

SCIENCE OF LEARNING

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Creativity and the Learning Trajectory

Dr Jared Cooney Horvath

Do Schools *REALLY* Kill Creativity?



OECD

*Transformative
Competencies for 2030*

*“Education must focus on
developing competencies...
[such as] creative and
critical thinking.”*



**Organisation of Economic
Co-Operation and Development**

OECD

Teaching & Assessing Creative & Critical Thinking

*“...it is not clear how
creativity and critical
thinking can be visibly and
tangibly articulated by
teachers or students.”*

[OECD Home](#) > [Education](#) > [Centre for Educational Research and Innovation - CERl](#) > Teaching, assessing and learning creative and critical thinking skills in primary and secondary education

Teaching, assessing and learning creative and critical thinking skills in primary and secondary education



Project Motivation

There is a growing consensus that formal education should cultivate the creativity and critical thinking skills of students to help them succeed in modern, globalised economies based on knowledge and innovation. However, teachers' (and countries') ability to foster and monitor progress is limited by the lack of understanding of how some of these skills materialise at different development stages. One reason why these competences are not promoted in a systematic way is that education systems have rarely established ways to assess them formally. Another, related reason is that, beyond an agreement on the broad objective, it is not clear how these skills can be visibly and tangibly articulated by teachers, students and policy makers, especially as part of the curriculum.

With this project, the OECD Centre for Educational Research and Innovation (CERI) aims to further develop and refine our understanding of how creative and critical thinking skills can be assessed in an educational setting.

List of participating countries in primary and secondary education :

Brazil, France, Hungary, India, Netherlands, Slovak Republic, Spain, Thailand, United States, and United Kingdom (Wales)

The project "Teaching, assessing and learning creative and critical thinking skills in education" has two different strands. The first strand focuses on fostering creativity and critical thinking in primary & secondary education (project from 2015 to 2019) and the second strand looks at creativity and critical thinking skills in [higher education](#) (project from 2019 – 2022).



