop.** Do you reach your goal?
- **Is it doable for the facilitator?** Is the manual understandable?

If you have never tested a workshop before, you can use the following recommendations:

Recommendations

Before the test:

Test group

Find a group of children to participate.

Tip: To evaluate the flow, you don't need a big test group. A workshop with 3–5 children can offer valuable feedback. If you want to evaluate the experience, a bigger test is recommended.

Facilitator

Find a facilitator who can give the workshop and closely represents the real facilitator you plan to use. So, you as a designer can observe and discuss details with the facilitator later

Tip: To prepare the facilitator, a complete walkthrough of all the workshop steps prior to the first test is recommended. This serves as a valuable pre-test to identify and solve unclear parts and find gaps in the workshop design.

Evaluation materials

If you want to specifically evaluate the experience of the children, it is recommended to use evaluation materials.

Examples are:

Pre- and post-questionnaires These can show

differences in feelings and knowledge between for and after the workshop.

Simple interview questions. Conduct simple interviews with the children afterward. Keep your questions short and open-ended, such as:

- What did you enjoy the most?
- What was new for you?
- What was the most difficult?

Note: Evaluating with children can be challenging, but not impossible. In fact, many children enjoy filling out questionnaires.

Tip: Take another look at the 'Experience layers model', this will help in the development of evaluation materials.

During the test:

Observation

The most important thing is observing the workshop. Watch how the children interact with the materials, each other, and the facilitator. Are they engaged? Confused? Excited? These cues reveal a lot.

Tip: Write down some observational points you deliberately want to look at.

Tip: Encourage the facilitator to use the manual as they see fit, trusting their expertise. Any changes can be discussed afterward.

After the test:

Evaluate

After the test, write down what you noticed.

What went well?

What could be improved?

Keep in mind: above all, it's important that the children have fun! Use this reflection to adjust your workshop before the next and maybe real run of your workshop!

References

Bastiaansen, M., & Duerden, M. (2024). EXPRESS: Conceptualizing Meaningful experiences. *Journal of Hospitality & Tourism Research*. <https://doi.org/10.1177/10963480241308344>

Duerden, M. D., Lundberg, N. R., Ward, P., Taniguchi, S. T., Hill, B., Widmer, M. A., & Zabriskie, R. (2018). From ordinary to extraordinary: A framework of experience types. *Journal of Leisure Research*, 49(3–5), 196–216. <https://doi.org/10.1080/00222216.2018.1528779>

Eason, L. P., & Linn, M. C. (1976). Evaluation of the effectiveness of participatory exhibits. *Curator the Museum Journal*, 19(1), 45–62. <https://doi.org/10.1111/j.2151-6952.1976.tb00484.x>

Kohnstamm, R. (2009). Kleine ontwikkelingspsychologie II. In Bohn Stafleu van Loghum eBooks. <https://doi.org/10.1007/978-90-313-7590-5>

Little, A. J., Curry, G., Smith, E., Whitehorn, J., & Sabella, M. S. (2024). Designing for proudness. *The Physics Teacher*, 62(3), 168–173. <https://doi.org/10.1119/5.0119011>

McRaine, D. L., & Russick, J. (2016). *Connecting Kids to History with Museum Exhibitions*. Routledge.

Packer, J. (2006). Learning for Fun: the unique contribution of educational leisure experiences. *Curator the Museum Journal*, 49(3), 329–344. <https://doi.org/10.1111/j.2151-6952.2006.tb00227.x>

Use this booklet when your aim is not just to design 'any' STEAM workshop, but to create a workshop that offers children a meaningful experience. It's about designing the right conditions to make an impact. A workshop where children feel curious, engaged, proud, or inspired, and where the experience stays with them even after the workshop ends.

