

MAKE DESIGN LEARNING VISIBLE

- TOOLBOOK -

Formative assessment tools for design thinking



An approach for formative evaluation of design skills in Design and Technology education designed for use with 8 - 14 year olds, but can also be modified to use with younger or older pupils

Colofon

Remke Klapwijk (Delft University of Technology) in association with Kay Stables (Goldsmiths University), 2019. This publication is based on the Dutch tools from 'Ontwerpen in Beeld - ontwerpend leren, formatief evalueren', developed by Wetenschapsknooppunt TU Delft and ontwerp bureau Meeple (Klapwijk, Visschedijk, Kok, Holla, 2017) in cooperation with Lucas Onderwijs, Rotterdam University of Applied Sciences, Marnix Academy University for Teacher education, Inholland University of Applied Sciences, HAN University of Applied Sciences, University of Applied Sciences Leiden and Brandt Onderwijs.

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VISUALISE A DESIGN SKILL

Make
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Pupils explore in text and images what you do when you apply a design skill



FA Strategy 1 Clarifying and sharing design skills and learning goals



Participants
Group/class



Duration
15-30 min



Design Experience
None

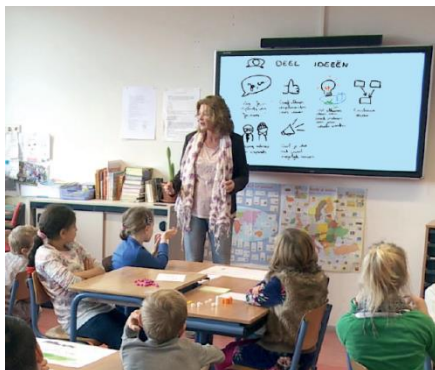
Description

Take a design skill that is important in the next lesson. Write the name of the skill on a big sheet of paper or on the whiteboard or smartboard. Divide the sheet in two rows of four boxes.

Discuss the skill with your students. What do you see when you apply the skill successfully? What do you do?

Start the dialogue with an example. Ask your class how you can draw this and formulate guidance. Fill up

the other boxes with examples from your class. Hang the sheet with the eight drawings in a visible place in the classroom. Use it as a reminder during the design activity. Let students compare their work with the guidance. Did they succeed or not?

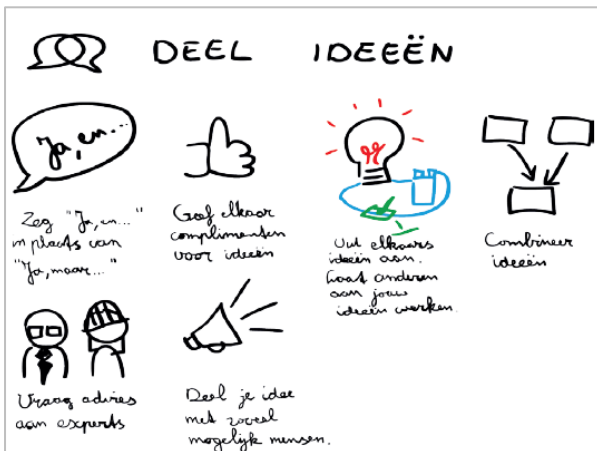


Effect

Students explore the learning goal and describe successful behaviour in their own words. The skill becomes clear to them and they are better able to apply it, to monitor themselves and to reflect together on their approach. All students gain from it and, in particular, low achievers benefit a lot as they may need more support to form a picture of learning goals and success criteria.

Example

Students and their teacher, Ms Harris, collectively explore the skill “Share ideas” because this is important in the upcoming design lesson. Ms Harris starts with a first example: “Give each other compliments for an idea”. She asks how she can draw this and a student suggests a “thumb up”. Next, the students give examples. Ms Harris asks the contributor for clarification, paraphrases and summarises the advice. Other students assist by giving similar examples and also suggest how to draw the advice. Ms Harris writes the collaboratively formulated suggestions below each drawing.




Translation:

- > Say “Yes, and..” instead of “But..”
- > Give each other compliments for an idea
- > Elaborate on each other’s ideas. Other pupils can work on your ideas
- > Combine ideas
- > Ask experts for advise
- > Share your ideas with as many people as possible.

During the design lesson the sheet with the 8 drawings is visible on the smartboard. During the activity, the Ms Harris asks the students if and how they have applied the suggestions and if they encountered any difficulties. Furthermore, individual feedback to students or teams is given on how well they apply the suggestions to practise a difficult element.

Practical advice

- ◆ **Visualise.** Try to visualise the examples in the boxes. Ask students to come up with ideas for the drawing and involve them by speaking aloud what you are drawing. You can also ask students to draw or to act it out.
- ◆ **Concrete.** Tell them that they will use the images in the next design activity. Write guidance down below the drawings.
- ◆ **Own experiences.** Ask pupils about their own recent experiences. Ask: “Who did you successfully share your ideas with during our last activity? What did you then do?”.
- ◆ **One at a time.** Focus on one, or at the most two, design skills during a series of design lessons. No experience in design yet? Start with the design skill  “Share ideas”.

EVALUATE EXAMPLES IN ADVANCE

Make
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Learners analyse and discuss examples of design skills and develop a sense of quality



FA Strategy 1 Clarifying and sharing design skills and learning goals



Participants
Group/class



Duration
15-30 min



Design Experience
None

Description

Provide your learners with examples of design outcomes, preferably anonymous outcomes of another class from a different design challenge. Include things like design questions, brainstorm results, prototypes, notes, sketches, user profiles or presentations. Take care to include mainly good examples and a few moderate ones.

Let the learners discuss in teams what they think of the quality of the examples. They ask each other focused questions related to the design skills. They may ask what is the most original result based on the card 🌀 “Think in all directions”. Or using the card 🧑🏻 “Empathy”, they may pose the question “Which example really goes into feeling how the problem would be if they had it themselves?”.

Effect

Learners look into examples in a conscious and active way and develop – even before they start working on the design project – an idea of quality. By checking how design skills were applied by others, they clarify their learning goals and get inspiration.

Example

Mr Dixon wants the learners to understand how to formulate design questions that are on the one hand open, on the other hand have a focus. He provides them with a number of good and bad examples of design questions from another class about a design problem that features a little rabbit with a broken paw that needed to cross a busy road back to his home.

Next, the pupils discuss these questions in small groups.

Achmed prefers “How can the rabbit reach the other side of the road?” and Katy “How to build a tunnel”. Katy explains that she likes the tunnel question more because it tells you what to do.

Achmed agrees that the question is very clear, however, he doesn't like that you cannot develop other solutions for the rabbit like a parachute or bridge. Next, the Mr Dixon asks his class to think of a design question related to the school garden. Katy and Achmed are able to think of a question that leads to various solutions: “How can they keep the school garden green during the summer holiday?”

