

FOSTERING CREATIVITY THROUGH DESIGN AND TECHNOLOGY EDUCATION

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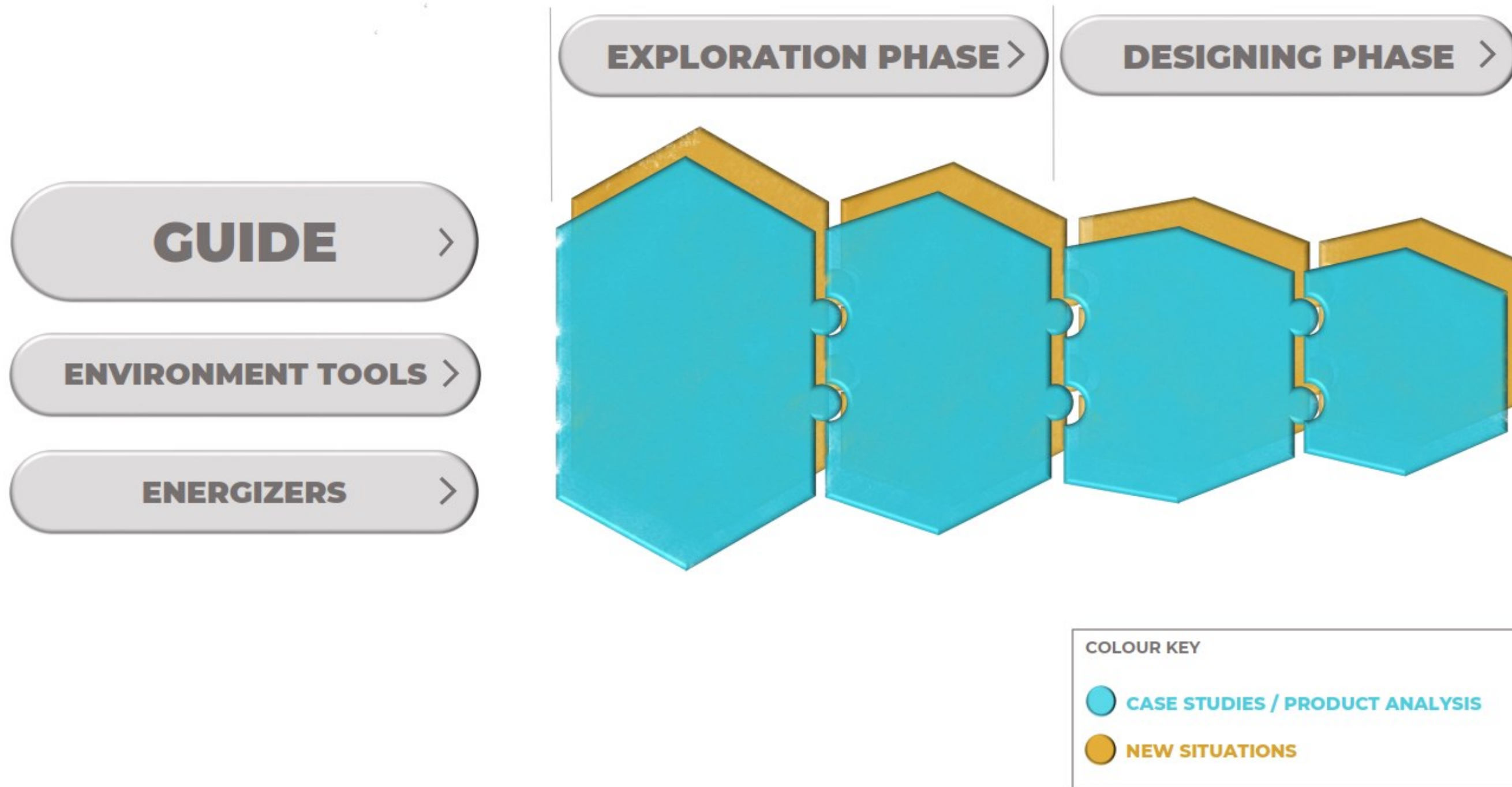
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Fostering Creativity Through Design and Technology Education





Creativity?

**Diverse Experiences of
Design and Technology
Education for a Contemporary
and Pluralist Society**

Contemporary Societies

Change

**MOSTLY DRIVEN BY
TECHNOLOGICAL
ADVANCEMENTS**

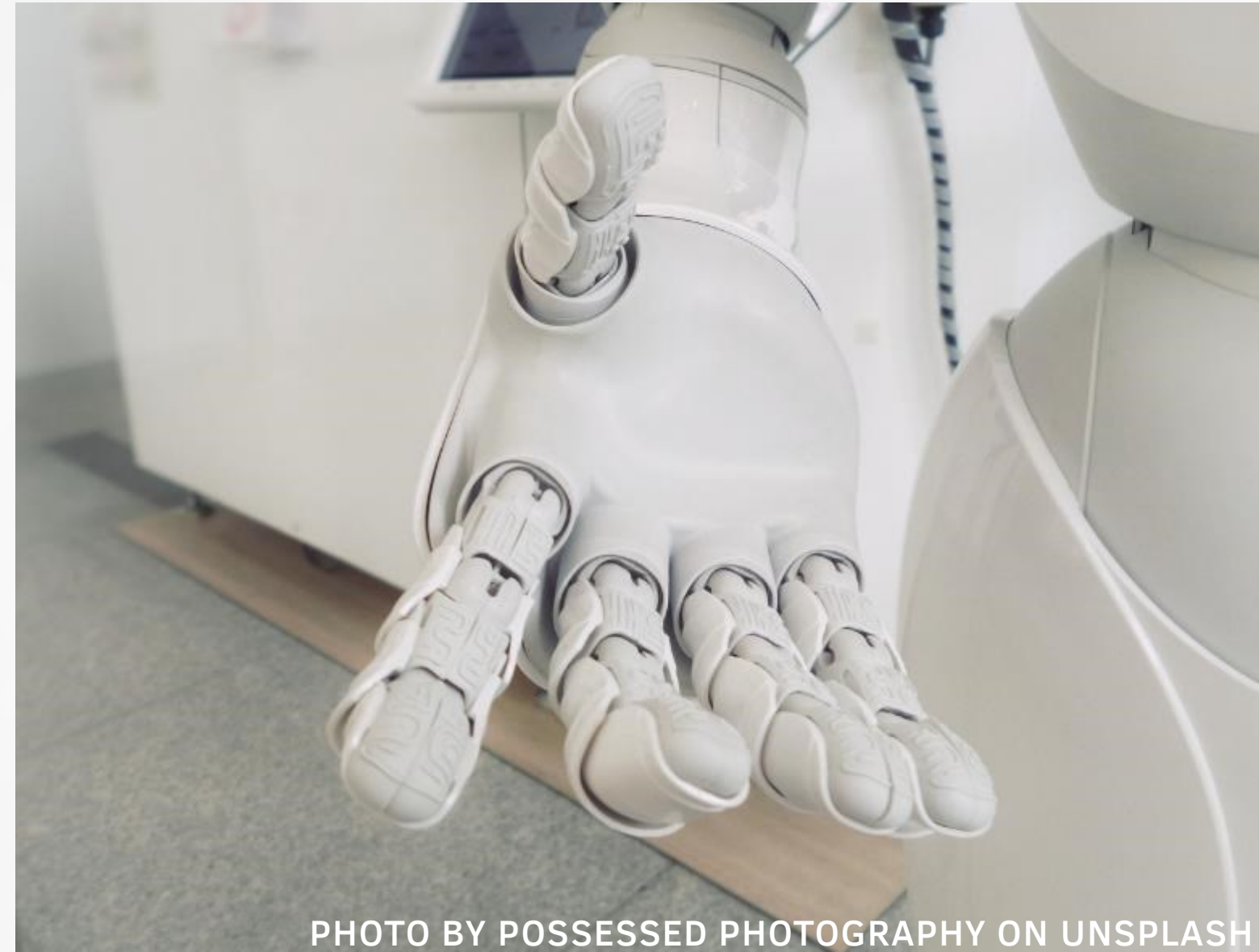


PHOTO BY POSSESSED PHOTOGRAPHY ON UNSPLASH

Contemporary Societies



PHOTO BY KELLY SIKKEMA ON UNSPLASH

Challenges

RECURRING FROM
THE PAST

Creativity

Active citizens who understand that diversity of ideas is not a threat but an opportunity

Pro-actively manage and direct change to address the challenges



Toolkit?



Toolkit?

TRADITIONAL SCHOOLING

“Problem-posing education bases itself on creativity and stimulates true reflection and action upon reality” (Friere, 1993)

“I believe this passionately, that we don't grow into creativity, we grow out of it. Or rather, we get educated out of it.” (Robinson, 2006)

Toolkit?

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TEACHERS' DILEMMA

“With the current emphasis on accountability, educators simply do not have the time to invest in curriculum that may not pay off.” (Runco, 2014)

Objectives

01

Define the Scope that Can and Should be covered by a Toolkit

02

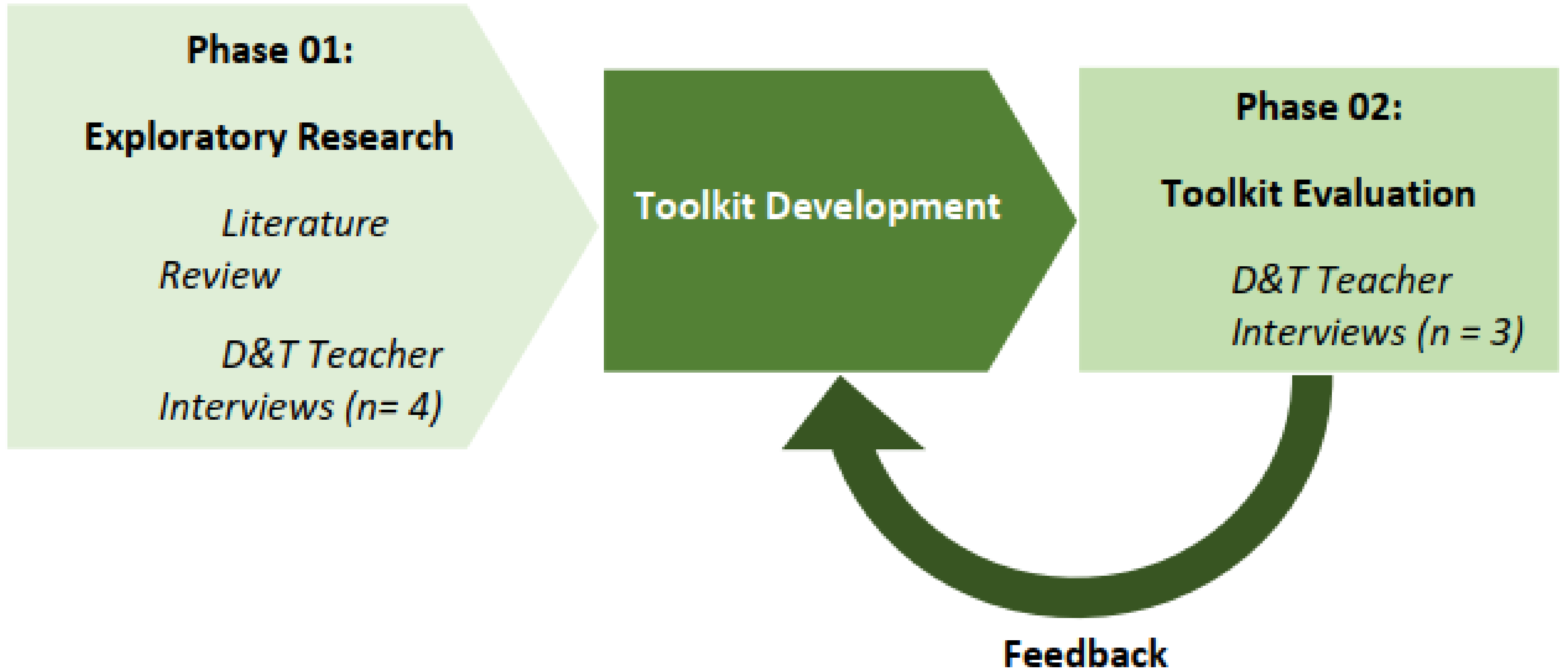
Identify Factors that help or hinder Creativity in the Design and Technology Classroom