Frank Lloyd Wright

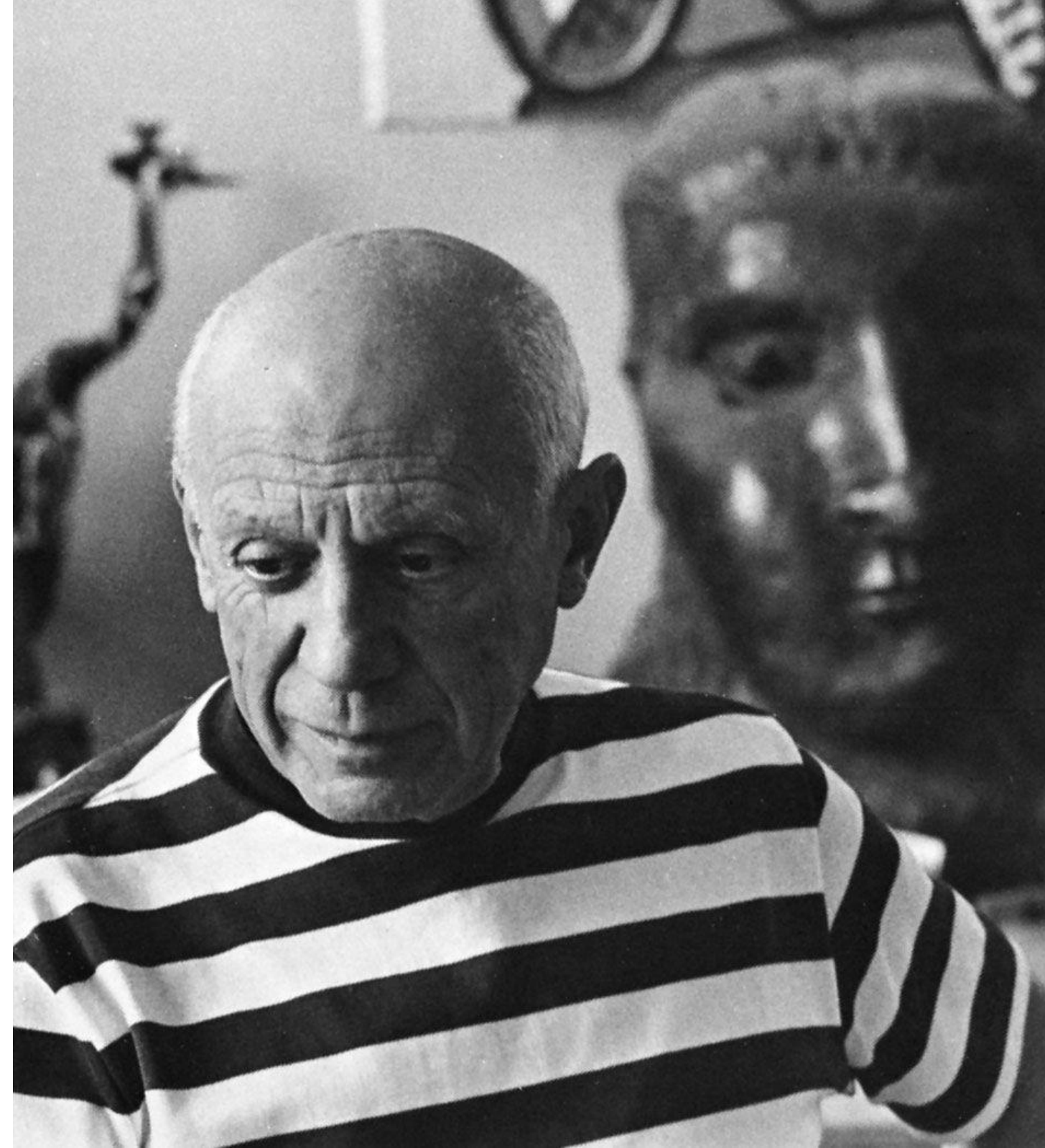


Fallingwater

1936



Pablo Picasso



Guernica

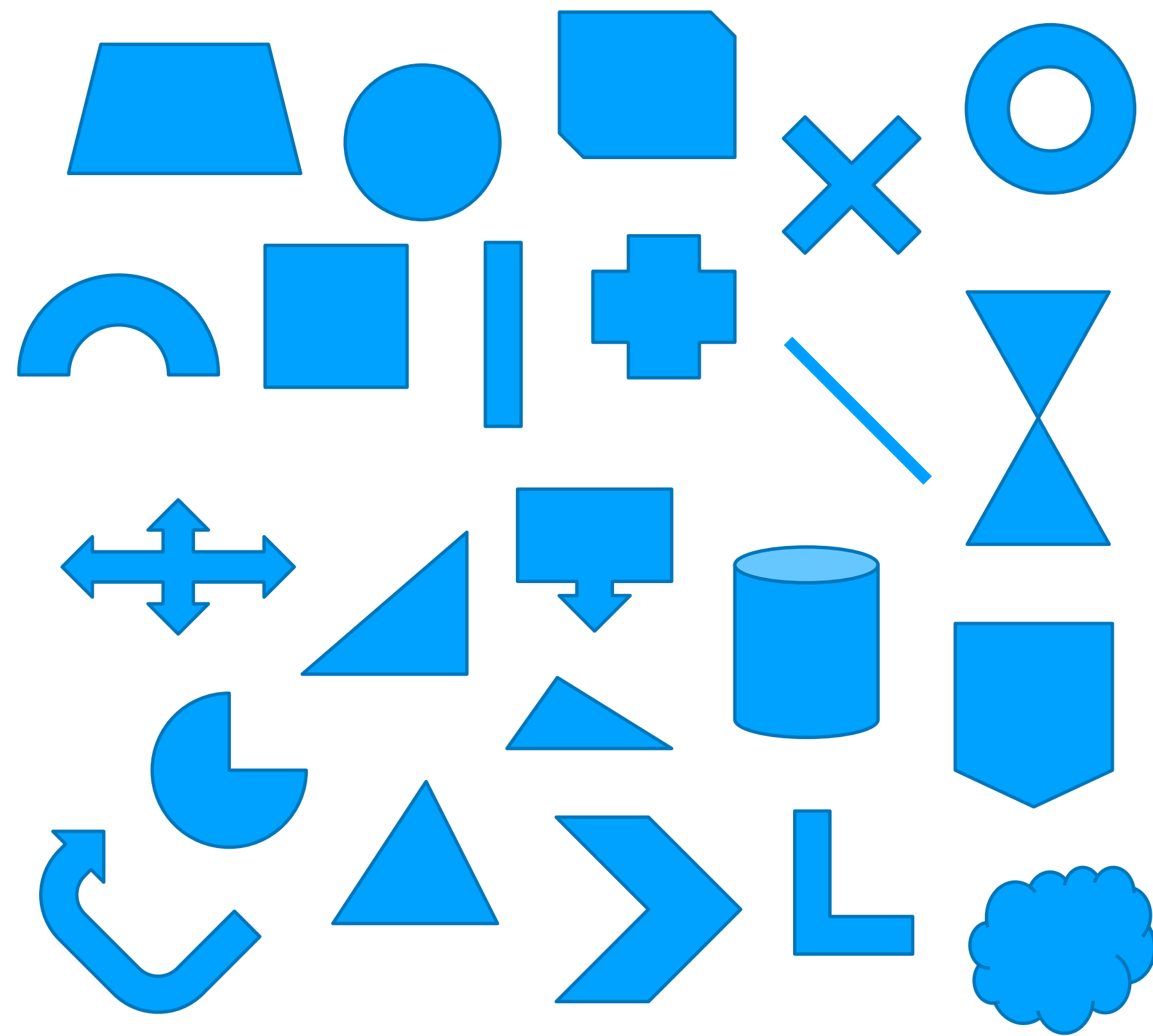
1937



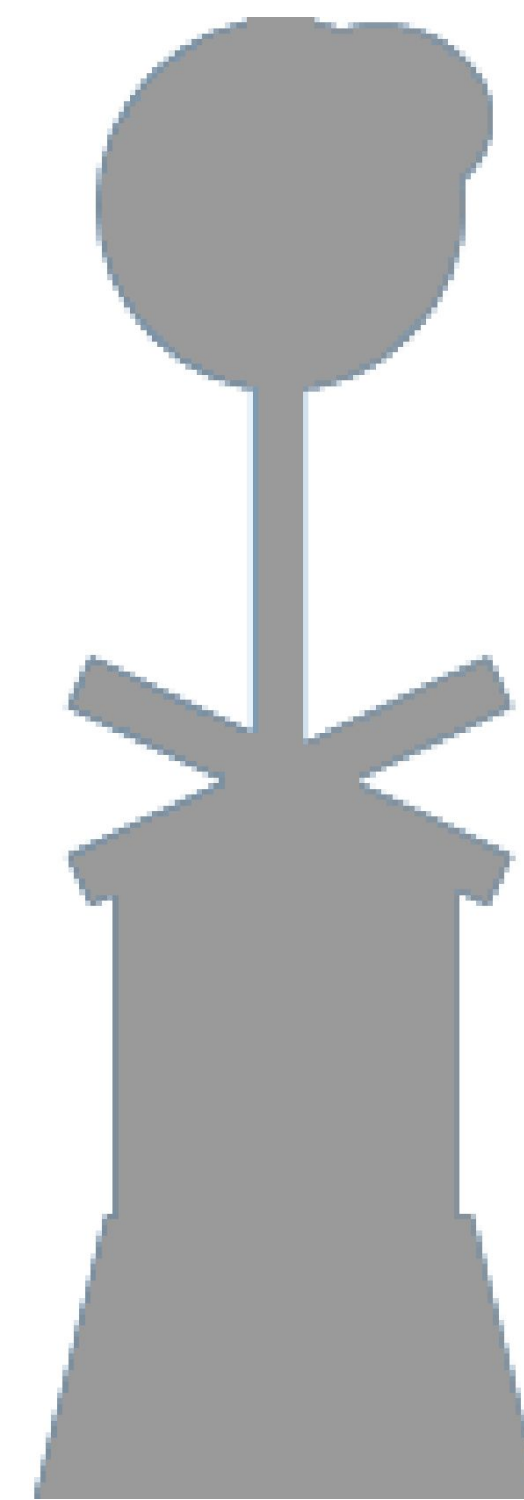
What is Creativity?