Practical advice

- ◆ **Scaffold.** Give the design skills cards to pupils for support in asking relevant questions.
- ◆ **Compare.** Stimulate the learners to compare examples to discover what is important in achieving quality. They may also experience how different approaches can create quality.
- ◆ **Create a stock.** Share your experience with other teachers and agree upon creating a (digital) stock of design outcomes.
- ◆ **Safe environment.** To make sure students are respectful, even if making a critical comment, agree a number of social rules with your class. Let students compare their own (intermediate) outcomes and decide how they can achieve high quality.



SYMBOLS FOR DESIGN LEARNING

Make
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Use the design learning symbols to show pupils which skill they are developing



FA Strategy 1 Clarifying and sharing design skills and learning goals



Participants

Individual/Group



Duration

5 min or less



Design Experience

None

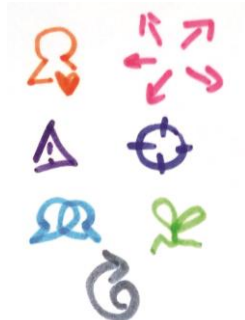
Description

Draw a symbol on the work of learners when they apply a design skill. A colourful symbol is available for every skill. Draw them when you observe a pupil applying the skill. This enables the pupil to retrieve this moment later on and learn from it.

Describe in a detailed and concrete way how the design skill has been applied and the positive effect of this action. If an effect is negative, discuss this with the pupil and provide support in the form of an achievable action. Stay with the pupil till (s)he succeeds and then draw the symbol.

Hint! Draw symbols on post-its and stick them on prototypes. Also give them during or after a presentation.


Make a picture of the work and add the symbol.



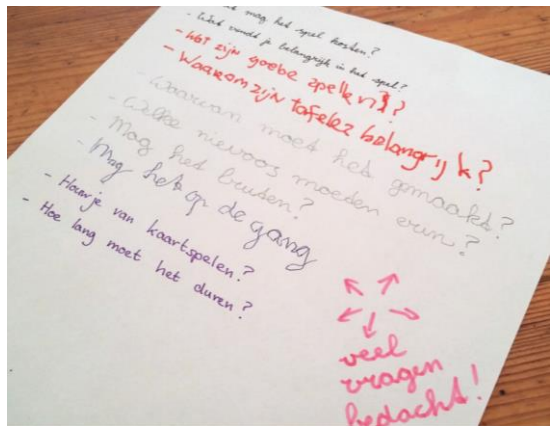
Effect

Pupils understand the learning goals and success criteria and know which design skill they are developing. Direct feedback is provided. Eventually, pupils associate the symbols with certain ways of working. All symbols are given to identify success. In addition, the personal attention from the teacher is often absorbed and increases motivation.

Example

Pupils are designing an educational game to learn maths. They start to think about the target group of the game: children play the game, teachers buy the game and a company has to produce the game. One of the teams wants to interview these target groups. They generate a lot of interview questions and will select the most relevant ones later on. The teacher draws the icon of “Think in all directions”  on their work and stimulates the team to think of even more questions.

She explains that when you develop many varied questions, interview questions will become better and more original. Well done team!



Practical advice

- ◆ **Step by step.** Start using this tool by focusing on one skill that has previously been shared with the class. Add more symbols once your class is familiar with the different symbols and their meaning.
- ◆ **Recognisability.** Frequent application of symbols will enable learners to recognize the design skills and success in their own approach.
- ◆ **Next step.** Move the learning forward by asking pupils before the next design activity starts to look back at the symbols in their work. How did they apply a skill and can they use this in the next design lesson?
- ◆ **Eliciting evidence.** Ask pupils to collect all the examples of one design skill and lay them side by side.

PRACTISE YOUR SKILLS

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Skill cards support learners to understand and practise design skills



FA Strategy 1 Clarifying and sharing design skills and learning goals



Participants

Individual/group



Duration

5 min or less



Design Experience

None

Description

Learners practise independently to apply a design skill. A card that describes a design skill supports the learning. These cards are available for each skill. The skill has a visual symbol and is explained in words that are easy for most children from 8 years upwards to understand, but with support could be used with younger children.

Give learners a card of a skill that they do well to stimulate their self-confidence and to select new challenges in this area. Also challenge pupils by giving them a card on a skill that they are still developing.

In advance of a design activity, the card helps to focus the learning. Let learners think about how they are going to apply a design skill during the next activity. Ask learners **during** the activity to regularly check their card. Are they developing the design skill or certain aspects of it? What else could they try?

After the lesson, learners reflect on how it went.

Effect

Learners learn to apply a skill in practice. They know what is expected as the message is written in the first person on the card, for example “I share understanding ...”, “I show my ideas ...”. This enables them to monitor what they are doing and know that they are learning. They know that they are becoming more successful by practising.

Example

A smoothie company wants you to *design* a new smoothie that is healthy and enjoyable for young children! Mr Williams introduces the design assignment for the next project and invites all teams to select one of the skills as a specific focus. Gordon’s team wants to focus on ‘bring ideas to life’ 🌱 as they struggled with this in a previous project. They check the card and decide to focus on the sub-goal: Express – I make my ideas and thoughts visible for myself and others.



During the brainstorm, all team members do not only write their ideas down, but they accompany them with little sketches. After the lesson, they reflect. Gordon found the drawing difficult. Mr Williams compliments him because he dares to say this to the team. Together, they develop the suggestion that sketches do not have to be beautiful, it is clarity of understanding that counts.

Practical advice

- ◆ **Collective learning.** Pair learners that are effective in a skill with learners that still have to practise it. Stimulate peer learning.
- ◆ **Positive and negative effects.** Teach pupils how to communicate about positive and negative effects of certain approaches. Teach them to select one concern and turn it into a small achievable challenge.
- ◆ **Roles.** Provide the learners with roles in the design team that fit with their learning goals. Scaffold when necessary, e.g. using framing sentences in a design presentation.



Develop empathy

I share understanding and feelings with the users who are experiencing the problem. I find out about the users and focus on the user's wishes and needs.

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Develop empathy

EXPERIENCE
I identify with the problem, trying to imagine what it is like to experience this problem.

TARGET GROUP
I research the user and the context of the problem. I talk to users.

ACTIVE
I involve users and other people affected by the solution in my design process and actively seek input and feedback.

Based on: Christensen in Bonté © 2017, TU Delft in Nieuw

AN EXTRA TOUCH TO "SHOW AND TELL"

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Learners present with a focus on a specific design skill



FA Strategy 2 Eliciting evidence of learning



Participants
Group



Duration
15-30 min



Design Experience
1-3 lessons

Description

Stimulate learners to add a special touch to the presentation of their design or their design process. Ask them to show and clarify how they applied a specific design skill. Support your pupils by providing them “framing” sentences such as shown here.

Learners can also write about how they applied a design skill. Ask them to use an additional paragraph in their design workbook or portfolio, an additional heading in a poster presentation or an explanation label beside their prototype.