03

Develop a solution that addresses the main research question:

How can Design and Technology Teachers make their lessons more conducive to creativity?

Methodology



Defining Creativity & its Links to D&T

- **It has an 'elusive definition'**

(NACCCE, 1999)

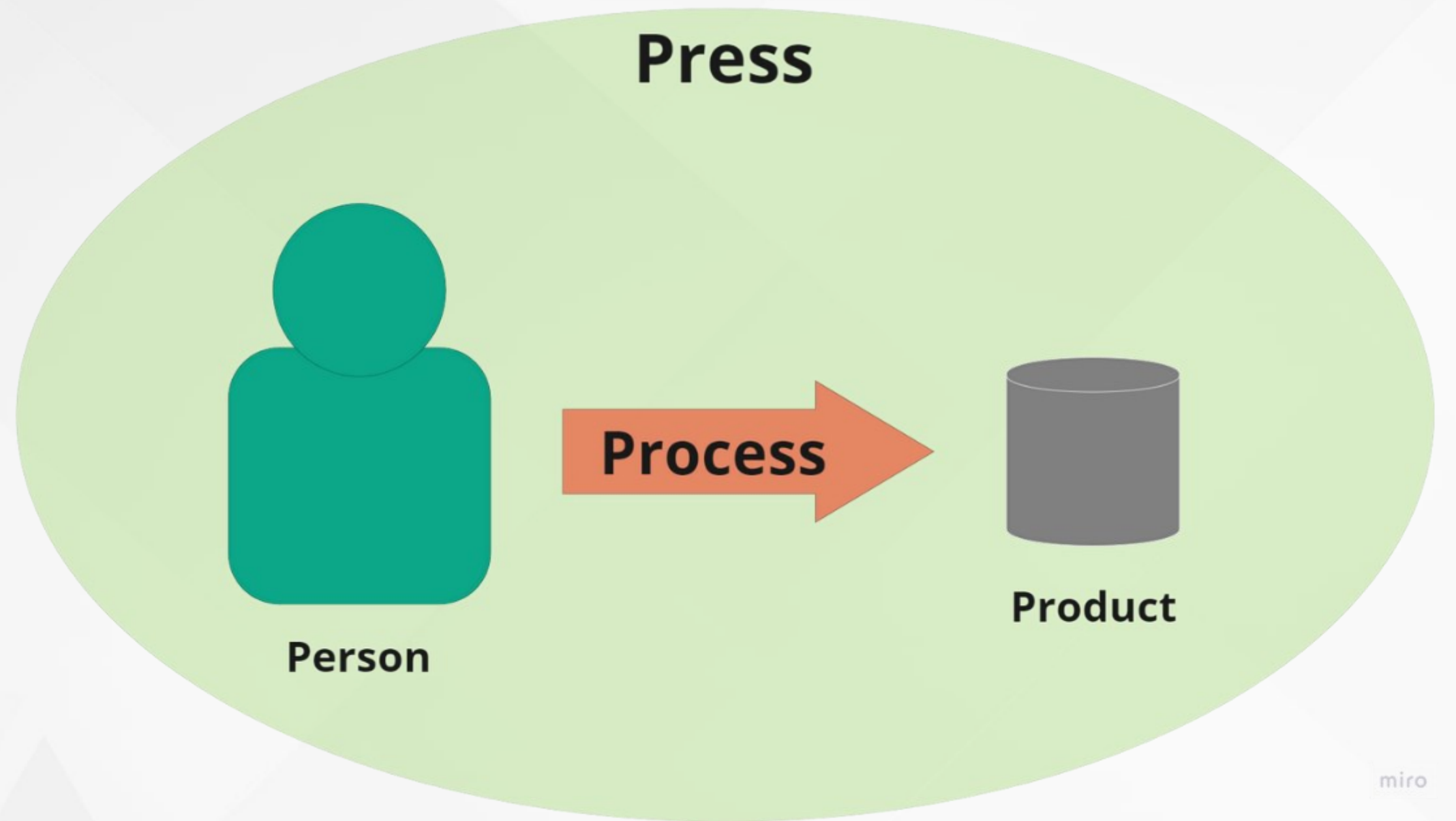
- **"...fuzzy at the edges.."**

(Fisher, 2004)



The Four P's of Creativity

(Rhodes, 1961)



(Adapted from Hyun-Kyung & Soojin, 2015, Figure 1)

Process



ANALYSIS → GENERATION → EVALUATION

Process

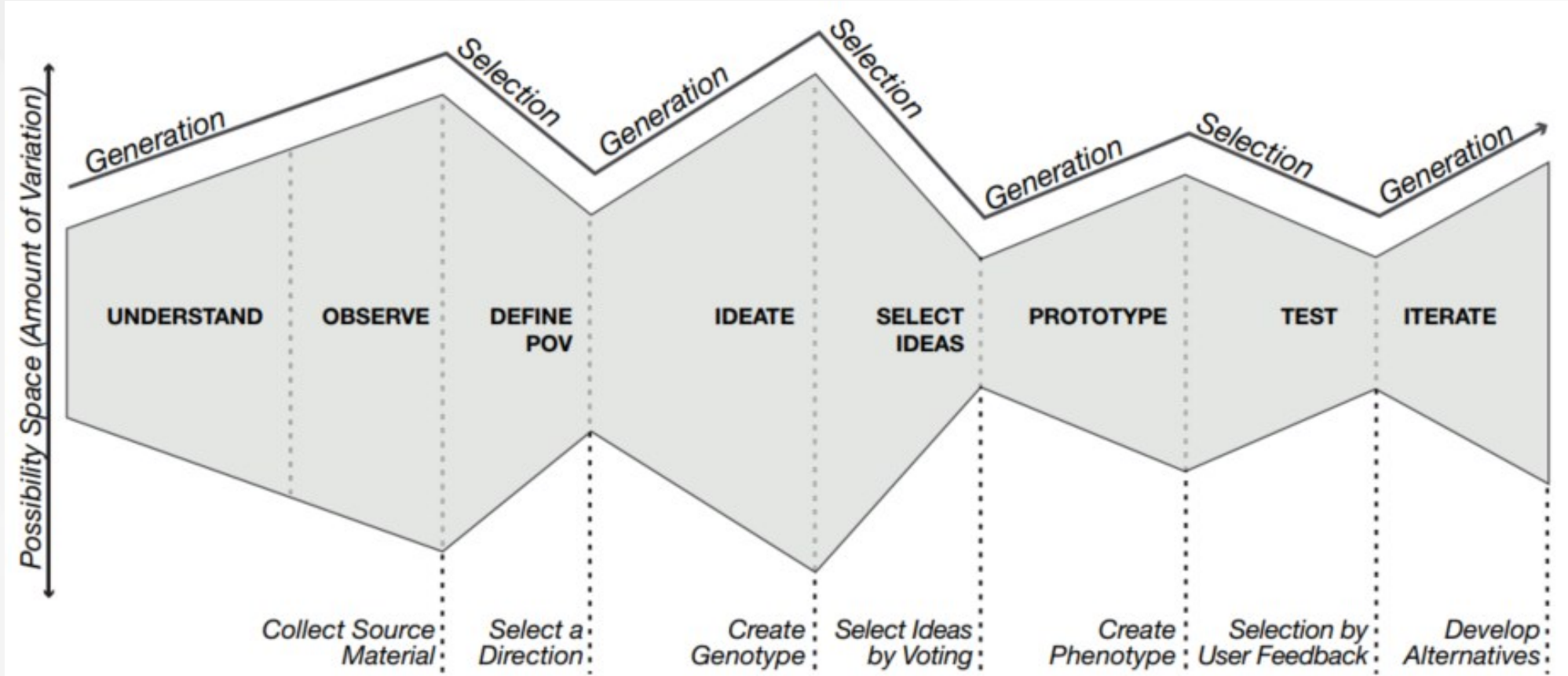


Figure 5: Alternation of generating and selecting in the design thinking process.