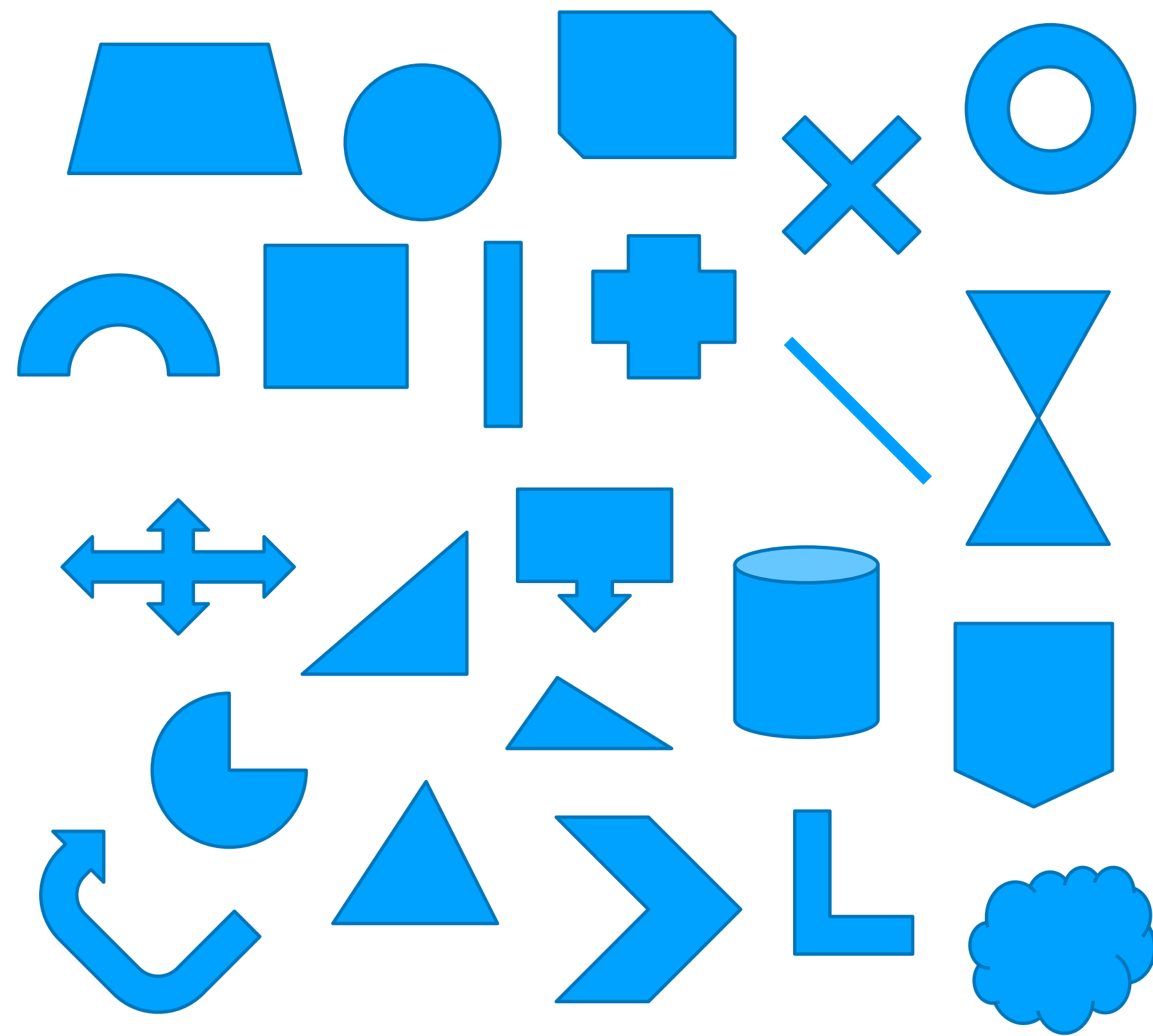
MEMORIES



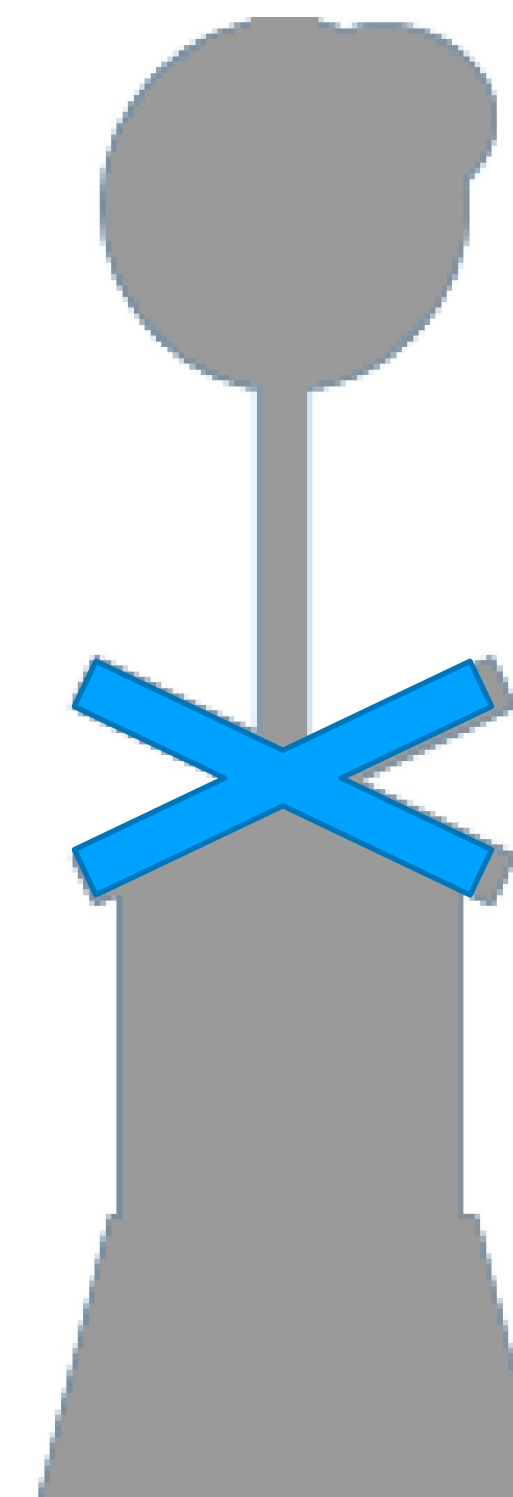
PROBLEM



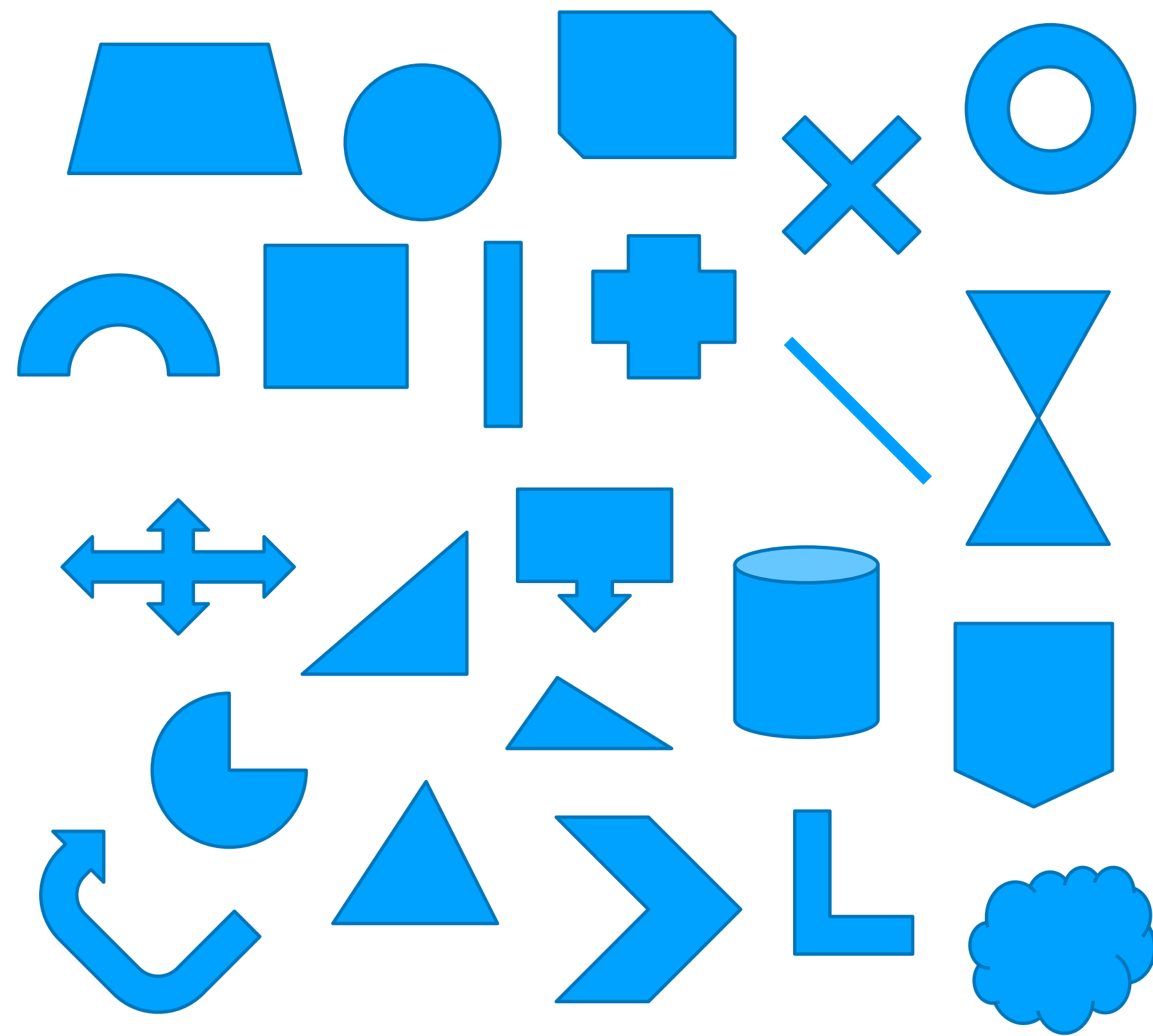
MEMORIES



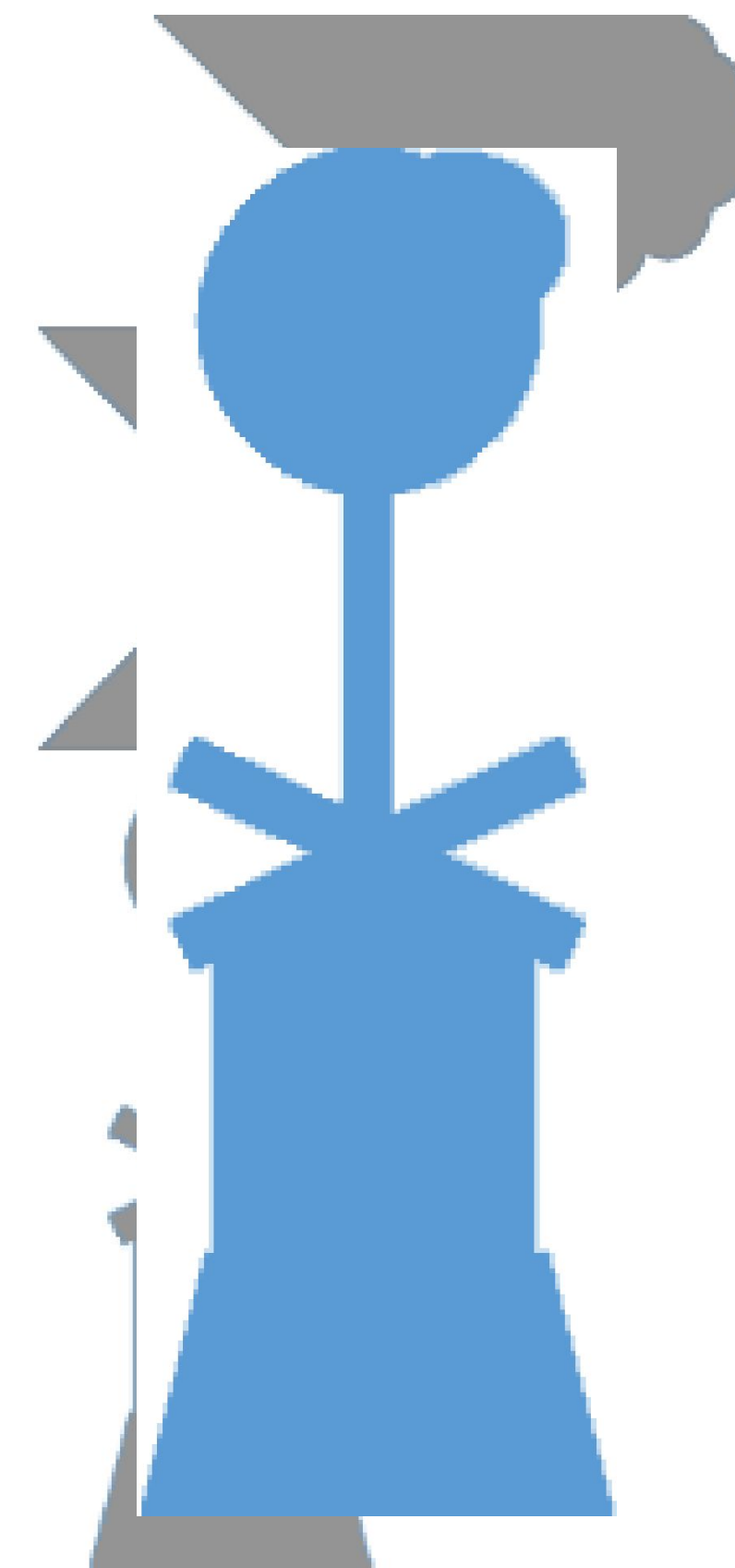
PROBLEM



MEMORIES



PROBLEM



Creativity Is...

*Nothing more nor less than
traditional problem solving.*



How Assess?