- > **Think in all directions:** “We could think of even more special ideas by...”
- > **Bring ideas to life:** “A handy way to make our idea more concrete was ... because ...”
- > **Make productive mistakes:** “By trying things out as soon as possible we discovered that ... was not working ... and next we tried ...”
- > **Develop empathy:** “We took a look at people who have this problem by ...”
- > **Decide on your direction:** “An import decision was ...”
- > **Share ideas:** “A good way to share ideas was to.”
- > **Make use of the process:** “When we do this again, we would ...”

Effect

Learners collect evidence of their own learning and make explicit how they applied a certain design skill. This provides a solid basis for feedback that moves the learning forward.

Example

At the end of a biomedical design project, the teacher organized for pairs of pupils to present to each other around the design skill 🔄“develop empathy”. Marie tells John how her design team applied this skill when developing a clever device for opening a milk container. Using four example sentences she explains how the design meets the user’s needs:

Our design is to help ... people with arthritis.

We tried to feel how it is to have this problem ... by taping our hands very tightly and pretending they were “stiff”.

We checked experiences of people who have to deal with this problem by ... speaking with Fatima’s grandmother. She showed us how painful her hands were and that she is often not able to open the lid on the milk container.

Our design is for the needs of these people ... opening the lid is no longer necessary in our new design.



Practical advice

- ◆ **Select the design skill in advance:** This tool becomes even more effective when pupils know the focus of the presentation before the project or lesson starts. As they collect information for the presentation during the design process, they are more aware of their own learning.
- ◆ **Formulate questions:** Ask pupils to actively develop sentences for the presentation around a certain design skill for their own use or for their peers. In this way, you can check if the skill is clear to them.
- ◆ **Next step:** Use the presentation to determine a next step. Develop an achievable challenge and let them practice it during the ongoing design task or a future task. Celebrate their success.



PHOTO STORYLINE

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Learners visualize their design process and the design skills by taking photographs



FA Strategy 2 Eliciting evidence of learning



Participants
Group



Duration
5-15 min



Design Experience
None

Description

Before starting the design activity, ask one design team or one pupil to frequently take pictures of their work. Let them focus on the materials, sketches, models or prototypes when you want them to reflect on design skills such as ‘thinking in all directions’ and ‘bring ideas to life’. If your focus is on communication, ask them to take pictures that show pupils while they are working.

Ask them every ten minutes to take a picture and pose questions about the picture, either in the moment or afterwards - . What do you see? What are you doing? Which design skill are you applying and how did that go? Ask the pupils to write down their most relevant insights in key-words for each picture. Use it to formulate feedback that you can give in the lesson.

Glue all pictures on a long piece of paper or save them digitally (see the website for digital tools that you could use). This provides a great opportunity to reflect on the process and applied strategies and moves your class forward.

Effect

Learners collect evidence of how their design process proceeds with either a focus on the growth of the design idea or on communication. They will often remember and notice elements in their approach that they would not have considered without the pictures. Through the mirror the pictures provide, and the subsequent analysis, the learners discover strong and weak points in their current approach.

Example




A building in the neighbourhood has been vacant for years and pupils are generating ideas about how to re-use it. The teacher asks Julia to take a picture of her work every now and again. All other pupils continue working as usual. Julia takes a picture of her brainstorm results.



Later on, she takes one of her design drawing and a number of prototype pictures.



With each picture the teacher asks “What are you doing?” and “What is your next step?”. In addition, the teacher asks her questions related to the skill  “Decide on your direction” such as “Which of your good ideas could be combined?” or “What can you do to better listen to your own opinion?”. At the end of the lesson, the whole class looks back on Julia’s approach to learn from it.

Practical advice

- ◆ **Keep the flow going.** Are your pupils novice-designers? Take care to keep them in the flow and change the timing of the pictures when necessary.
- ◆ **Reconstruct and reflect.** Your pupils have to learn how to use the pictures to reconstruct their design process and to reflect on it. Help them with easy questions about what happened, how they evaluate it and about ideas that will help them to further develop their design skills.
- ◆ **Whole class.** Enough mobile phones or camera's available and a bit of experience with these devices? Let each design team make a series of pictures.



STUDENT REPORTER

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Learners make an inventory of how a design skill is applied



FA Strategy 2 Eliciting evidence of learning



Participants

Group/class



Duration

5-15 min



Design Experience

1-3 lessons

Description

Give two or three students the role of reporter. They are not designing themselves, instead they keep track and report what happens in the design lesson. They observe, interview, write, draw and photograph what happens. They make an inventory of different ways a design skill was applied by describing the behaviour of their classmates. They may also note what the teacher says and how this is acted on by the pupils.

The teacher gives the floor to the reporters for the last ten minutes of the lesson and they summarise what they have seen and give an overview of different ways of applying a skill. They speak about memorable moments.



As a teacher, you may want to use the overview made by the reporters to evaluate the approaches applied and give your class a manageable challenge on a point of concern to advance their learning.

Effect

As a reporter, learners experience the design process in a more distant way. This creates additional reflection and awareness and they may see and report things that would have otherwise gone unnoticed. Useful evidence of learning is collected.

Example

Ms Baptiste would like to “double” herself during the design project “Green schoolyard”. She asks Shabina and Michael to help her and to report about the design skill 🧠 “Develop empathy”. Shabina and Michael give a summary at the end of the lesson and report that Team A took a lot of time to understand all aspects of the problem. They are planning to interview local residents, children and teachers. Team B has developed two solutions and developed these quite a long way. However, they are not sure if the target group will like these solutions. Shabina and Michael end their presentation with the statement “The best way to design is without asking the target group”. The class does not agree and team B decides to ask the target groups to react to their ideas.

Practical advice

- ◆ **Role model.** Demonstrate the reporter approach. Give a good summary about what you have noticed at the end of a design lesson.
- ◆ **Good observers.** Select your reporters consciously at the start. Let them focus on design skills that have been shared already.
- ◆ **Statements.** Experience with the tool? Ask your pupils to develop a few statements about the pro's and cons of a certain approach. Or to develop suggestions for other actions. Let other pupils react to these ideas.



GOLDEN FRAME

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Putting evidence of growth in a design skill in the limelight



FA Strategy 2 Eliciting evidence of learning



Participants

Class



Duration

5-15 min



Design Experience

None

Description

A golden picture frame is hung in a central place to hold design results of students who are in the limelight because they have shown evidence of growth in a design skill. Many examples are suitable for framing; a design drawing, prototype, presentation, inspiring questions, presentation or notes. Focus the students' attention on the golden picture frame. What can we learn from these students? Which design skill is applied successfully?

Frequently change the contents of the frame to show work of all students and of all design skills across a school year.



Effect

The framed results bring good examples into the collective memory of students. The emphasis is on what went well. Students develop an insight into quality and can follow these good models. Furthermore, being selected is motivating for individual students.