Process

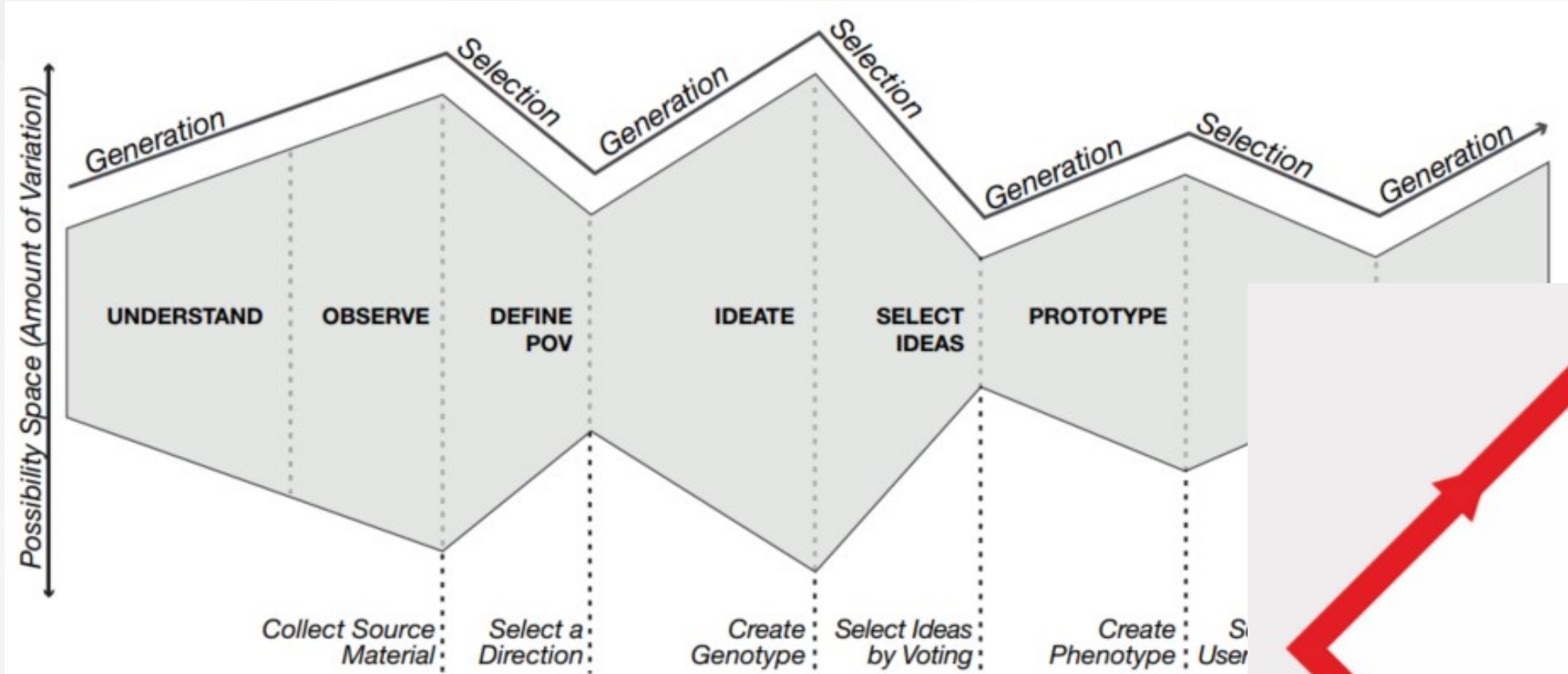
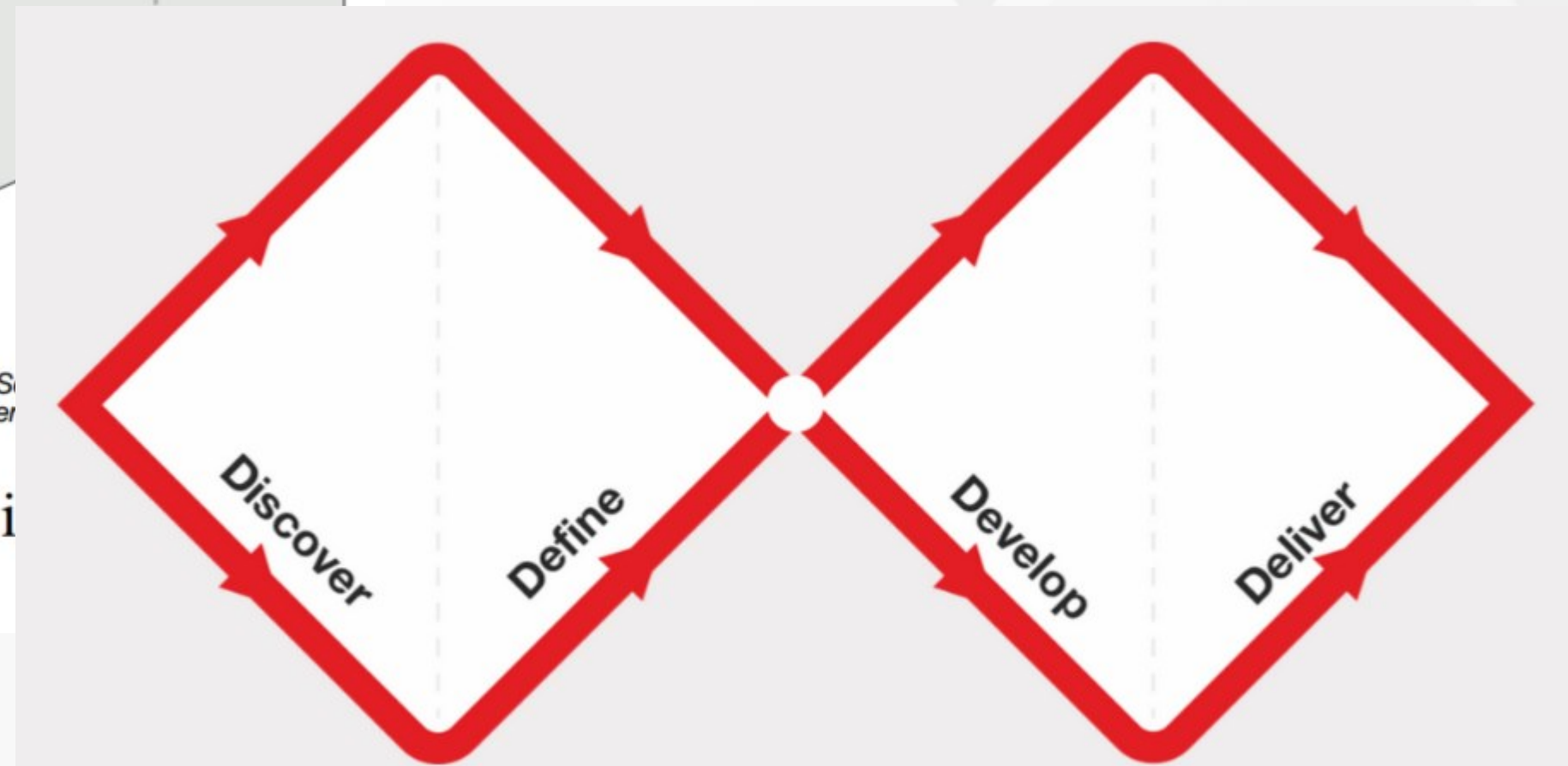


Figure 5: Alternation of generating and selecting in the thinking process.



The Double Diamond by [the Design Council](#) is licensed under a [CC BY 4.0 license](#).

Process

A relation has been found between general process knowledge and creativity

(Christiaans & Venselaar, 2005)

Product



Product

Diverse, Unique and Appropriate, Relevant, of Value

(Amabile, 1983; Cropley, D. & Cropley, 2010; Denson et al., 2015; Robinson, 2017)

Press

society

culture

history



Press

The instrument of children's creativity in design & technology is the designing and making assignment (DMA)

(Barlex, 2004)

Person

Personal
Attributes

and

Qualities



Person

Tolerance to:

Risk

Mistakes

Ambiguity

Creative

confidence



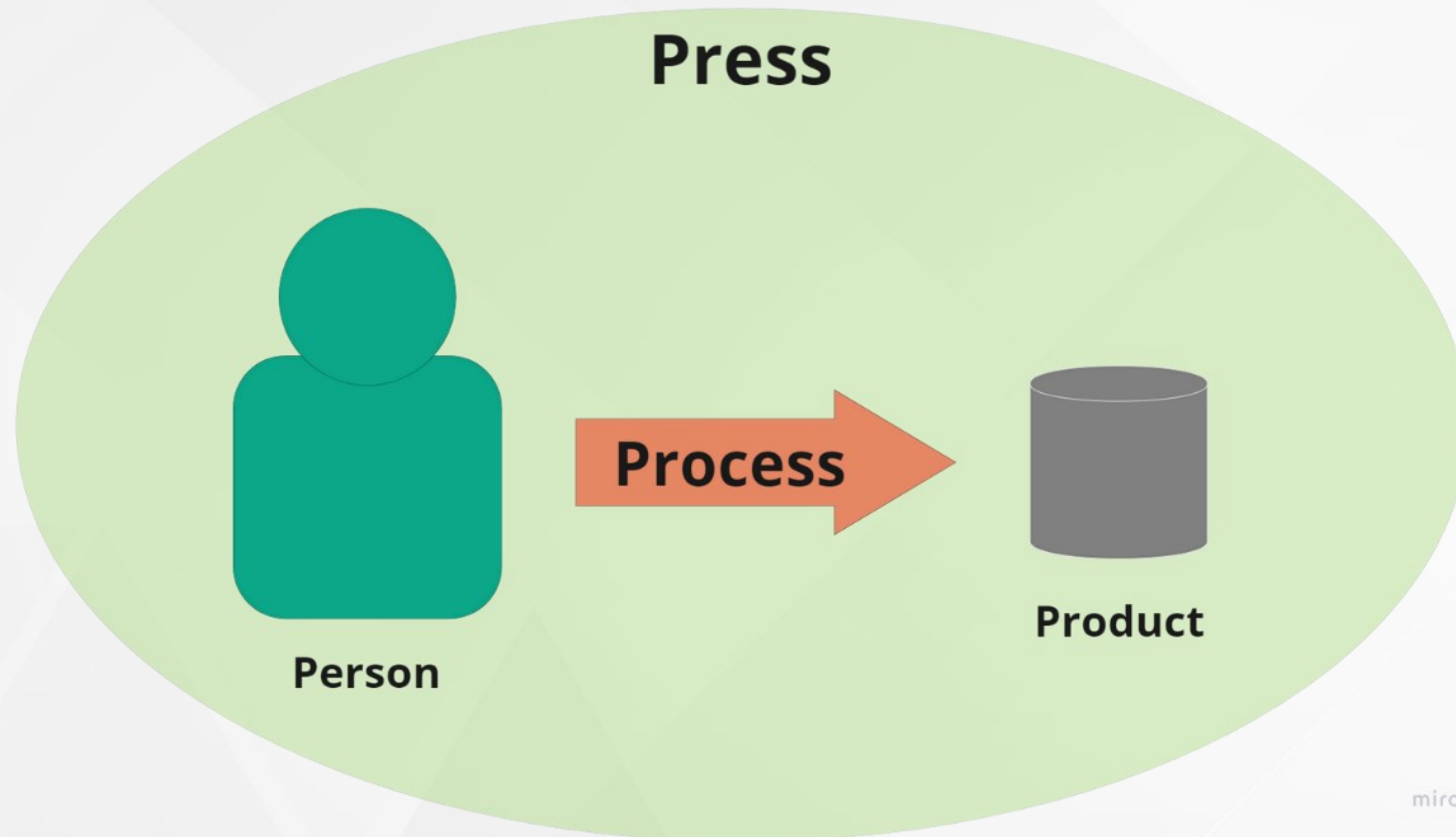
Links to the Findings

Focus on the Product

Links between Creativity & D&T not explicit



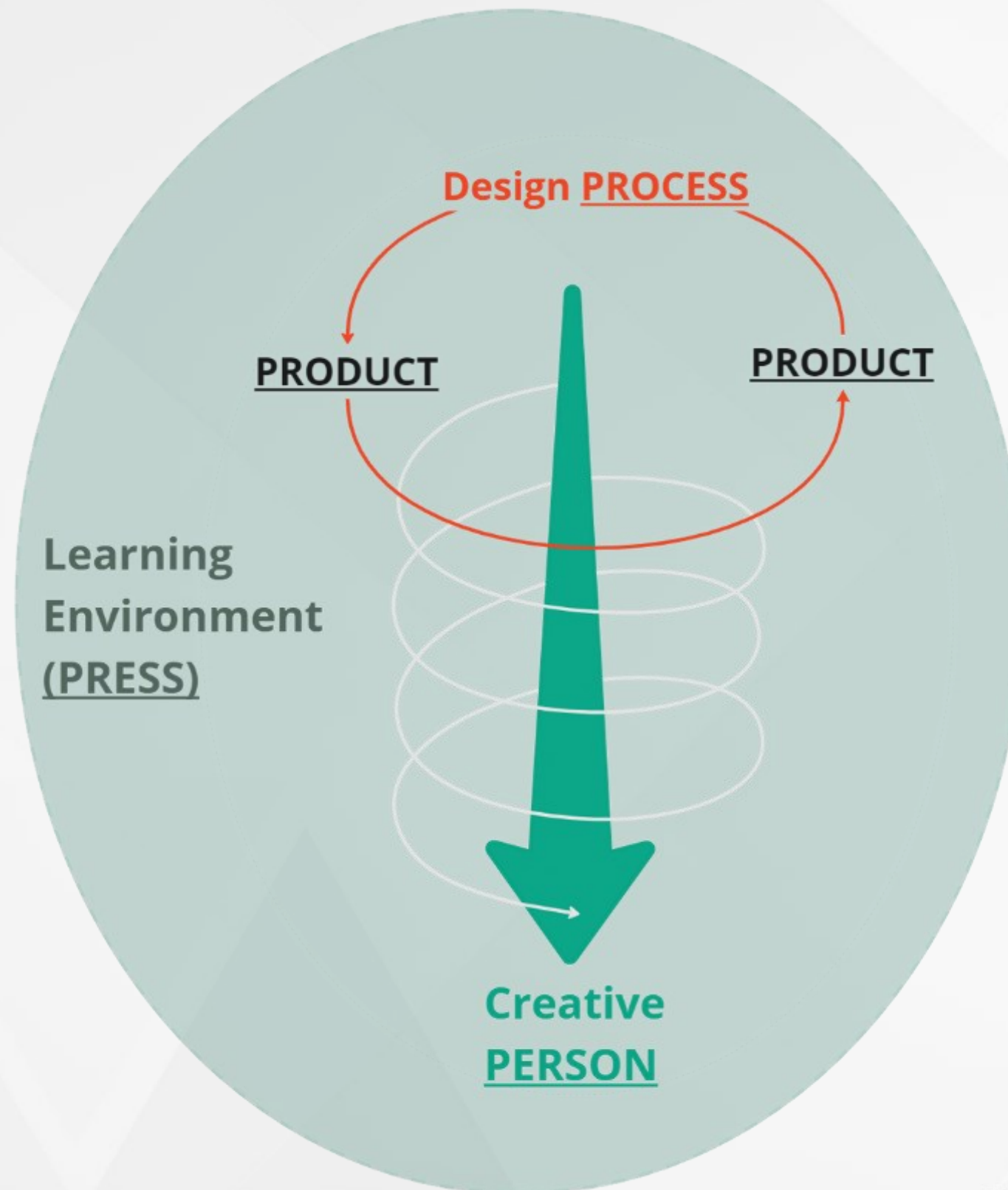
Underlying Philosophy

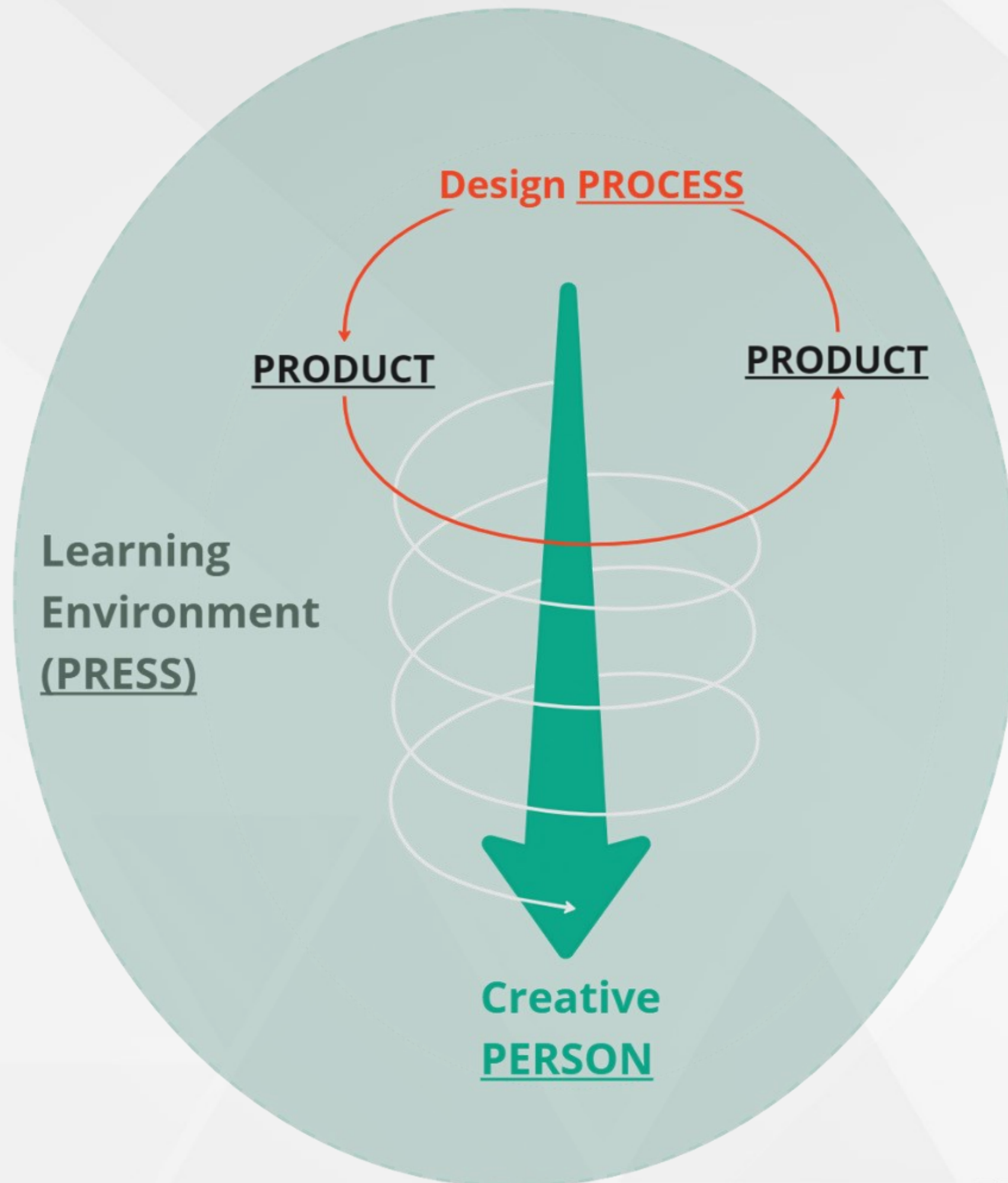


miro

(Adapted from Hyun-Kyung & Soojin, 2015, Figure 1)

Underlying Philosophy





Underlying Philosophy

01

The Design Process at the Backbone

02

Frequent practice through the use of the Spiral Curriculum concept

03

Each iteration produces creative products, the long term aim is the fostering of Creative Persons

Factors Affecting Creativity

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Barrier

Inability or Lack of Confidence for students to express themselves

Related to findings discussed by Barlex (2007)

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Creativity Fixation / Design Fixation

A factor highlighted by Barlex (2004) and Cross (2006)

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Facilitator

An opportunity of Sensory interaction with their ideas - (eg: 3D imaging / simulators)

Mirrors benefits of modelling and prototyping (Pahl et al, 2007)

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Facilitator

A learning environment and Classroom Climate that promote:

Freedom, enthusiasm, fun, and where students feel safe and confident to express ideas.

How do these reflect in the design of the Toolkit?