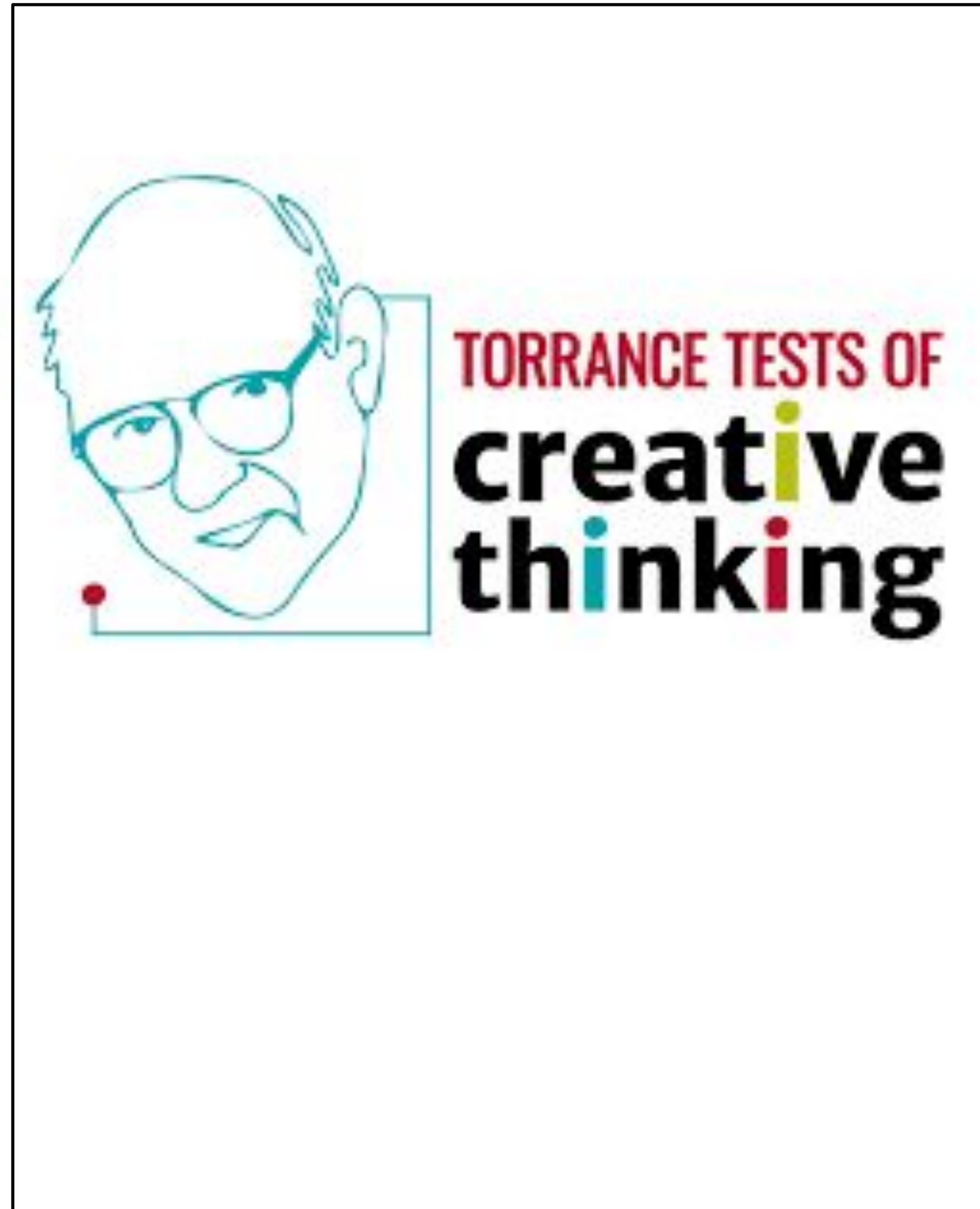


Torrance Test

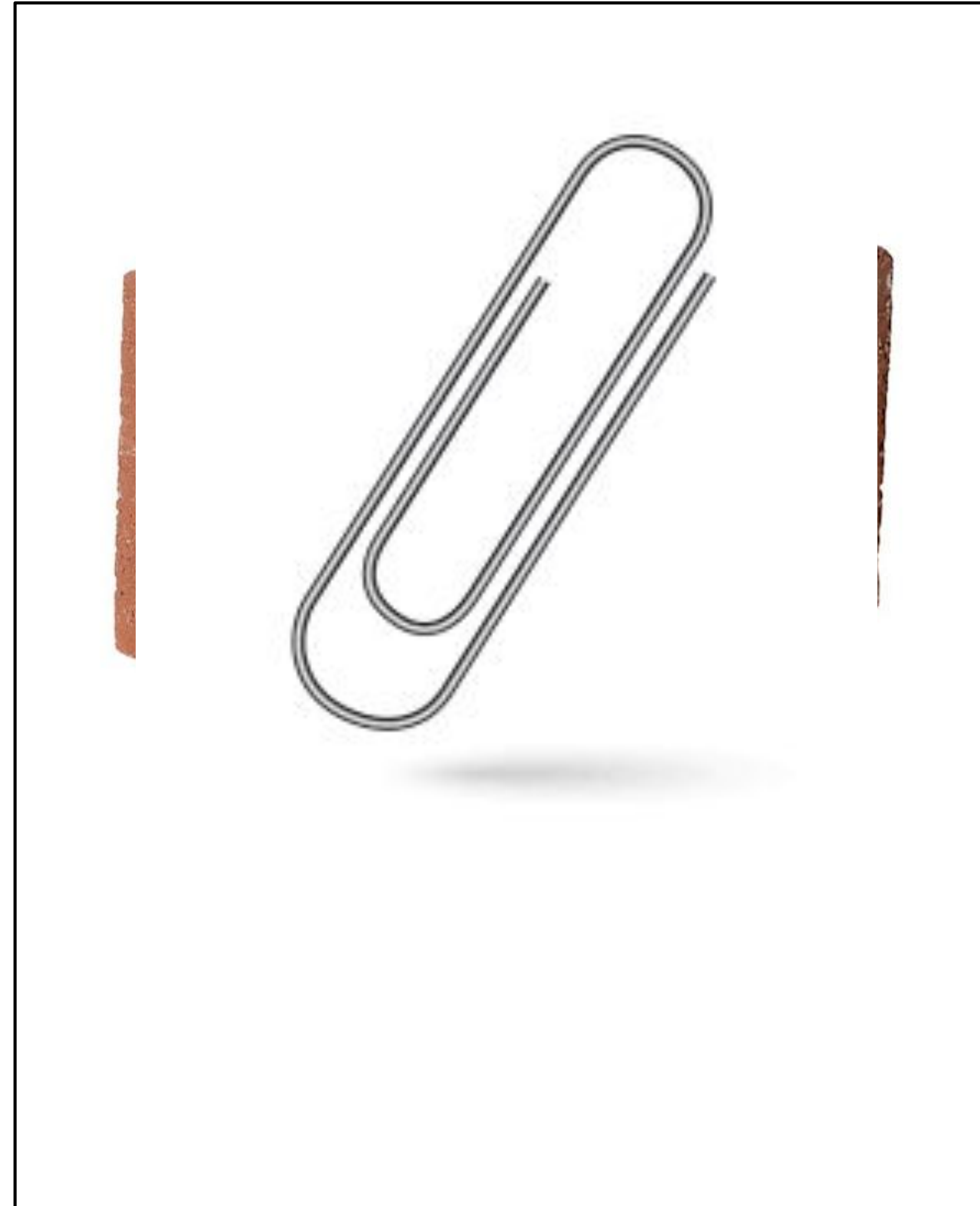
Divergent Object Use

Complete the Picture

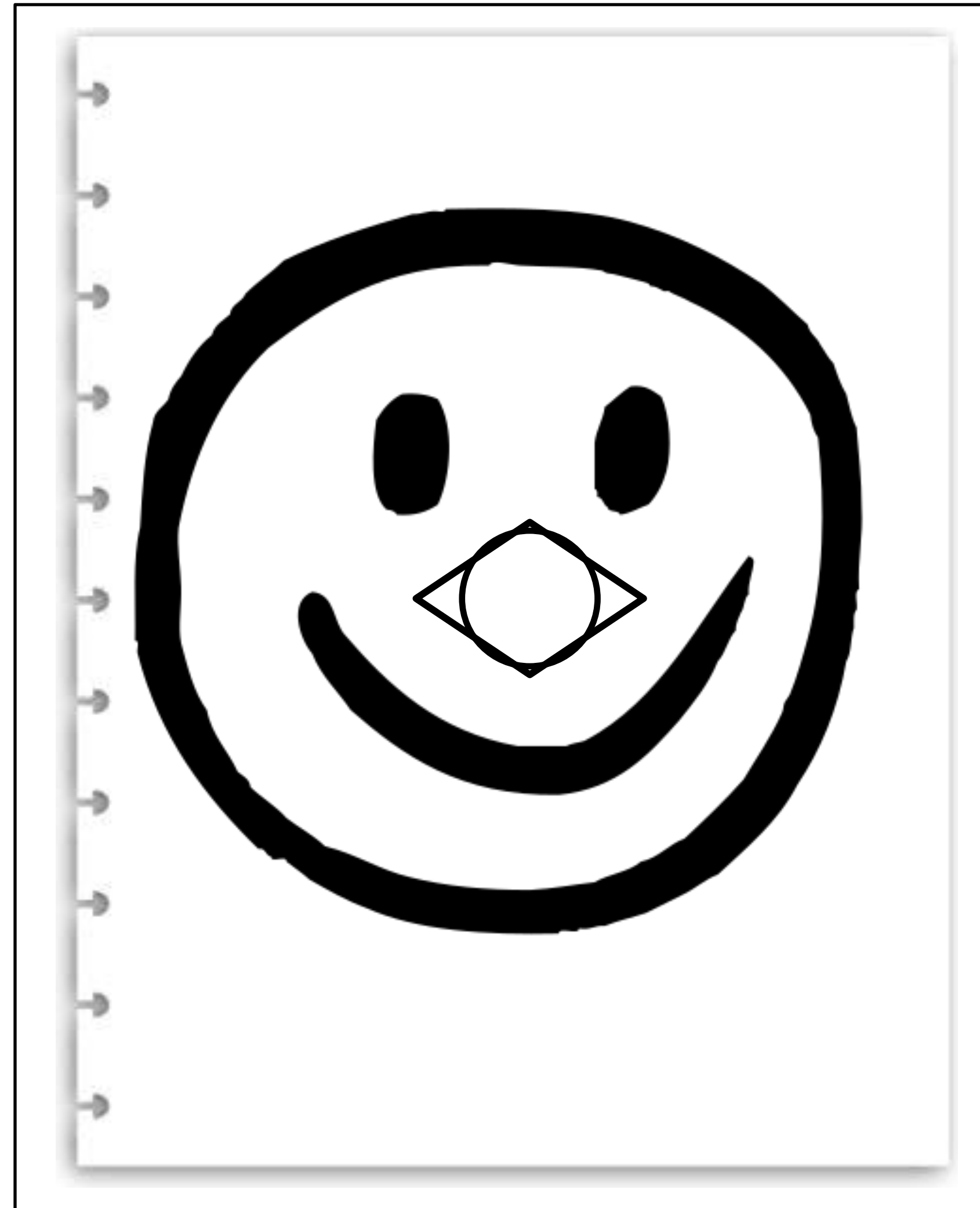
Consequences



Divergent Object Use



Complete the Picture



Consequences

*Imagine
If...*

~~Edoardo~~
~~Edoardo~~

~~humanoids~~
~~humanoids~~

*What would be the
consequences?*

How Does Creativity Work?

5 Great Myths



Myth #1
*Creativity Decreases
with Age*



PERCENTAGE OF CREATIVE GENIUSES

Age 5:

90%

Age 10:

30%

Age 18:

12%

Age 30:

2%



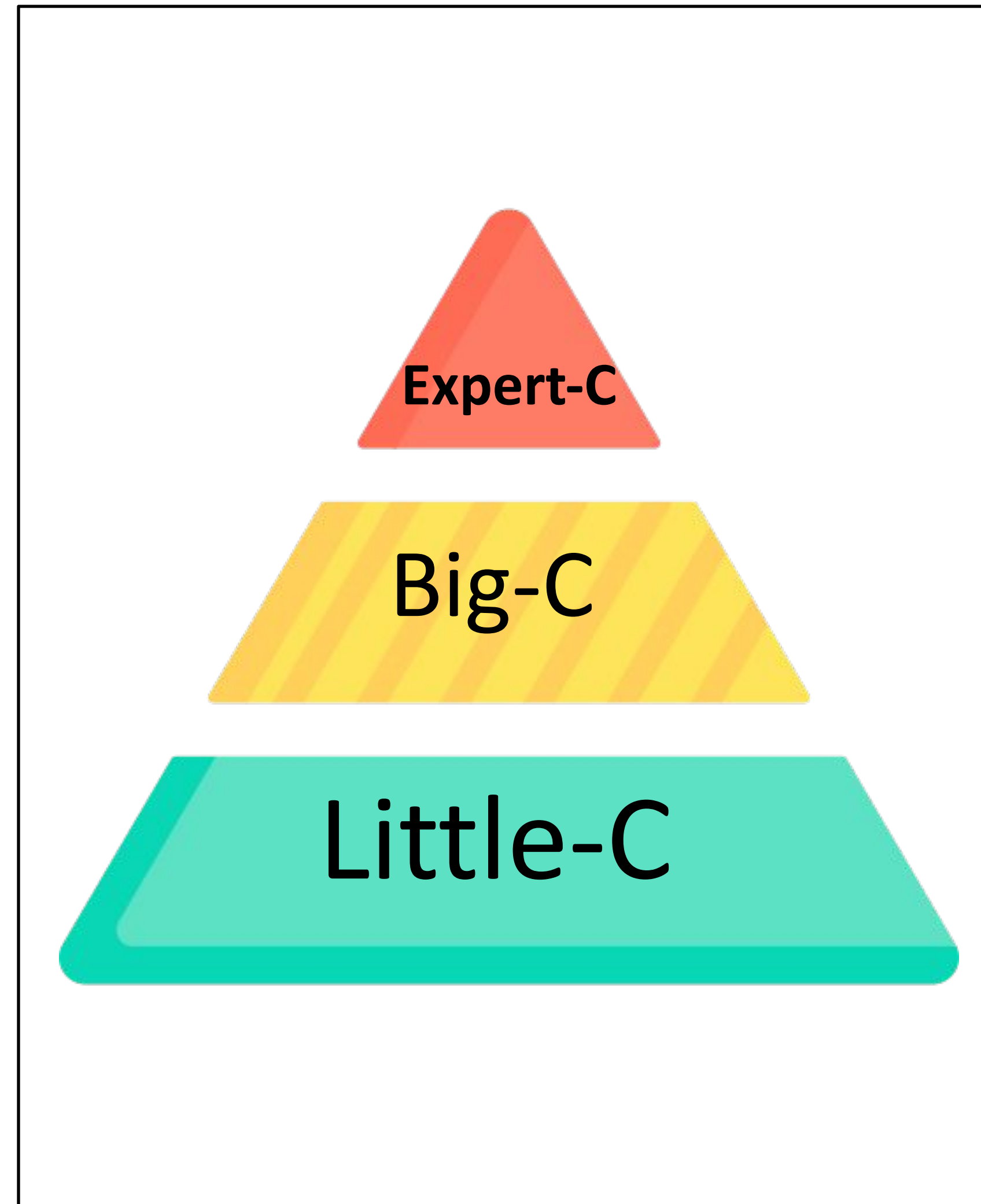
The Truth

*Adults don't lose
creativity...*

Adults evolve creativity.



3-Levels of Creativity



Little-C
Personal Novelty
(originality)



Big-C

Personal Novelty + Utility
(originality + validity)



Divergent Object Use

KIDS

“Wear it as a hat”

“Use it as a bird house”

*“Throw it in the air to
attract UFOs”*



Divergent Object Use

ADULT

“Wear it as a hat”

“Use it as a bird house”

*“Throw it in the air to
attract UFOs”*



PERCENTAGE OF CREATIVE GENIUSES

Age 5:

90%

Age 10:

30%

Age 18:

12%

Age 30:

2%



Expert-C

Universal Novelty + Utility



The Truth

*Adults don't lose
creativity...*

Adults evolve creativity.