Example

One of the girls in the classroom uses a wheelchair. She is not able to join in playing marbles. The class does a project on “How can Kim join in playing marbles?” and develops prototypes for their solutions. Seeta and Amy design a marble gripper. The prototype is made of strips of wood and two yogurt bins. They discover during testing that the gripping power of the bins is not sufficient. Seeta and Amy generate a lot of new ways to make the bins work.

The teacher photographs the first prototype. The picture is given a pride of place in the golden frame as an example of ⚠️ “Make productive mistakes”. Seeta and Amy have tried out their prototype and looked on purpose for things that did not work out as intended.



Practical advice

- ◆ **Symbols.** Draw the relevant symbol of the design skill on the results that will be framed. For example, one of the teams developed a lot of varied ideas. Frame their brainstorm results and draw the symbol  “Think in all directions” on the results.
- ◆ **Inform.** Discuss and select with your class at the start of the lesson which design skill will be central in the learning process. Or tell your students that during a certain period the golden frame will only be given to one specific design skill.
- ◆ **Agree.** Agree on a fixed time period to switch the contents of the frame, for example once a week.
- ◆ **Hurray - it didn't work!** Make a “Hurray - it didn't work!” frame. Discuss discoveries about things that didn't work. Analysing what did not work out is one of the most effective learning strategies. See also the tool “What isn't working yet?”

PERSEVERANCE CUP

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Students receive a Perseverance Cup when they use a design skill that they find difficult



FA Strategy 3 Providing feedback that moves learning forward



Participants

Class



Duration

5 min or less



Design Experience

None

Description

Students get the opportunity to earn perseverance cups. These cups are meant for pupils that practise design skills that are difficult for them. The reasons for receiving a cup are different for every student. For example, taking the perspective of someone else into account during a decision process or drawing a lot when a pupil had not done this before. Or checking everything before proceeding or asking questions that stimulate speculative thinking in all directions. Students earn perseverance cups for their effort, not for the result.



Draw a cup. Write down who earned the cup and why. You can also use the provided template on page 61 or contact us for the pdf at R.M.Klapwijk@TUDelft.nl. Give the cups a visible place in the classroom.

Effect

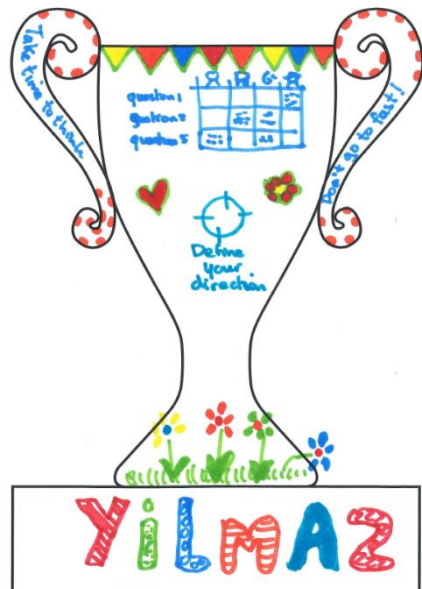
Students learn to focus their attention on personal learning goals and personal success. They discover the importance of effort and trying to do something. They discover that they can even master skills that are rather difficult for them.

Example

Last week, four perseverance cups were earned. 🎯 Yilmaz took care to order her data and to draw an overview before she proceeded. ✨ Joey dared for the first time to make funny and strange combinations during a brainstorm. 🌀 Daniel showed a remarkable openness towards ideas from his teammates and continued to build on these ideas. ⚠️ Estelle always wanted to ignore things that did not work out, but this time she was able to talk calmly about it.

The four pupils have decorated their cups. They also wrote down how they were successful in earning the cup.

The four perseverance cups were put in a place of honour – a central shelf – in the classroom. Estelle's mother was very proud of her.



Practical advice

- ◆ **Achievable challenge.** It is not easy to do something you are not yet able to do successfully. It requires courage and a manageable challenge. Take time with each student to develop an achievable yet challenging task. Ask a student who earned a cup to explain how s/he succeeded in persevering and putting effort in the task.
- ◆ **Nominate a peer.** Are your students comfortable with the perseverance cups? Ask students to nominate their peers for a cup.
- ◆ **Collect.** Appeal to children's collecting craze and let them collect various perseverance cups. Stimulate students to think of what they can do to earn the next perseverance cup.



ON THE RIGHT TRACK?

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During a short pause, students think about the way they use a design skill



FA Strategy 3 Providing feedback that moves learning forward



Participants

Individual/Class



Duration

5-15 min



Design Experience

None

Description

Select a design skill to focus on that has been shared before. Take a short break from the design activity and check if all students are on the right track. Ask questions and stimulate students to evaluate if they are applying the skill in the right way. Which elements of the design skill do they apply well? What difficulties do they experience? How could they proceed?

Take care to describe the approaches that go well in a tangible way. Make things as concrete and specific as possible and describe the positive effect. Do the same for the approaches that had a negative effect. Let each student or design team select one thing that did not go well and think of a feasible action to practise for the next step. Let the students continue their design activities after the break.




In this way they can directly apply the concrete action and improve. Ideally, they get the opportunity to practise until they achieve success.

Effect

Students learn the value of reflection. They discover the positive and negative effect of their design approaches and can directly practise one particular thing. The feedback is not overwhelming as no more than one point of concern is selected and a feasible action is planned.

Example

Students design products (f.e. games) to learn grammar in a fun way. During idea generation a short pause is created. Pupils are asked to evaluate if they thinking creatively in “all directions” . Are they managing to think of lots of ideas and are their ideas varied? Did they come up with some unusual ideas or make new ideas through combining existing ideas? What happened in their minds when they were not able to think of a new idea but were merely repeating an idea? What helped them to create a unique, unusual idea? The pupils describe their thinking processes and each design team selects one concern. For one team this was about making unusual combinations. Another team looks for inspiration in various directions such as hobby's, sport and games. Each team thinks of a feasible way to develop new approaches during brainstorming.

Practical advice

- ◆ **Tangible.** Ask specific questions about their experiences with a skill. By making the current and new approaches as specific as possible, they know what to change.
- ◆ **Timing.** Ideally, the moment of reflection is somewhere halfway in the activity. However, the creative flow should not be disturbed. Select a moment that interrupts the flow as little as possible.
- ◆ **Habit.** Make a habit of mid-way evaluation during a design lesson . Take time to practise feedback that focuses on students' approaches and their effect and on selecting only one element to practice. After some time, students are able to give high quality peer-feedback in an independent manner.



WHAT ISN'T WORKING YET?