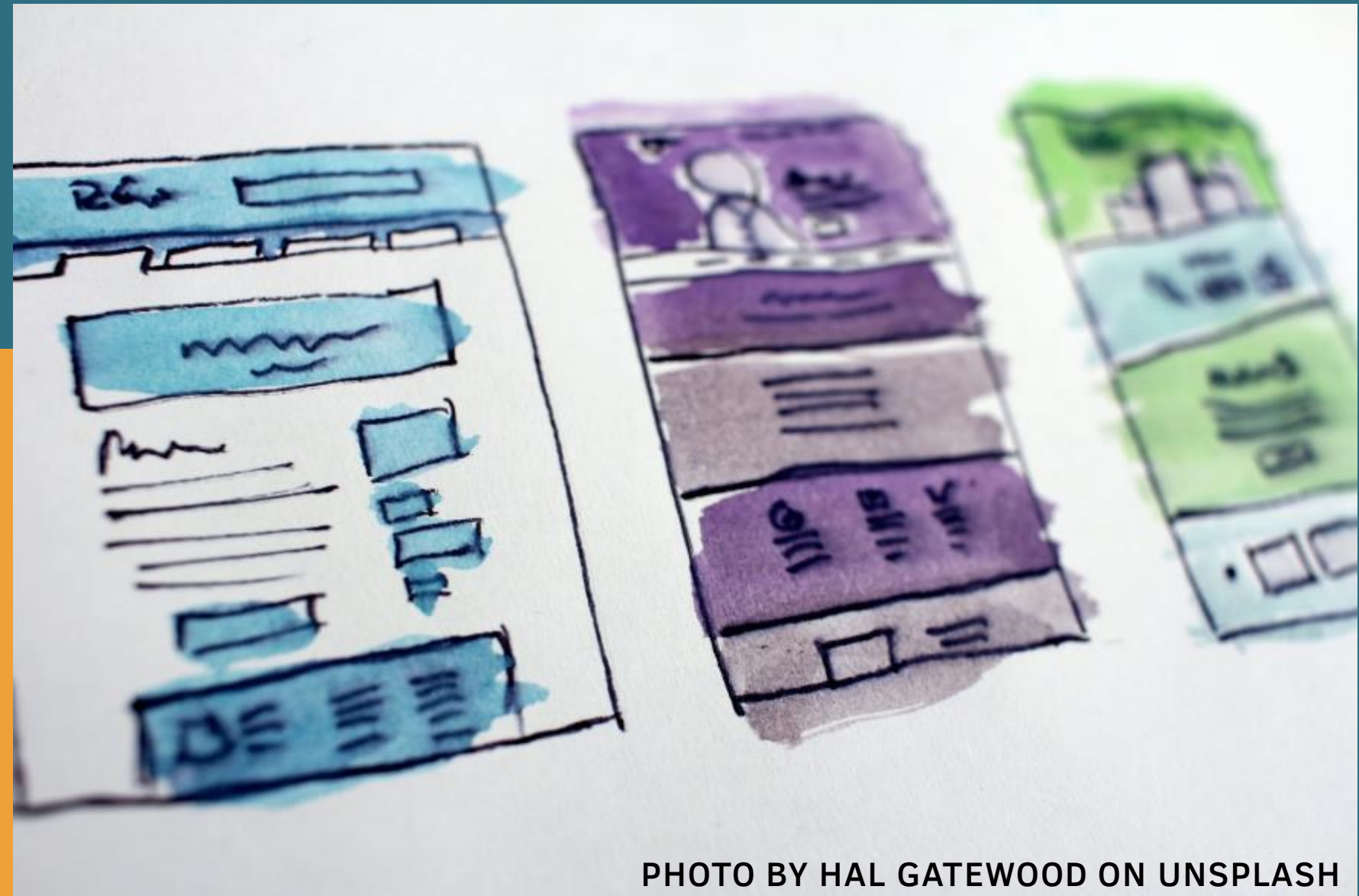


PHOTO BY HAL GATEWOOD ON UNSPLASH

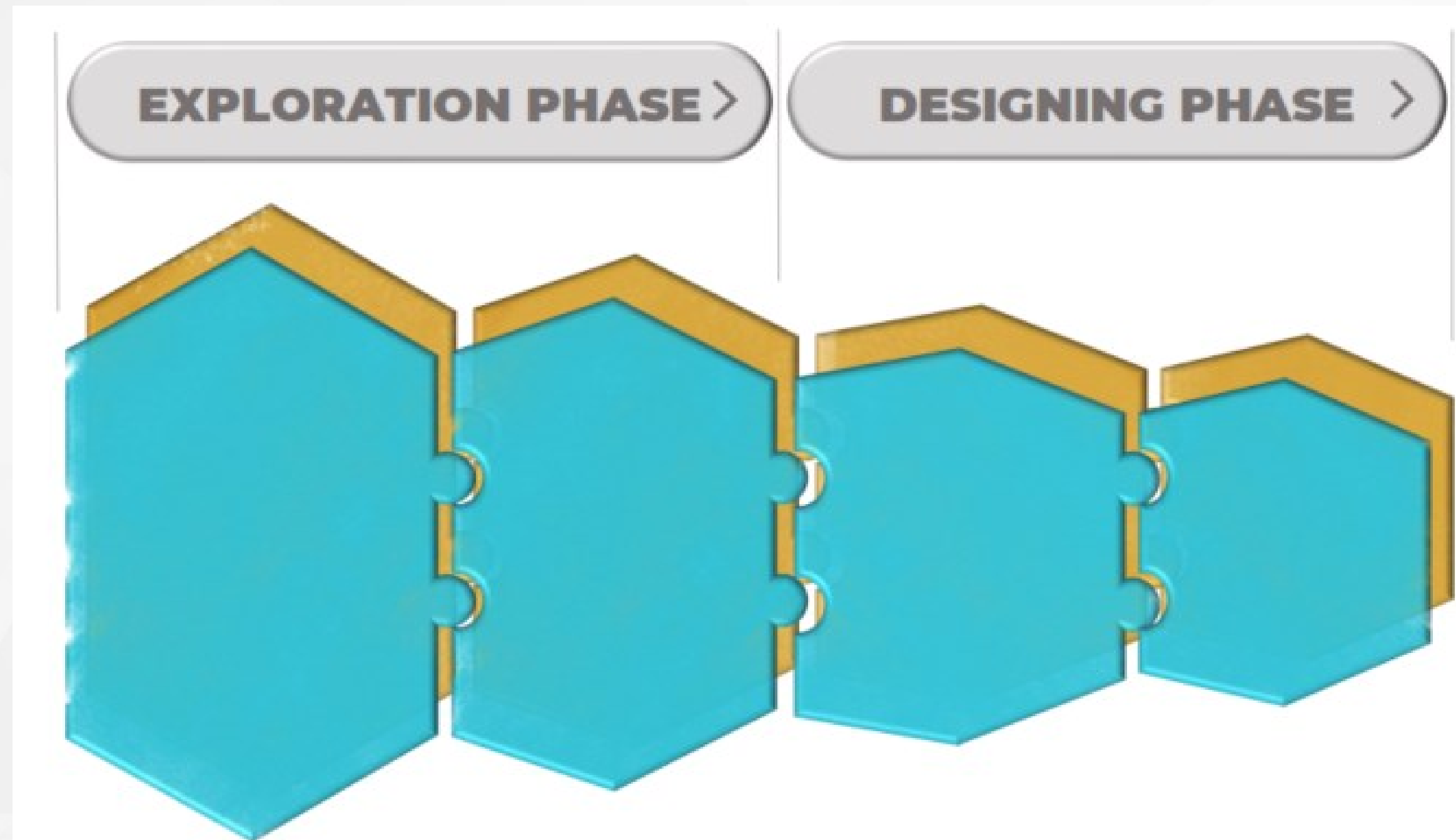
Design Process

Exploring

Designing

Making

Evaluating



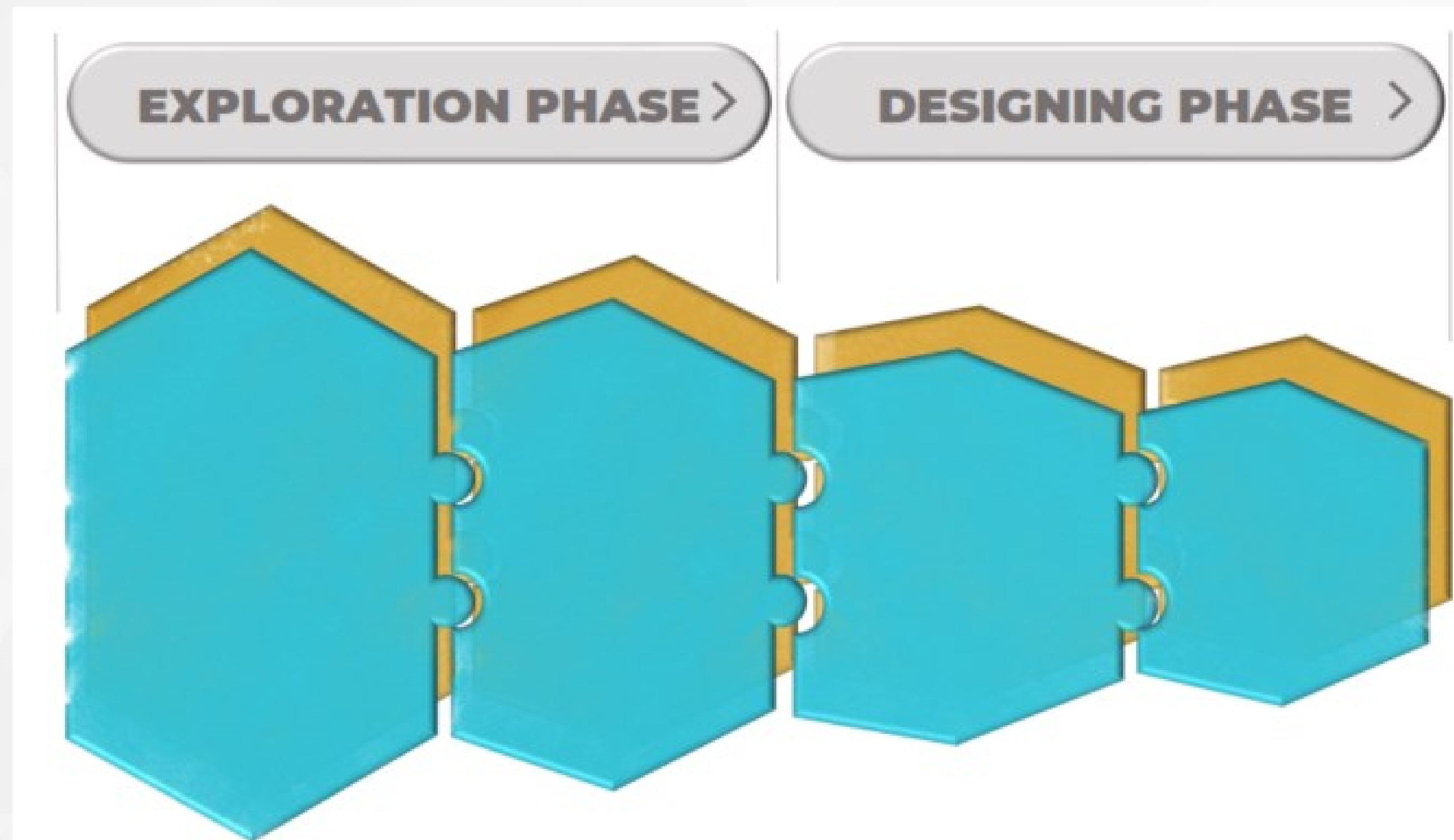
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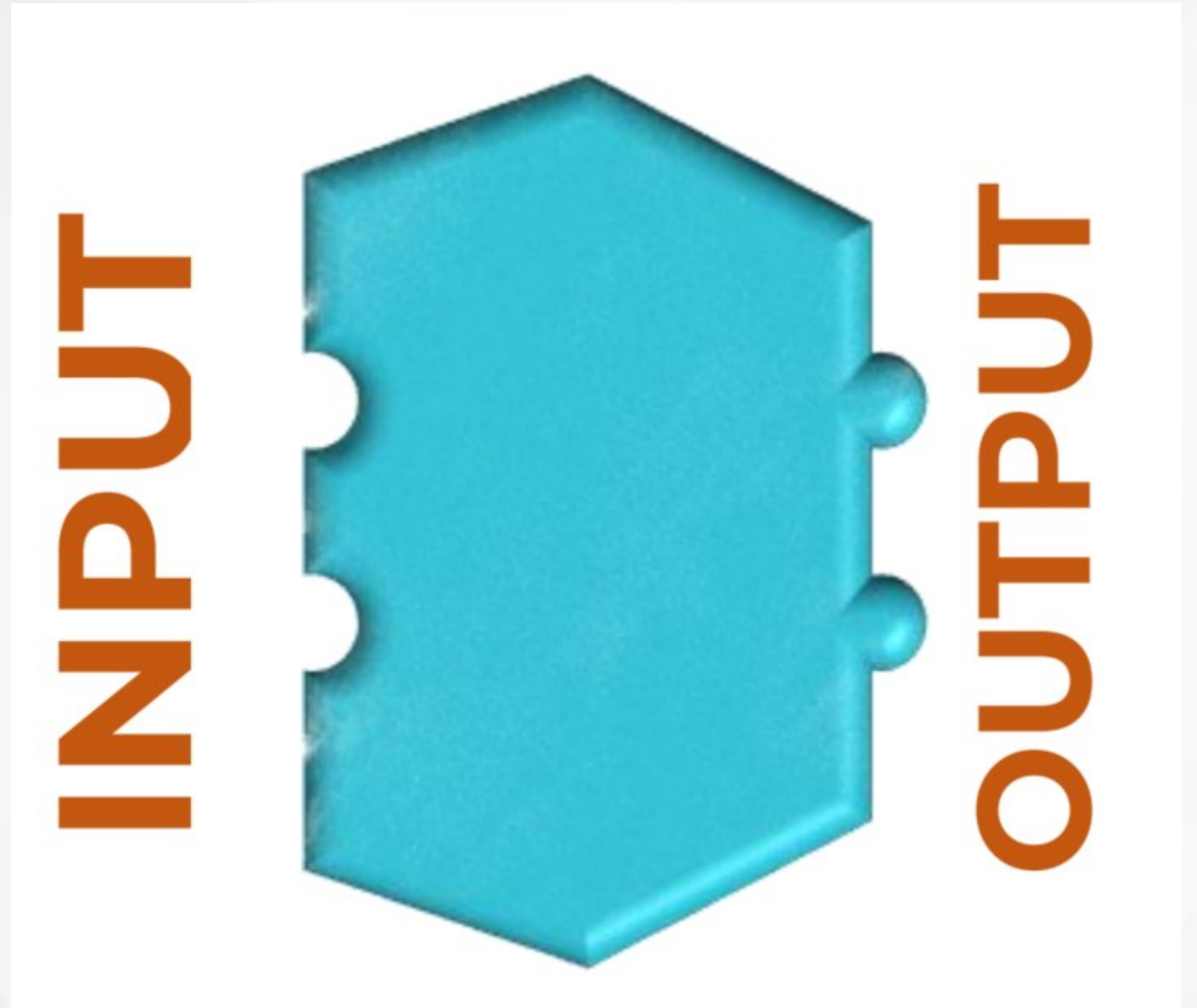
Evaluating