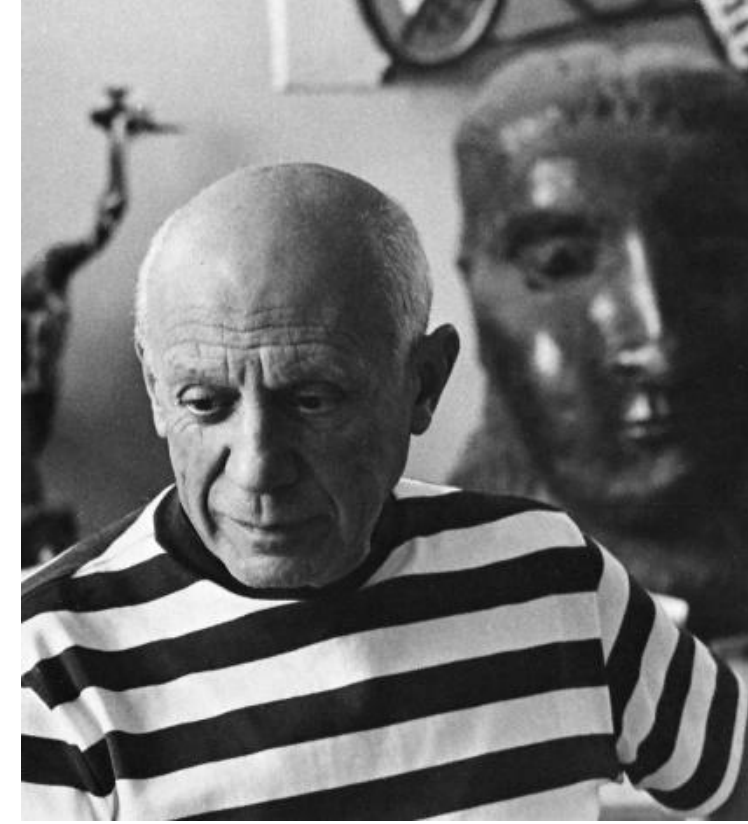
Frank Lloyd Wright

67 Years Old

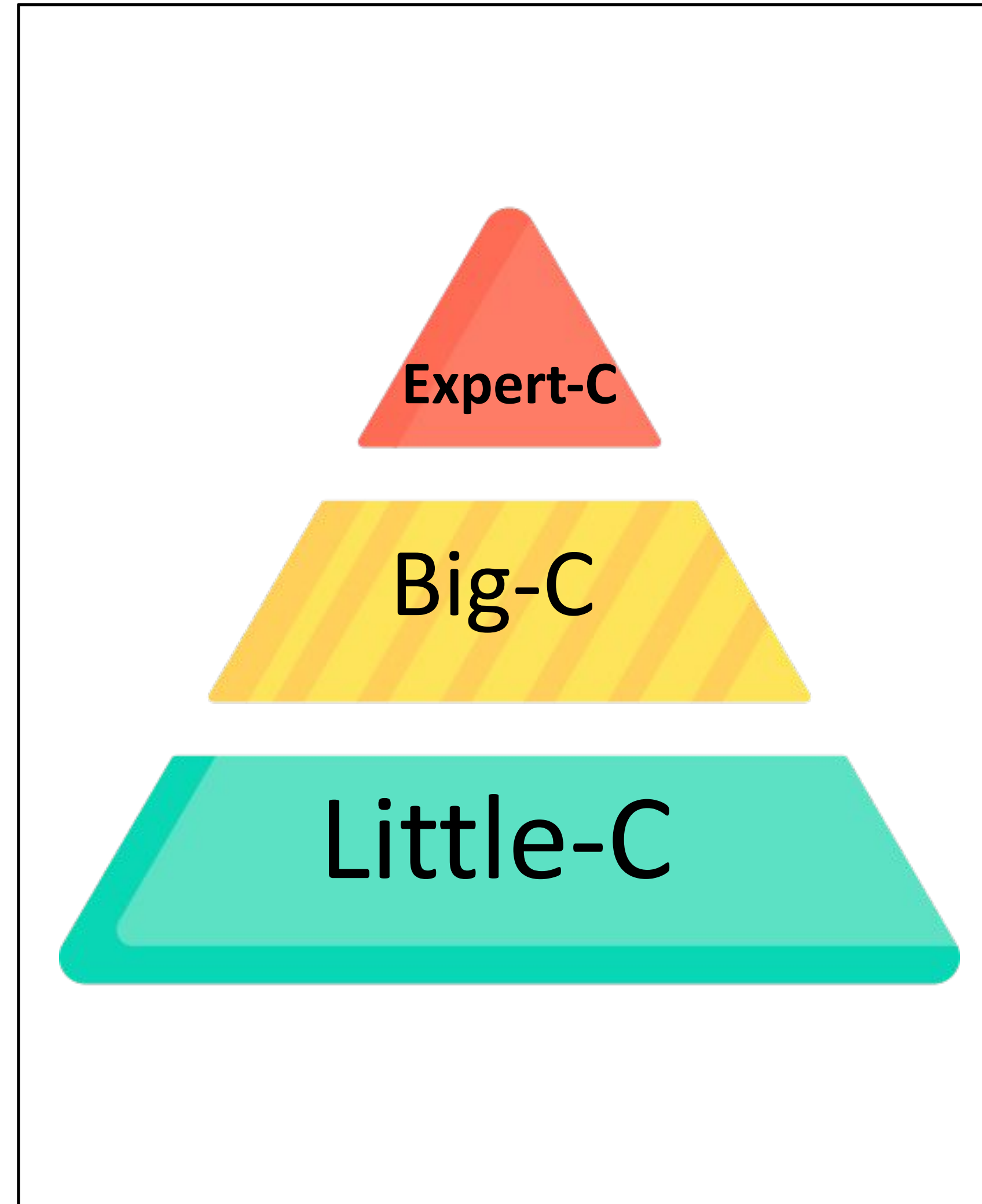


Pablo Picasso

56 Years Old



How Move Up Ladder?