Make
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Students discover that it is important to test ideas; a focus on things that are not working helps to develop a design



FA Strategy 3 Providing feedback that moves learning forward



Participants
Group/class



Duration
5-15 min



Design Experience
None

Description

Hands-on and minds-on are the essence of designing. Stimulate learners to quickly try as many things out as possible. This is especially needed during making and prototyping. Provide a lot of opportunities for testing early designs. Create one or more places where prototypes can be tested in your class. Tell your students that the most important question to ask continuously is: What does not work? Because you learn the most from things that do not work out, encourage them be on the look-out for this. It creates improvement of initial design ideas.

Ask a number of students to give an example of a discovery of something that did not work as expected. Ask them also what they did with the discovery and what they gained from it. How did they change their design or what are their plans? By presenting mistakes all students will learn about the value of experimenting and trying out. In addition, making mistakes can be fun.

Note: This tool is great for working on design skill:



Effect

Students alternate continuously between doing and thinking. Iterative design is stimulated. Students learn through trial-and-error by checking if something works or not. They learn to analyse mistakes and discover how they can solve these problems and improve the design.

Example

Students are working on the design question: how can wind be used to create movement? A design team wants to make a wind catcher from a plastic bag. When they are busy connecting the bag to a small piece of wood with wheels, the teacher suggests to test how the bag catches wind from a fan. The team discovers quickly that the bag does not catch wind but directly shuts.

Through experimenting and testing with different bags, the team discovers that a broader mouth and another form of the bag is needed to collect the wind.



When the teacher stops the design and making process for a moment and asks : ‘What did not work?’ the team shows their experiment with the initial and final bag to the class and explains why the later version works the best.



Practical advice

- ◆ **Self-correction.** Select design assignments that enable students to discover if their design works or not. Provide ample room for making and testing
- ◆ **Support.** Support the testing process by focusing the students’ attention. Ask descriptive, evaluative, explorative and speculative questions. Descriptive: what do you see here? Evaluative: Is this what you expected and wanted to happen? Explorative: Are there other ways to do this? Speculative: What if you tried ...?
- ◆ **Let go.** Let go of your own ideas about the design result. Don’t interfere when you expect that a solution will not work. It is a valuable experience for students to discover it for themselves. And you never know, it might be possible after all.
- ◆ **Design process.** There are a lot of moments in a design process that ask for quick experimenting. For example, let students show their preliminary interview questions to a peer or try them out on a first user.

SUGGESTIONS WALL

Make
Design
Learning
Visible

Learners share recommendations with one another



FA Strategy 4 Activating learners as resources for one another



Participants
Class



Duration
5 min or less



Design Experience
none

Description

Ask learners to write or draw advice or suggestions for classmates on a post-it. Use a new post-it for each suggestion and let them stick it to a wall, door or window. A suggestions wall is created. To collect as much advice as possible allow your class to give tips on any skill or topic. If a particular skill is missing all the time, ask for suggestions on this skill. Stimulate your class to check the suggestions wall and try out a tip.




Reflect once in a while on the suggestions wall. Who has used a tip? How did it help? What kind of tips are particularly useful? Do we tend to overlook certain advice?

Many teachers extend the suggestions wall to other classes as well. In this case, focusing on a specific skill is helpful to make it manageable.

Effect

Learners become aware of the skills and knowledge they already possess collectively. Someone may know one thing, another person something else. They also learn how to support their peers in the learning process and learn more collectively.

Example

In the previous design activity, teacher Ms Abdulla discovered that a number of pupils have not yet mastered the skill of  “Decide on your direction”. They particularly find the subskill “overview” difficult. In the next design project the following design question is central: “How can everybody play in a safe way in the schoolyard?”. Ms Abdulla provides the class with an instruction of getting an overview and uses an example to demonstrate the approach. Next, all design teams go to work.

Paul’s team draws a number of circles with activities that children do in the playground such as football, skipping ropes and playing with sand. When a game endangers another activity, the

team draws a red line between the two. As a suggestion they stick “use circles and red arrows” on the wall. Meryem’s team did it differently. This team suggests to “Make a list of activities and show with a smiley how safe the activity is”. Joseph’s team is happy with these suggestions: “Now we also know how to proceed to get an overview of the problem”.



Practical advice

- ◆ **Rules.** Agree upon a number of social rules with your class. For example, how many children are allowed at the same time at the suggestions wall.
- ◆ **Getting used to it.** Some pupils may have to get used to a suggestions wall and a few might misuse the wall for inappropriate comments. Adjust this process and discuss what makes advice relevant and useful so all pupils will participate well in the end. Learners take responsibility for their learning.
- ◆ **Start young.** Start as early as possible with a suggestions wall, four year olds can join in. Let them draw suggestions and help them to formulate their ideas. Pupils like to support each other.

LIBRARY OF INSPIRATION

Make
Design
Learning
Visible

Developing a library full of inspiration on the design skills



FA Strategy 4 Activating learners as resources for one another



Participants

Class



Duration

30 min or more



Design Experience

1-3 lessons

Description

Evaluate a design lesson with your pupils. On which design skill did they work well? What did the pupils learn? What advice was the most helpful? What did not work well and what could be a reason for this? Collect all the valuable findings in an inspiration library. Use final and intermediate outcomes, as exemplified in the list alongside. Start a new good habit! Take a look at the inspiration library at the start of any design lesson. Use an example to demonstrate that your class can find inspiration in the library. Position the library in a visible place where all pupils can access it.

Examples of (intermediate) results

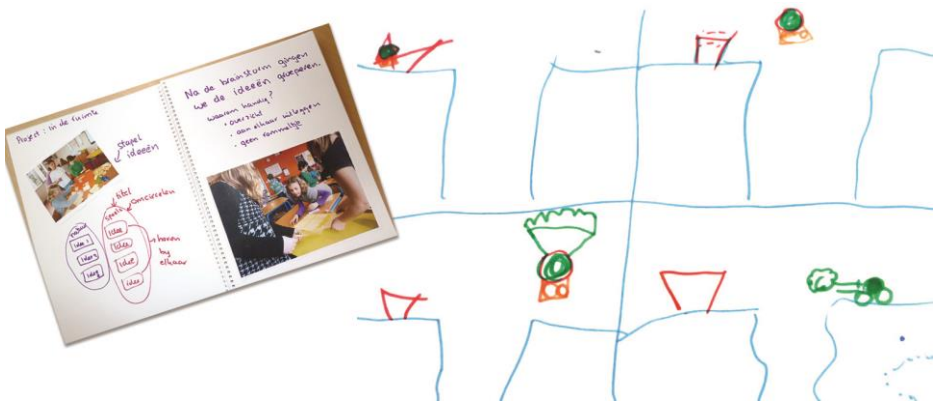
Description of a design problem
Interview questions
List of design criteria
Research notes
Brainstorm results
User profiles
Ways of sketching design ideas
Design Scenario or story board
Ways of Prototyping
Computer models
Floorplans
3D-drawings to build a prototype
Calculations
Test results
Presentations

Stimulate pupils to check the inspiration library when they get stuck. They can search for suggestions, valuable design methods and good examples. They discover how other pupils tackled problems that they might meet as well.