Plug-in Modules

The smallest units in the
process

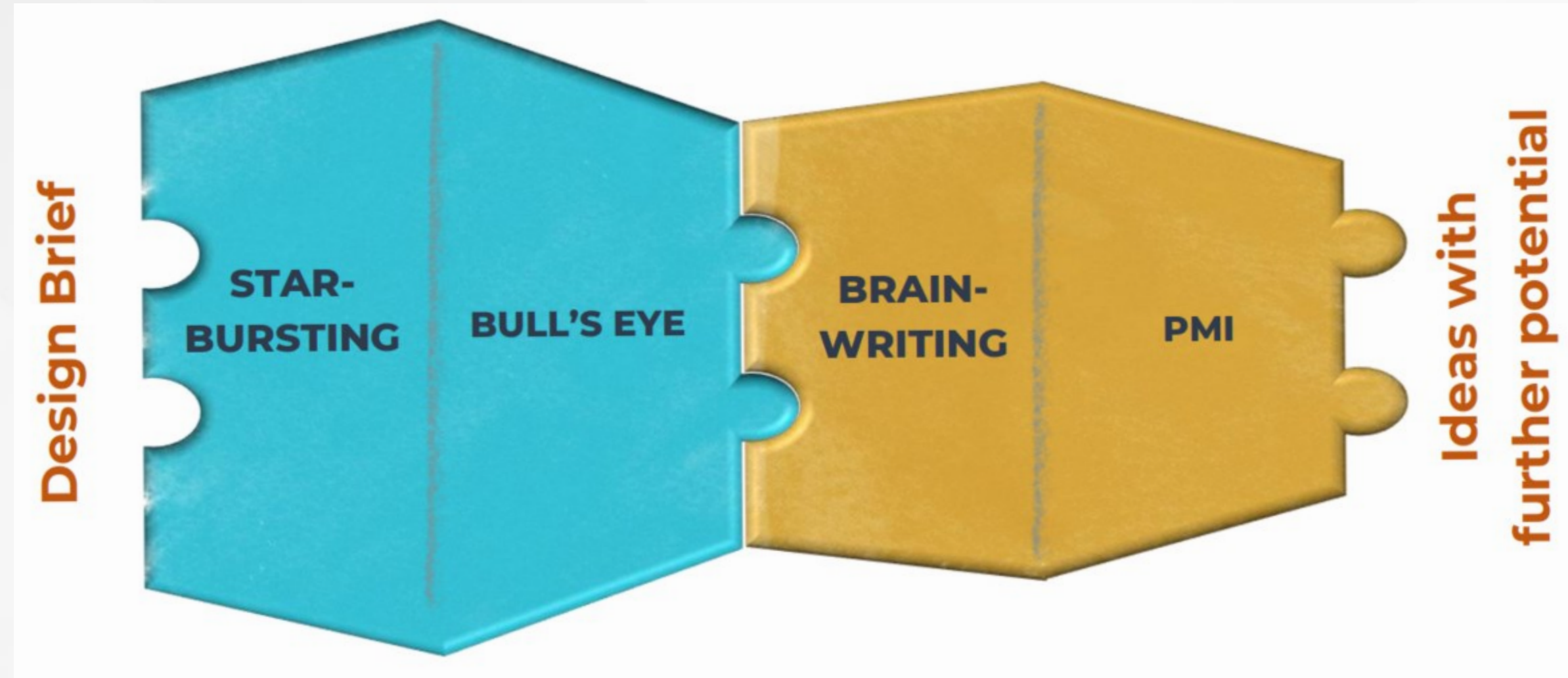
Aids flexibility and
Decision-making



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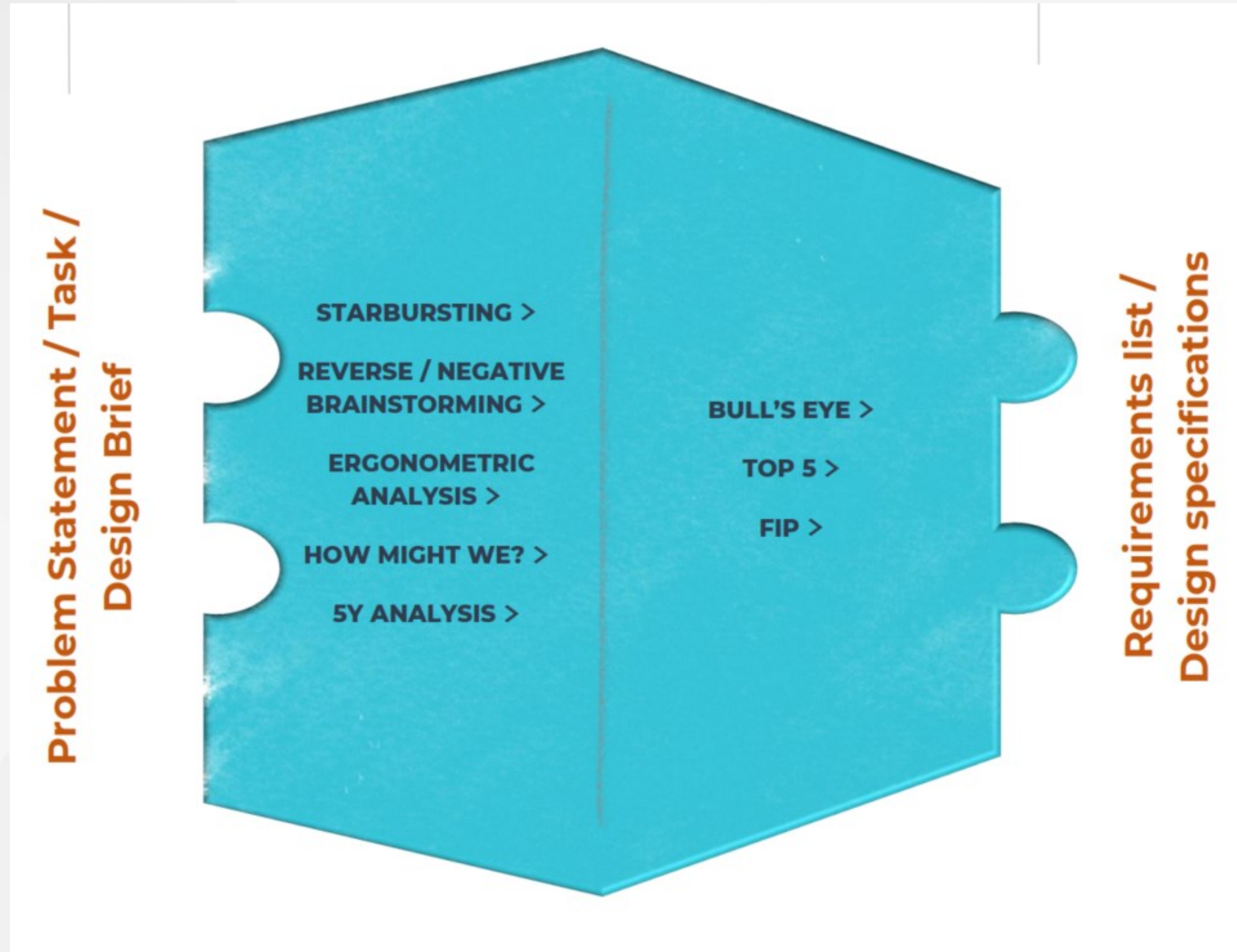
Aids flexibility and
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Tool Organisation

Specific Design and
Creativity tools

Purposefully sorted
within the modules
(Phase/divergent/
convergent....)