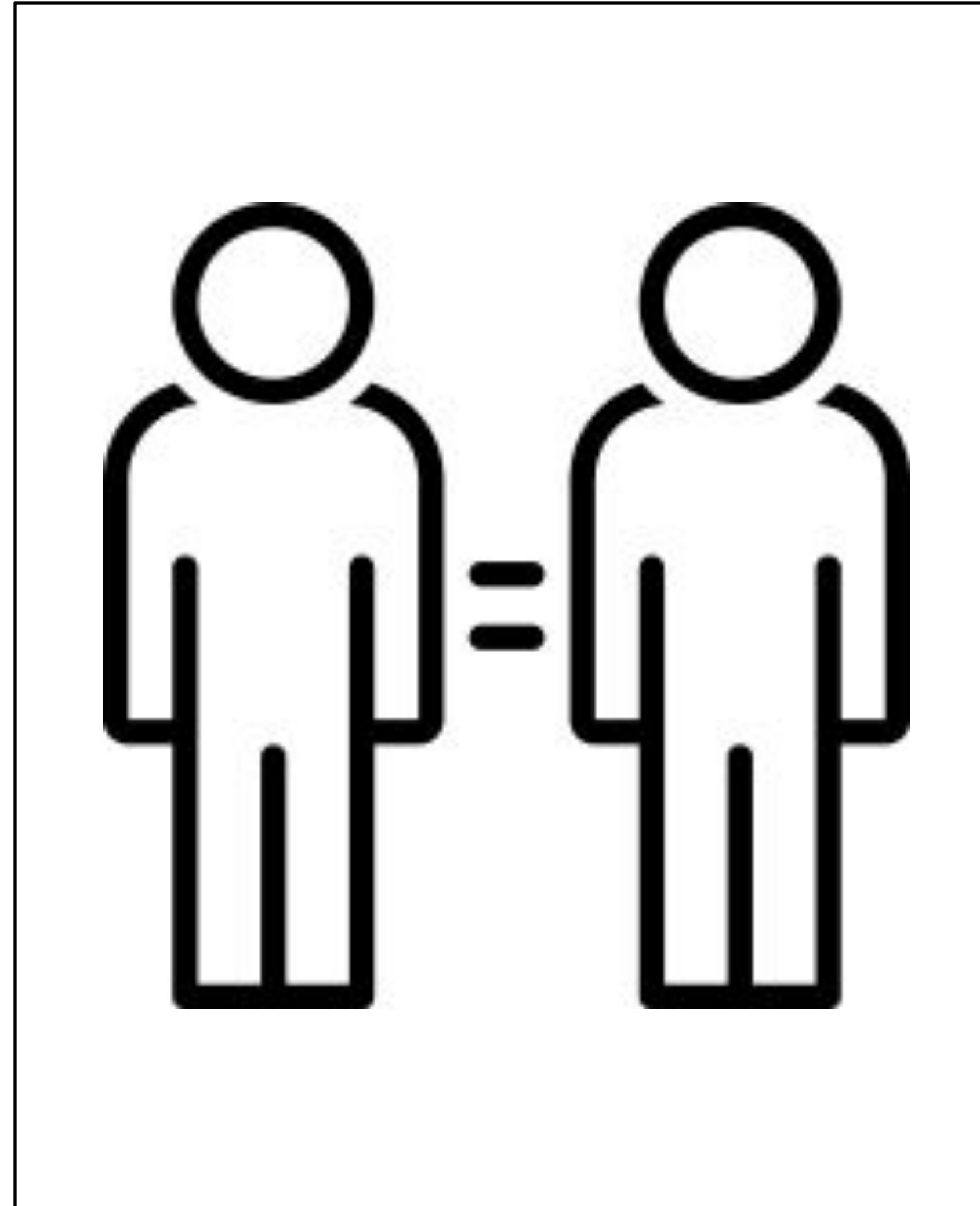
Myth #2

Creativity is a Special Skill



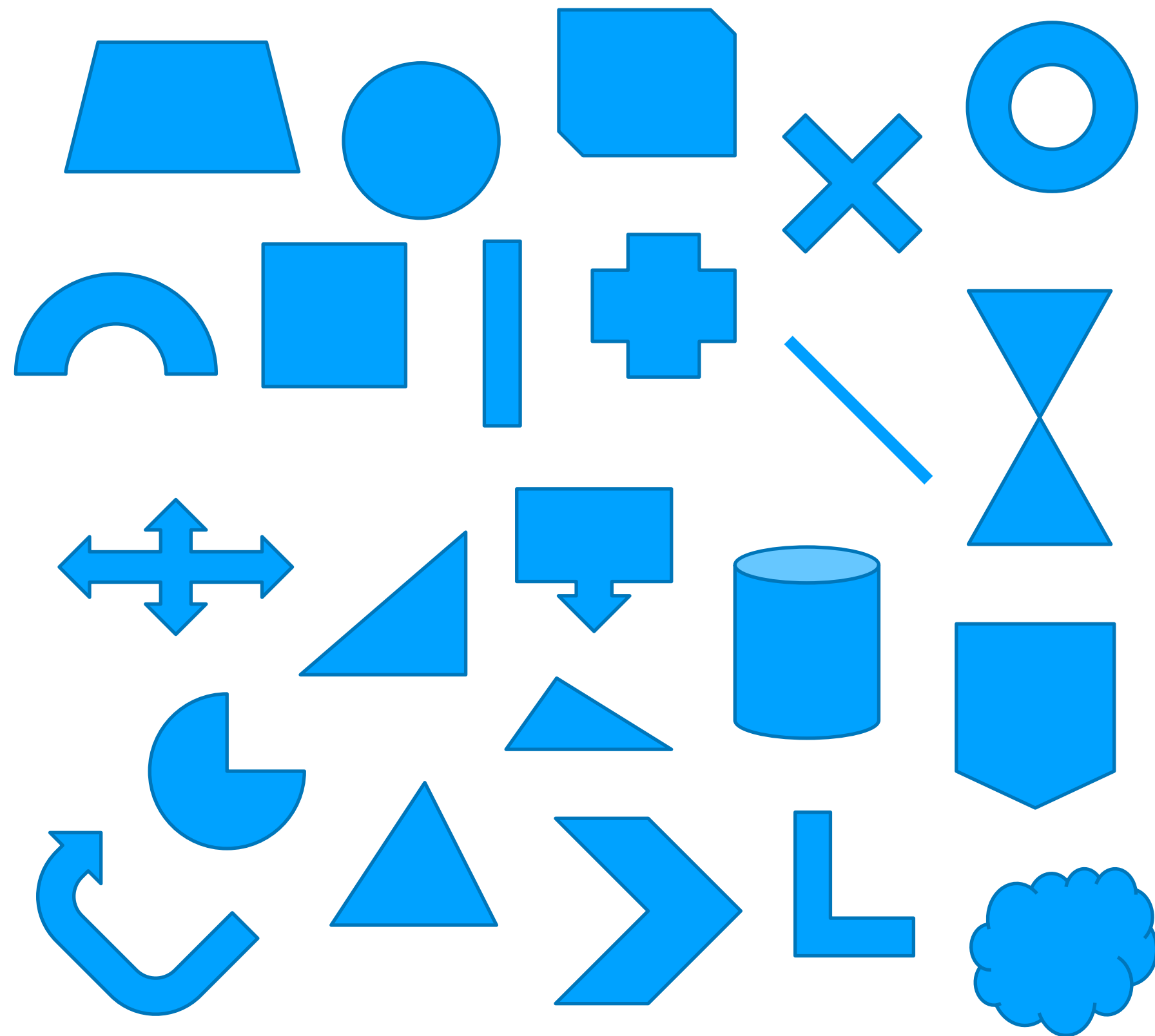
The Truth

*The Creativity Process is
Identical for All People*

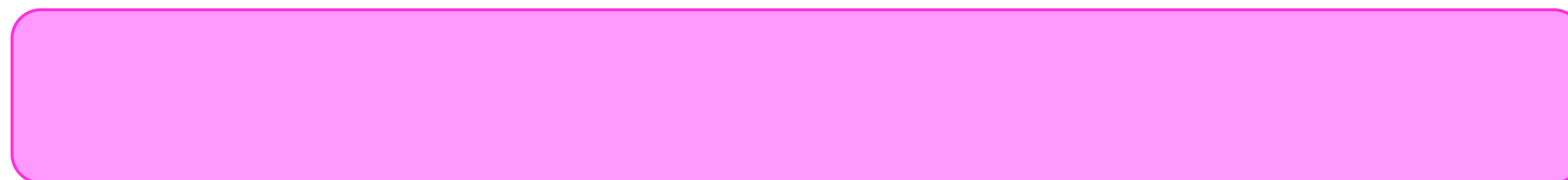
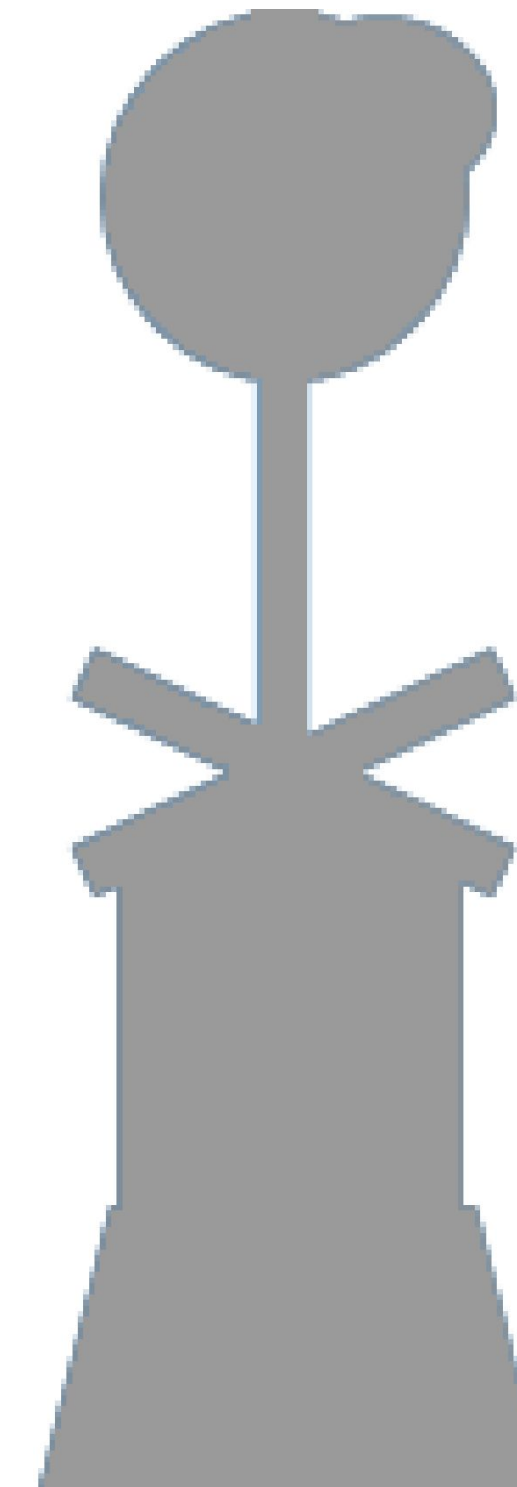