Effect

There are two major effects. First, you stimulate the confidence of your pupils to learn to do something new by pointing to the learning evidence of the last period. Pupils see their own progress through collective monitoring. Second, they are inspired to use what they have learned in new situations and pupils become a learning source for each other.

Example



During a design lesson with the design question: “How can we bring relief goods to the other side of the ravine?” one team has developed the idea of a catapult-parachute with a specific folding-out mechanism. They consult the inspiration library because they have no clue how to present this to their

classmates and find a great many of examples of how to depict an idea in the section  “bring ideas to life”. The team goes to work and makes a short comic with four drawings that show how the parachute will be launched across the ravine and leave a box with relief goods behind.

Practical advice

- ◆ **Avoid fixation.** Sometimes it is too tempting to be ‘fixated’ on someone else’s idea and just copy it rather than think of what would be best for your own project. Make sure that the examples help pupils learn, and are then inspired to explore their own ideas, rather than copy directly from the library.
- ◆ **Keep it simple.** There are many ways to document. A simple drawing, a post-it, a photograph or a number of key-words are often sufficient.
- ◆ **Ordering.** Organise items in ways that you can show or hide as suited to a project or lesson. For example, collect in loose leaf folders and use tab pages so you can change the ordering in the library.
- ◆ **By design skill.** Order the inspiration library by design skill. Alternatives: by design project or design stage.
- ◆ **Divide tasks.** Give one design team the responsibility to collect relevant documents or examples and insights to update the inspiration library.

STUDENTS AS EXPERTS

Students act as experts in a specific skill

Make
Design
Learning
Visible



FA Strategy 4 Activating learners as resources for one another



Participants

Class



Duration

5 min or less



Design Experience

1-3 lessons

Description

Select a design skill that will be central in the next design lesson. Look for two or more students that have mastered this skill above average. Let them function as experts. Classmates can ask for support from these experts during the next lesson.


Change roles. Regularly select new experts and alternate between different skills. In this way, each pupil will act as an expert in a certain area.

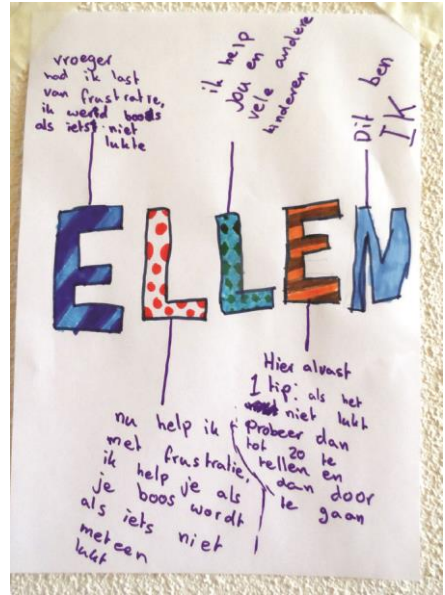
Teach experts to demonstrate and explain things to their peers. Stimulate them to give others room to experiment with the skill. Ask “How can some-one else learn to do it well?”

Effect

Your students will master the design skill at a higher level when they have to explain it to their peers. In addition, the expert role stimulates self-confidence. Collective learning takes place when students get support from the experts.

Example

A teacher appoints two students as experts for the design skill  “Make productive mistakes”. These students are real go-getters. They will usually make and test their idea from the very start. As a result, they discover quickly things that do not work and are able to improve their design successfully. Ellen, one of the experts, used to become frustrated when something did not turn out well and she got stuck. She learned to transform her frustration into action. When she observes a similar problem with her classmate Alfie, she walks up to him. The two discuss the frustration and think of actions that Alfie could try.



Translation of Ellen's paper:

- > I used to become very frustrated when something did not work out!
- > I help with frustration and when you get angry
- > I help you and lots of other children
- > Here is 1 tip: if it does not work, try to count to 20 and then go on with the project
- > This is me!

Practical advice

- ◆ **Visible experts.** Use an expert-hat or badge to make experts recognisable. Or let experts write their name and design skill on a card and possibly some advice for the skill. Hang the cards in the classroom before the design activity starts.
- ◆ **Apply to be an expert.** At the end of a design lesson give your students a chance to explain why they want to become an expert. Are they able to provide an example that shows how they applied a design skill in the past lesson? Tip! Observe your students during the lesson and challenge introvert pupils to apply as well.

MATRIX OF SKILLS

Make
Design
Learning
Visible

Showing good examples of design skills in an orderly way



FA Strategy 4 Activating learners as resources for one another



Participants

Individual/Class



Duration

5 -15 min



Design Experience

None

Description



Select one or more design skill relevant to the design activities in the upcoming lesson. Write them on the top of a big piece of paper, a whiteboard or smart board and draw the related symbol.

Every time the learners or the teacher discover that a design skill has been applied well, they gather evidence. The evidence is written, drawn or glued (copy of picture) below the relevant skill. In this way a matrix of skills is created full of examples from pupils, for pupils.

Effect

A range of quality examples of design skills is made visible for the pupils. They build a collective memory of good examples. They are able to reflect on examples of their own success and find inspiration in the examples of peers.

Example

Pupils are designing a new product to improve communication at school. The teacher walks around and takes pictures when she sees pupils that  “Bring ideas to life” or  “Decide on your direction” in a very good way. On a white board/smartboard, she includes the picture below the relevant design skill and writes some keywords down.

During the design lesson, the matrix of skills stays visible on the board. Towards the end of the lesson, the teacher discusses the good examples. What were the different approaches used to bring ideas to life? What can you learn from this?



Bring ideas to life

Decide on your direction

show how it works

drawing

combining ideas

ordering

Practical advice

- ◆ **Start simple.** Start collecting examples for one skill. Once your class is familiar with the approach, you can make a matrix with many skills.
- ◆ **Evaluate.** Check and discuss the matrix once in a while. Which are skills that they practise often and which skills are less prominent? Is a change of focus in the design and learning process required to practise all skills?
- ◆ **Own portfolio.** When pupils are experienced in making a classroom matrix, they can make their own matrix. Eliciting personal development is valuable.



TRAFFIC LIGHTS

Make
Design
Learning
Visible

Learners indicate in real-time if they have achieved the intended skill



FA Strategy 5 Activating learners as owners of their learning



Participants

Class



Duration

5 -15 min



Design Experience

None

Description


Provide each learner with their own “traffic lights”: three cups in the colours green, orange and red. Give instruction or provide an activity to practice a certain skill. Take care that your class understands the specific success criteria. During or after the instruction or activity, all pupils use their traffic light to show if they have achieved the learning. Green is “I understand it”. Orange means “I am not sure if I understand it” or “I do not understand it completely” and indicates ambivalence. Red means “I do not understand it”.