Colour Coding

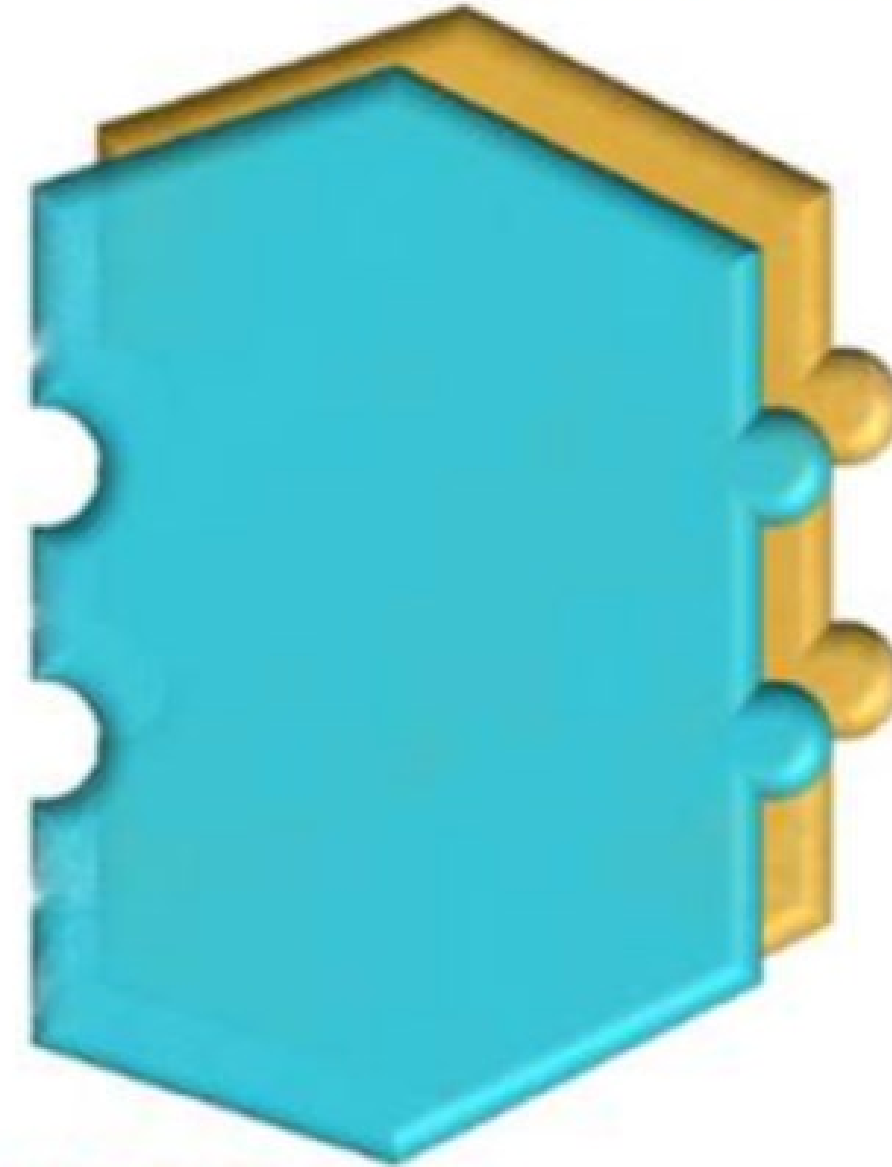
For Scaffolding
purposes

Open ended Scenarios

vs

Product analysis / case
studies

NEW SITUATIONS



**CASE STUDIES
/ PRODUCT
ANALYSIS**

Tools with specific intent

Aesthetic and Functional
expression and
manipulation of ideas

Parallel prototyping

Individual or Cooperative

Parallel prototyping is the process of considering a range of potential design ideas simultaneously before selecting and refining one specific design approach. This is done by quickly creating a range of low-fidelity prototypes which are then evaluated.

The benefits are that designers engage with their ideas, by experimenting and investigating a wide range of opportunities. It is also a good method to keep designers from fixating on an idea too early

Discover Further:

Hanington, B., & Martin, B. (2019). *Universal Methods of Design: 125 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions*. Rockport Publishers.

Tools with specific intent

Aesthetic and Functional
expression and
manipulation of ideas

Parallel

P

Flexible Modelling

Individual or Cooperative

This tool makes use of modelling tools such as [Velcro Modelling](#) allowing users to configure a product using a set of predetermined features. This way users communicate directly through the construction and presentation of the product to express their needs.

This is particularly useful when a basic concept is set but there are various options with regards to arrangement and fine details. This tool can be combined with other tools to help in the evaluation and selection of ideas

Discover Further:

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Tools with specific intent

Aesthetic and Functional expression and manipulation of ideas

Parallel

P

Flexible Modelling

Modelling foam/Floral foam (oasis)/Foam core



Source: (Hallgrimsson, 2012)

Tools with specific intent

Aesthetic and Functional
expression and
manipulation of ideas

Parallel

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Modelling foam/Floral foam (oasis)/Foam core

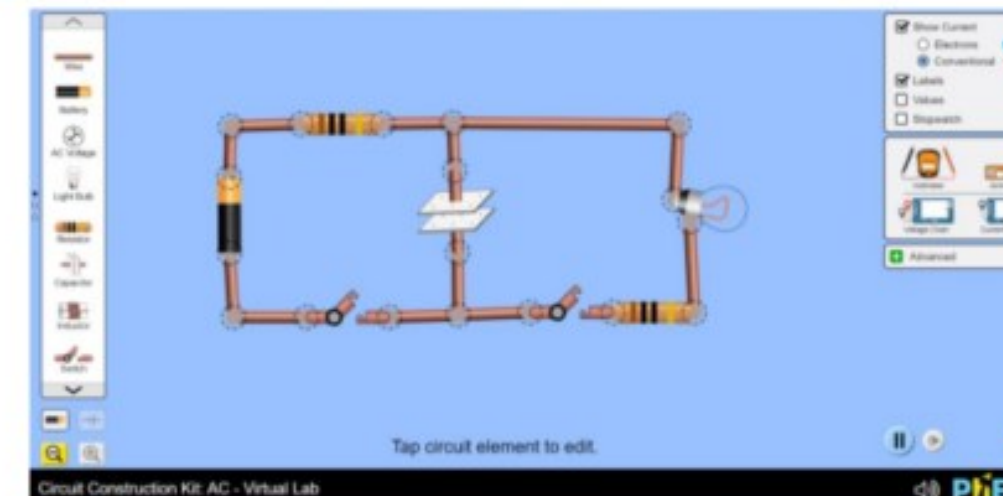
Source

Virtual simulations

This is another method for students to quickly visualize and interact with their ideas.

Electrical

PHET interactive simulations, Physics simulators -
<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>



Tools with specific intent

Short-term (energisers) and long-term creation of a learning environment that support creativity

Uses for a paper clip



Individual or Cooperative

This is a brainstorming exercise in practice, which can be used on its own as an energizer. Besides that it can be useful to set the tone for the lesson to come, it can also be helpful to introduce the brainstorming rules in a game-based setup in preparation for brainstorming during other tasks.

It can also be beneficial to allow students to lead the brainstorming session themselves to help them learn the rules, while giving the teacher the possibility to observe the dynamics in the class.

Method:

- Introduce the energizer by posing the question: "How many uses for a paper clip?"
- Ideas can be written on the whiteboard.
- If ideas seem to dry up, use mind maps/concept maps/ word webs for further association
- Help students to generalize using their own responses – E.g.: if someone says, "it can be used as a nose ring", it can be generalized as: Paper clip as jewellery, and suggest "How else could it be used as jewellery?"
- Encourage humour – for example adding a ridiculous response into the melting pot.
- Use other point of views – example – what would [batman] use it for?
- Consider adding other tools – example: SCAMPER.
- Have fun!

Discover Further:

Bowkett, S. (2007). *100+ ideas for teaching creativity* (2nd ed.). Continuum New York.

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Paper tower



Click on the video to watch it

Cooperative

This activity is aimed at promoting creativity and idea generation skills.

Method:

The class is divided into groups of 6 or 7 learners. Each group is given an A4 sheet of paper.

In 5 minutes, each team has to build a free-standing tower using only the members' sheets of paper. No other materials are allowed to build the tower.

After the 5 minutes are over, the students can be invited to engage in self or peer evaluation techniques by discussing how they planned their tower and what could have been done differently next time.

Discover Further:

Baldacchino, L., & Pulis Xerxen, S. (2013). *Fostering entrepreneurship through education: a handbook*. St. Nicholas College.,

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Cooperative



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Quick Feedback

When students have achieved desired outcomes, telling them quickly that they've done it, powers the...
If a student has not achieved the expected outcome, quick feedback allows for change in the right direction.
Refer to 'Use of language'...there is a difference between "look that's wrong" and "Notice what happened and how it improved"

Sincere Praise

An overly corrective approach focuses on the negative. Giving sincere praise is a recognition of the positive. Be honest, such that the student realises the link between the praise and the achievement that has earned it. **and tell them about it"**

The principle of utilization

This principle asks us to take whatever the students bring into the classroom and utilize it positively. It's not always easy work, and sometimes impossible. But when achieved it pays off.

Tools with specific intent

Tools that counter for Design Fixation

Reverse Brainstorming / Negative Brainstorming / The Anti-problem



Click on the video to watch it

Individual or Cooperative

Combines traditional brainstorming approach with 'reversal' methods.

Can be used to further discover a defined problem. Can also be used to help people get unstuck and running out of ideas for solutions.

Helps evaluation of a problem differently and breaking out of existing patterns.

Steps:

Having identified a problem, participants focus on, and aim to generate ideas of all possible ways to CREATE that problem or how to make it worse.

Ask the question:

"How could I possibly cause the problem?"

The rules for [brainstorming](#) apply

This would lay the foundations for further brainstorming to generate solutions for the problem by tackling each possibility generated in the reverse-brainstorming session.

Tools with specific intent

Tools that counter for Design Fixation

Reverse Brainstorming / Negative Brainstorming / The



Click on the vic

Dark Horse



Source: www.vecteezy.com

Individual or Cooperative

Combines traditional brainstorming approach with 'reversal' methods.

Can be used to further discover a defined problem. Can

Individual or Cooperative

In a horse-racing scenario, a dark horse is the one that has the least likely odds to win, but which ultimately may have the greatest chance of reward.

In the case of design it is a prototype built to explore a previously rejected idea.

This tool can be useful to counter for design fixation or evasion.

Discover further:

Carleton, T., & Cockayne, W. (2009). The power of prototyping in foresight engineering. Paper presented at the DS 58-6 Proceedings of ICED 09, the 17th International Conference on Engineering Design, Palo Alto, CA, USA.