Give the greens the assignment to clarify the design skill to the oranges. They may start with a question “What is it that you do not understand?”. Ask the oranges to check if the greens understood the skill correctly. Collect the reds in your class to give them additional instruction by the teacher.

Effect

Learners assess if they understand how they can apply a design skill during and after an activity. They work together to achieve all pupils understanding what is intended. In this way, they look after one another. Everyone learns - the stronger pupils by explaining, the others by receiving customised instruction.

Example

Ms Barnett's class has generated ideas on "How to look around the corner" and will build prototypes today. An important goal is to learn to saw in a safe way as part of the design skill  "Bring ideas to life". Ms Barnett demonstrates the sawing and explains how to keep it safe. After her demonstration, all pupils use the traffic lights to show their understanding.

She pairs two 'green' and two 'orange' pupils. The greens ask the oranges what they do not understand yet about sawing and safety. One of the oranges says that he doesn't understand how to hold the saw. The greens start to explain and demonstrate, but discover that one of them doesn't understand how to saw safely as well. The three practise till they all understand how to saw safely. Ms Barnett provides additional instruction to the two reds. One of them is left-handed and Ms Barnett demonstrates sawing as if she is left-handed. When pupils understand it, they are allowed to build prototypes.



Practical advice

- ◆ **Success criteria.** Share and clarify learning intentions and success criteria beforehand. Make these specific and adapt them to the level of your pupils.
- ◆ **Close connection.** Create pairs of children that have a good relationship with each other.
- ◆ **Reflect.** Reflect on the activity and your instruction. Analyse what works and what doesn't work. Ask your learners for feedback and change your approach.
- ◆ **Traffic Light.** Use paper cups for a sustainable solution. Make it yourself? Make triangular towers by folding thin coloured card.



CARD ABOUT YOURSELF

Make
Design
Learning
Visible

Students make a card with their strong and weak points and define their learning goals



FA Strategy 5 Activating learners as owners of their learning



Participants
Individual



Duration
5 -15 min



Design Experience
1-3 lessons

Description

Plan a design project and check which skills can be learned during the project. Describe the project and the skills briefly.




Give each of your students a card (=sheet A5). Ask them to describe which of the skills needed in the upcoming project they have mastered in an acceptable way and which one they want to develop. Let them write or draw how they will work on mastering the skill in the next project. Ask them also to imagine what it will look like when they have reached their goal.

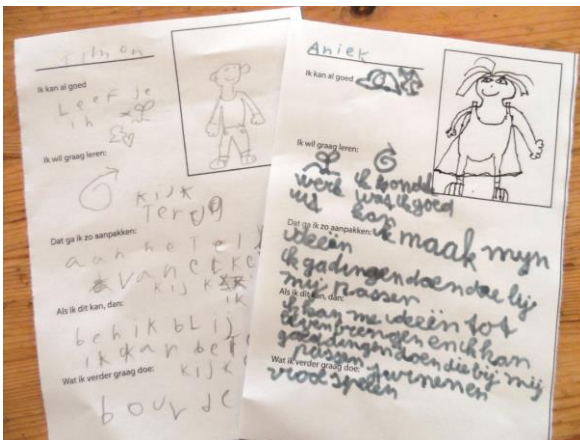
Collect the cards and use them to put together well-balanced design teams. Think of specific tasks that can help individual students to reach their learning goal. Reflect half-way and at the end of the design project. How did they work on mastering the selected skill? Did they proceed towards their goal? What is the difference between the new way of working and their old way of working?

Effect

Students set their own specific learning goals and use design activities to develop a skill. They reflect on the skill and learn to look at their personal development. This helps to develop their ability to regulate their own learning process.

Example

Mr Schillaci asks all his students to make a card about themselves. Maya writes on the card that she is quite good at  “sharing ideas” and  “thinking in all directions”. She wants to learn how to  “bring her ideas to life” and to learn to work with different materials. She also wants to discover the things she is doing well (“use the process”). This is her plan! She is going to make her ideas and she is going to do things that she enjoys doing. Mr Schillaci collects and reads all cards and puts teams together. He takes care that students within a team can learn from each other. At the end of the first project afternoon, he asks his students to reflect. Maya says that the discussion with Olivier helped her to elaborate her ideas in a better way than before.



Practical advice

- ◆ **More about yourself.** Invite students to say more about themselves on their card. What do they like to do in a design project, but also, for example, which sports do they like and why?
- ◆ **Making design teams.** Diversity within a design team usually leads to better design results. When students are well aware of their own abilities, strengths and weaknesses, they are able to put a design team together.
- ◆ **Portfolio.** Collect the cards for each student along with evidence of the learning goals that they have reached. Look back with the students on the design skills and their progression once in a while.

GROUP DESIGN RESULTS

Make
Design
Learning
Visible

Classify design outcomes to stimulate joint reflection



FA Strategy 5 Activating learners as owners of their learning



Participants
Group/class





Duration
15 -30 min



Design Experience
1-3 lessons

Description

Examine with your whole class the design outcomes of a lesson, for example, design drawings, prototypes, stories about the target group or interview notes. Classify these results. Organise and cluster results that are similar or apply particular criteria and lay the outcomes down in order.

For example, use the size of the prototype, the kind of materials used, price or the technical concept applied. Or approach the grouping in a different way and apply a design skill to make groups. For example, use the amount of variation in design ideas for the design skill  “Think in all directions”. Or use the level of attention to the target group for the design skill  “Develop empathy”.

Use different criteria and check how the order changes, for example, when the variety in ideas is replaced by how the needs of the target group have been matched.

Examine the arrangement and ask questions such as:

1. What do we see? Which groups or clusters have been made?
Do we see a lot of variation in the design outcomes or not?
2. How is variety brought about?
3. What can we learn from these outcomes?

Look out! This approach is not meant to judge the quality of the design results, but to get an overview of the different outcomes. A moment of reflection is created. The students will discover and reflect on the characteristics of the design outcomes and learn from this.





Effect

Clustering, ordering and comparing stimulates reflection amongst learners. They become better able to recognise different qualities of originality. Looking at work from others enriches and opens new pathways for pupils in design.

Example

Students generate ideas for alternative uses for a community centre in their neighbourhood. After brainstorming, students group their idea-sketches using different design criteria.

Students hang sketches with a lot of detail on the wall below

 "Bring ideas to life". Original ideas are posted below  "Think in all directions". Ideas that are difficult to make are pinned up below  "Make productive mistakes". Ideas that are designed for specific users of the community centre are posted below  "Develop empathy".

The students reflect collectively. What occurs often and what is hardly represented? They discover that all their ideas are related to children and they propose to generate additional ideas for other users such as the elderly



Practical advice

- ◆ **Criteria.** Let your students suggest criteria to group the different results. Or let them group the results intuitively and ask them to explain their grouping.
- ◆ **Stimulate.** Stimulate the students to use different criteria to order a set of outcomes. Examine the results using one criterion and re-order them using another.
- ◆ **Unusual.** It is refreshing to use variety as a criterion. Which results occur often and which ones are scarce? Which result has nothing in common with the rest and is unusual?