Teachers' idea of having a toolkit

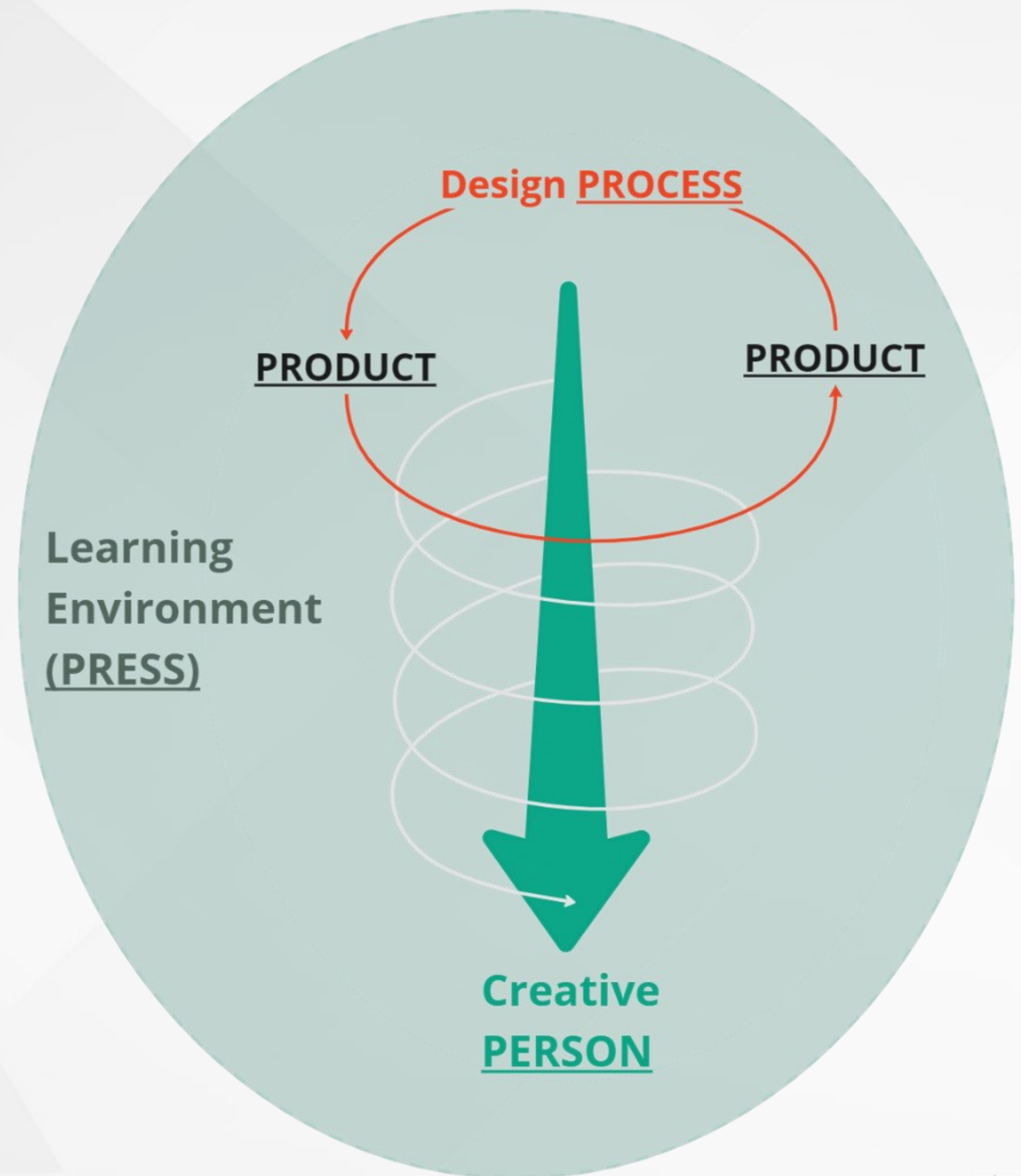
Teachers welcome the idea of having a toolkit

BUT

They do not want it to restrict their autonomy

Toolkit with 3 layers

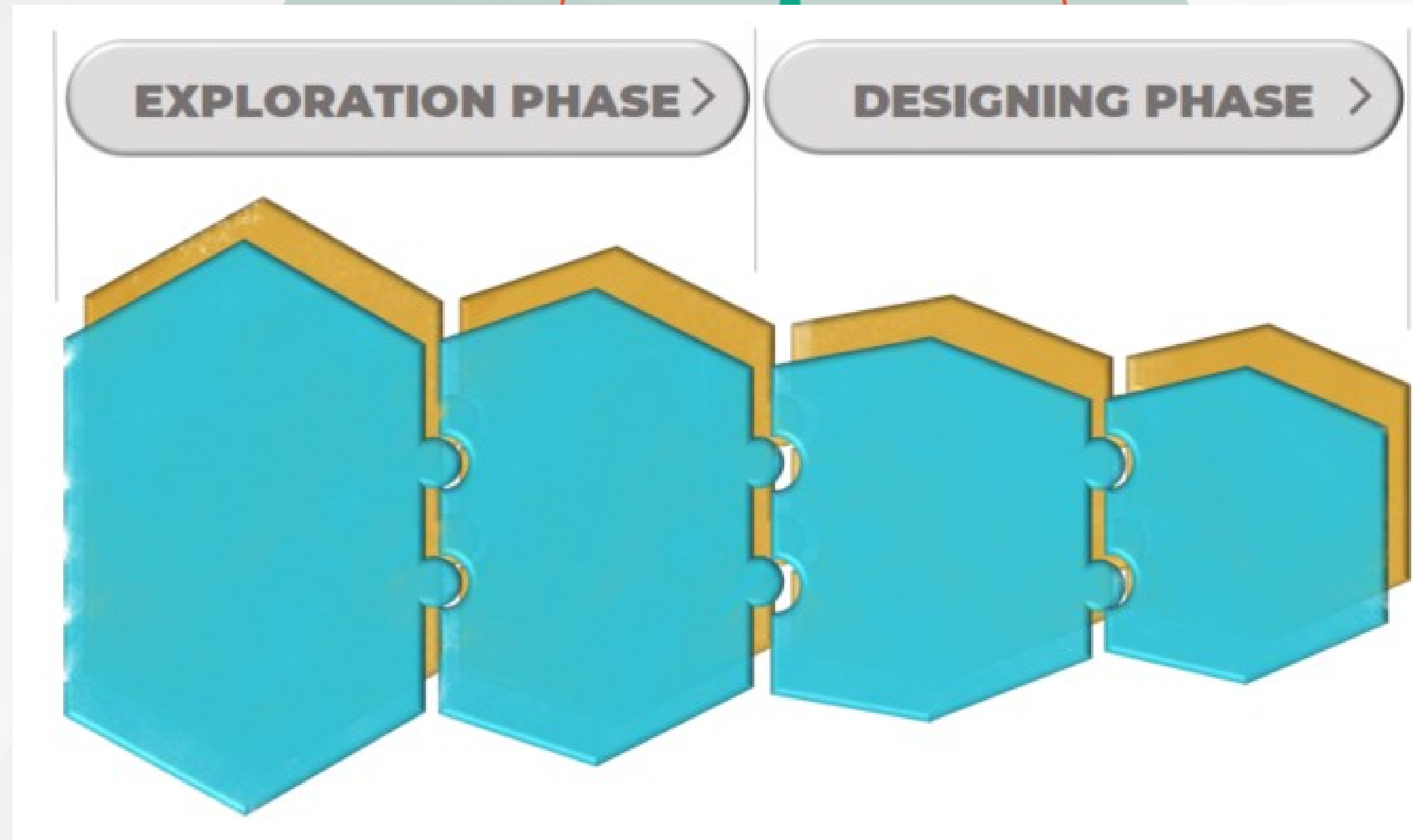
The underlying philosophy



Toolkit with 3 layers

The underlying philosophy

The organisation of the design process



Toolkit with 3 layers

The underlying philosophy

The organisation of the design process

A library of tools

Reverse Brainstorming / Negative Brainstorming / The Anti-problem



Click on the video to watch it

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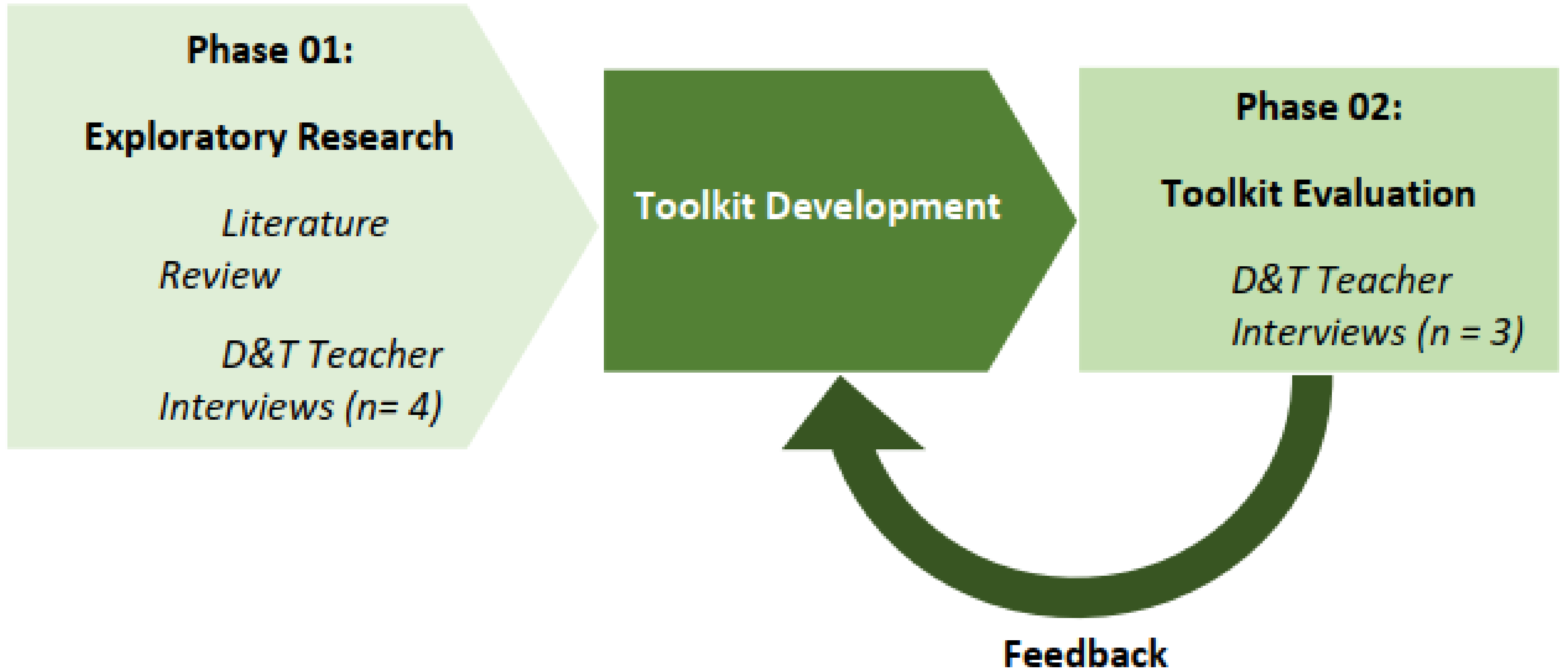
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Methodology



Toolkit Evaluation

Facilitates research and exploration by students

Addresses Design Fixation

Helps students think deeper about the design process



Toolkit Evaluation

Concerned with Time:

To learn to use the toolkit

To fit the toolkit with delivering the content
of the syllabus

Layout



Future Possibilities

Improvements on graphical communication elements

Developed on more interactive and accessible platforms

Cooperative Space for the D&T teachers community



Conclusion

The Value of Design and Technology in Education:

The answer to bridge the gap between traditional schooling and Creativity



**THANK
YOU**