OBSTACLE GAME

Make
Design
Learning
Visible

Using a game, pupils think of obstacles in a design process and relate these to possible solutions



FA Strategy 5 Activating learners as owners of their learning



Participants
Group/class



Duration
15 -30 min



Design Experience
Advanced

Description

Divide your class in two teams: one focusing on obstacles that create problems for designing and one on solutions. The goal of the obstacle game is to combine problems in a design process with potential solutions. Summarise briefly what pupils have learned about the design skills. Give each team a stack of paper. Ask one team to think of as many as possible obstacles for a design process and write each one on a separate piece of paper. Ask the other team to generate as many solutions or strategies as possible and write each of them on a separate piece of paper. The teams work independently.

An obstacle could be “some children only believe in their own ideas” and “when I have an idea in mind, it is very difficult for me to put it on paper”. A solution could be “Combine the strengths of each idea from the various team members” or “Work together, one explains the idea and one draws it”.

Start the game. The teams take alternate turns. The team that starts the first round of the game plays a card and describes the situation on the card. Does the other team possess a matching card? If so, they earn one point. If not, the other team gets a point. In the next round, the other team starts and plays the first card. The teams play several rounds trying to match obstacles with solutions and solution with obstacles until the game ends.

Effect

Pupils will more easily recognise obstacles that cause problems when designing and are able to solve these a lot more quickly as they have access to a great many solutions. This increases confidence. In the game, pupils can share their experiences in a safe and anonymous way.



Example

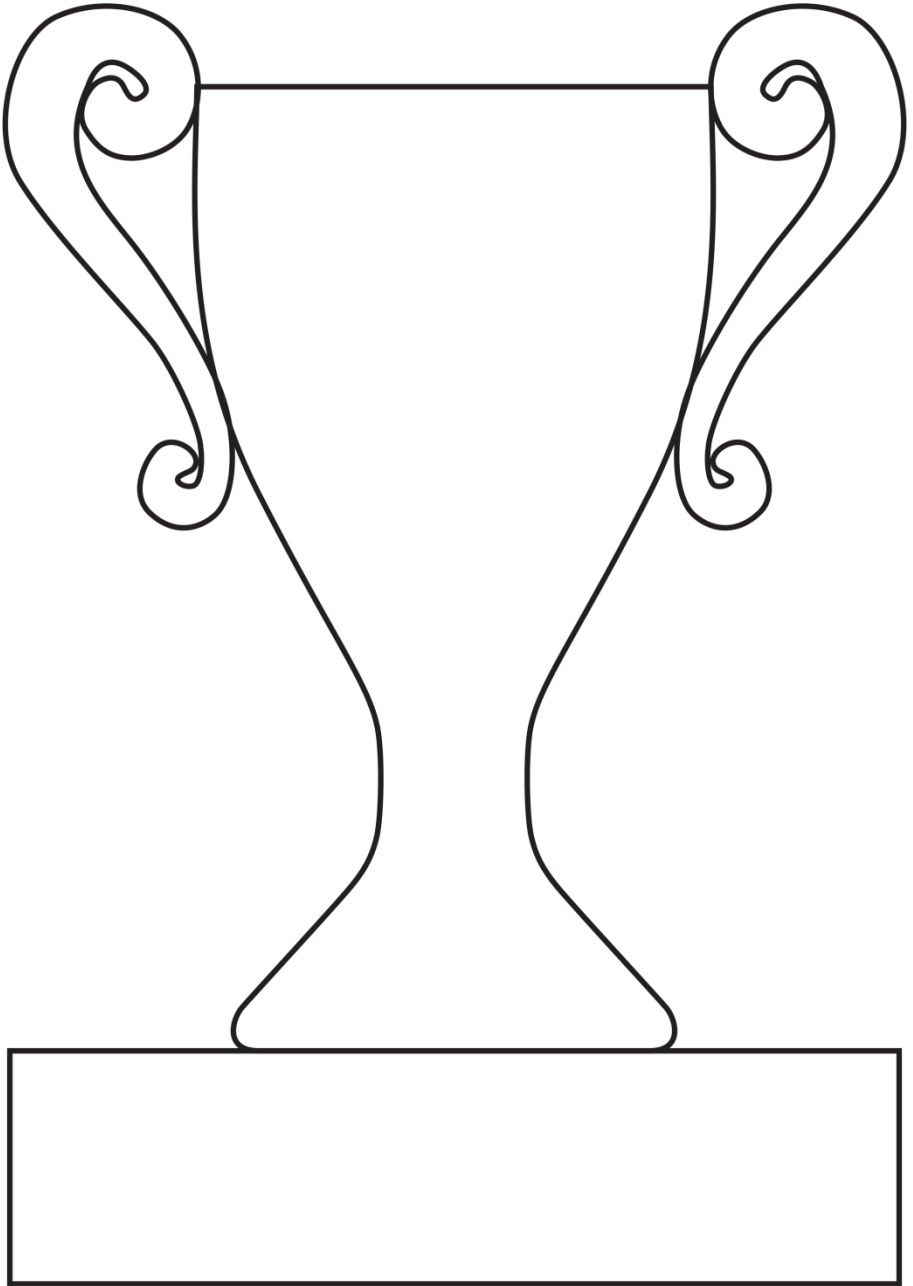
Pupils work in pairs on the design challenge to create a device for a farmer to sort small, medium and large apples. Each pair is only allowed to use a specific (mystery) bag of materials. The class plays the obstacle game just before the design activities start. The teacher divides the class in two.

The first team thinks of as many obstacles as possible while meanwhile the other team thinks of a variety of solutions. After this, the class is ready to play the game.

The first obstacle card drawn is “Working together is difficult. Your own idea always looks better than the idea of someone else”. The pupils from the “solutions-team” check their cards for a matching card. They suggest “combine parts of the idea of one person with parts of the idea of another person” as a matching card. The pupils of the solutions-team earn one point. During the design activity, the pupils cooperate better and try to combine ideas.

Practical advice

- ◆ **Role model.** Provide a few examples of problems and solutions that they have experienced or that might happen in the next activity to get the pupils started.
- ◆ **Collaborate.** When teams have no matching obstacle for a solution or the other way around, ask the two teams to think collectively to find a matching obstacle or solution.
- ◆ **Dialogue.** Stimulate dialogue. Ask pupils to give arguments for and against a certain solution. Respect all relevant solutions and let pupils try them in upcoming (design) activities. The proof of the pudding is in the eating.
- ◆ **Visible.** Display the combinations of obstacle and solutions cards in your classroom.
- ◆ **One skill.** Are your pupils experienced in playing the obstacle game? Ask them to think of obstacles and solutions related to one specific design skill or to specific design activities.



MAKE DESIGN LEARNING VISIBLE