FOCUSED THOUGHT

MEMORIES

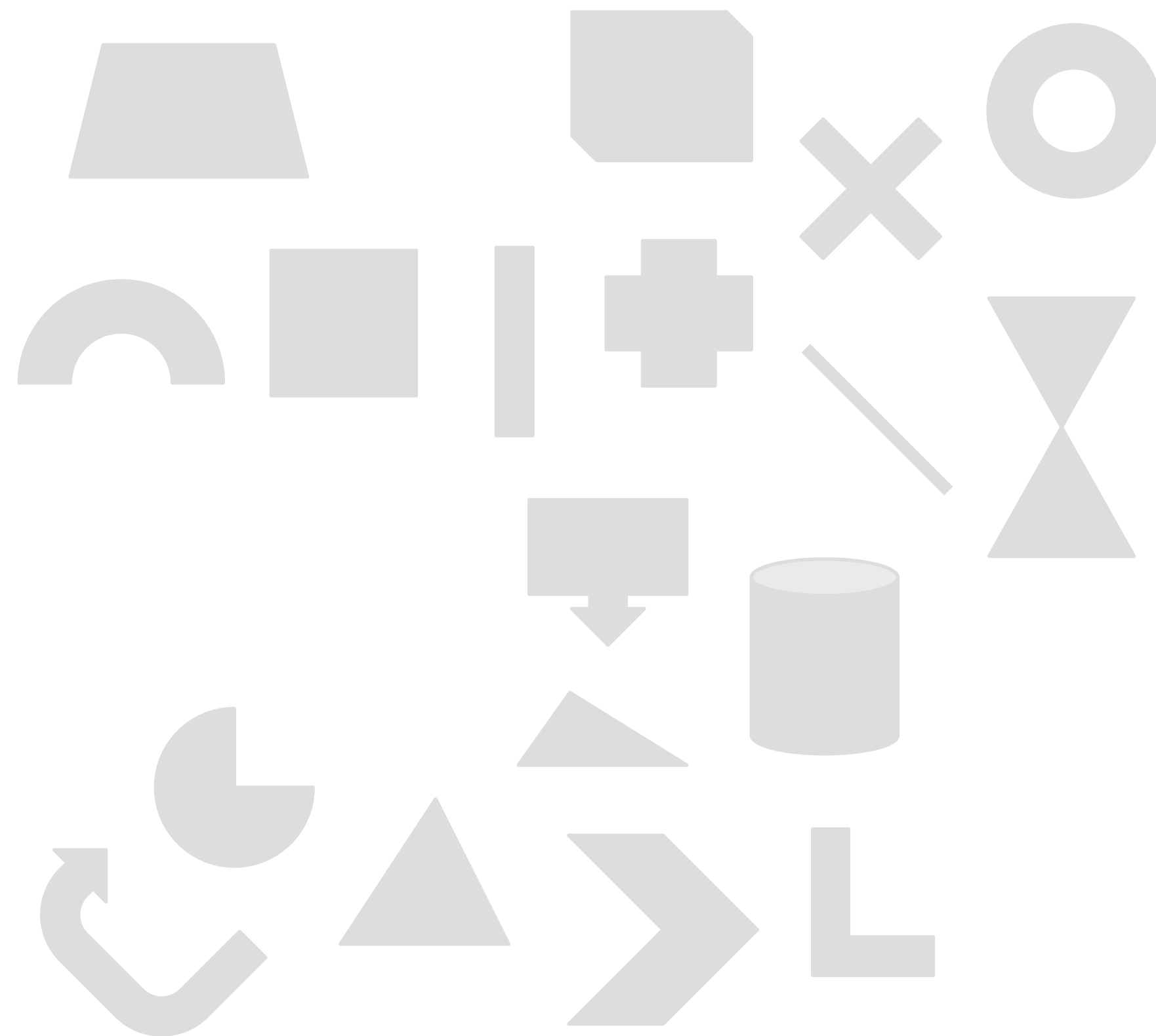


PROBLEM

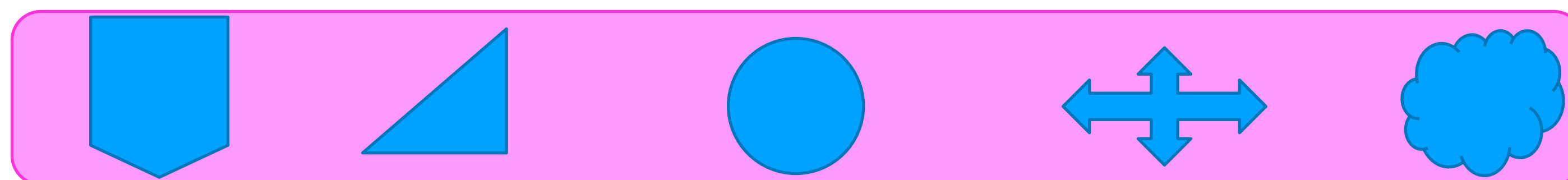
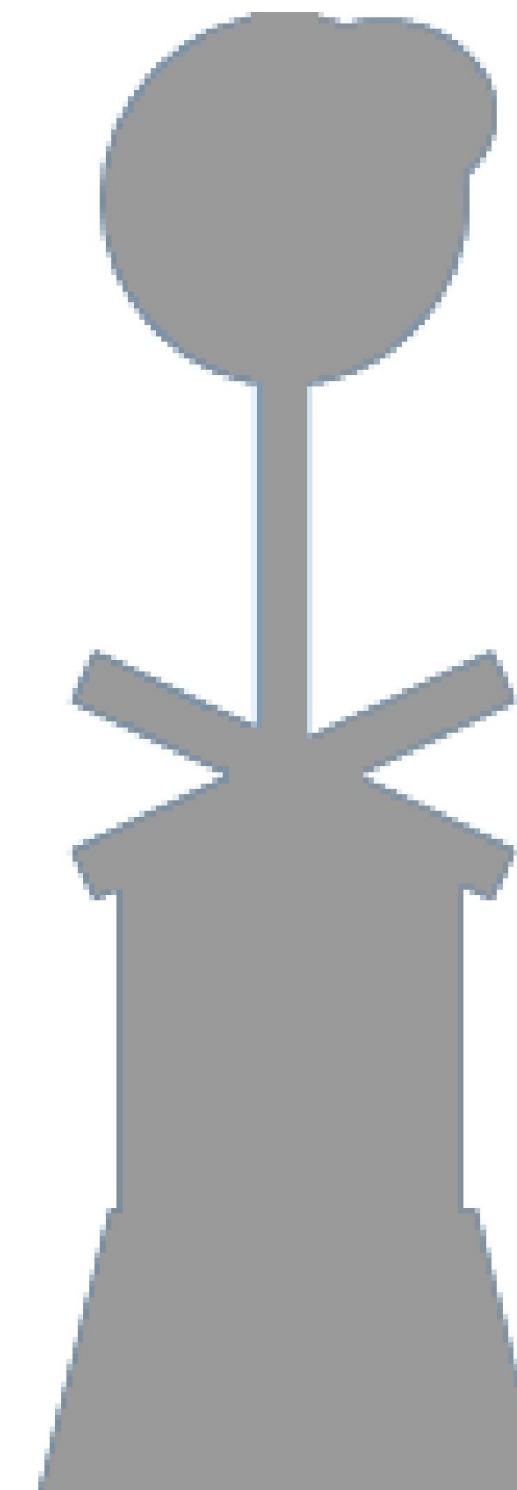


FOCUSED THOUGHT

MEMORIES



PROBLEM

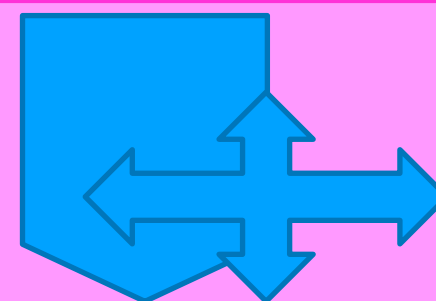
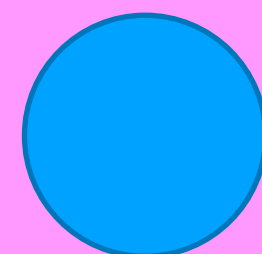
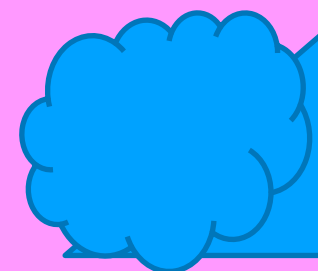
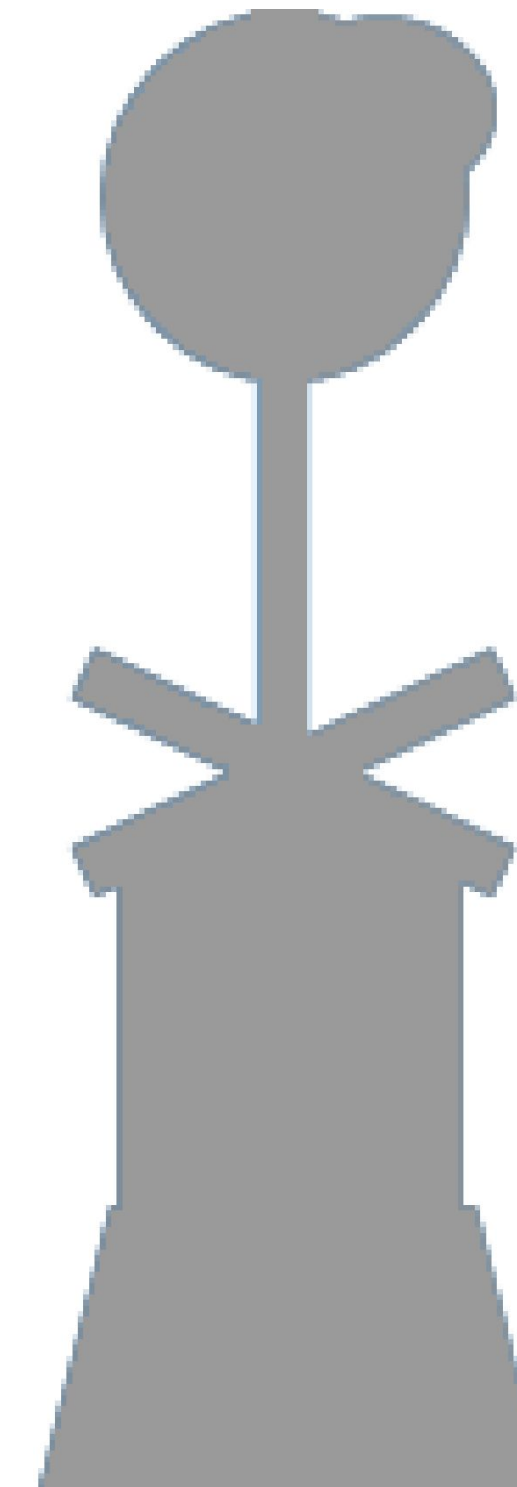


DIFFUSED THOUGHT

MEMORIES

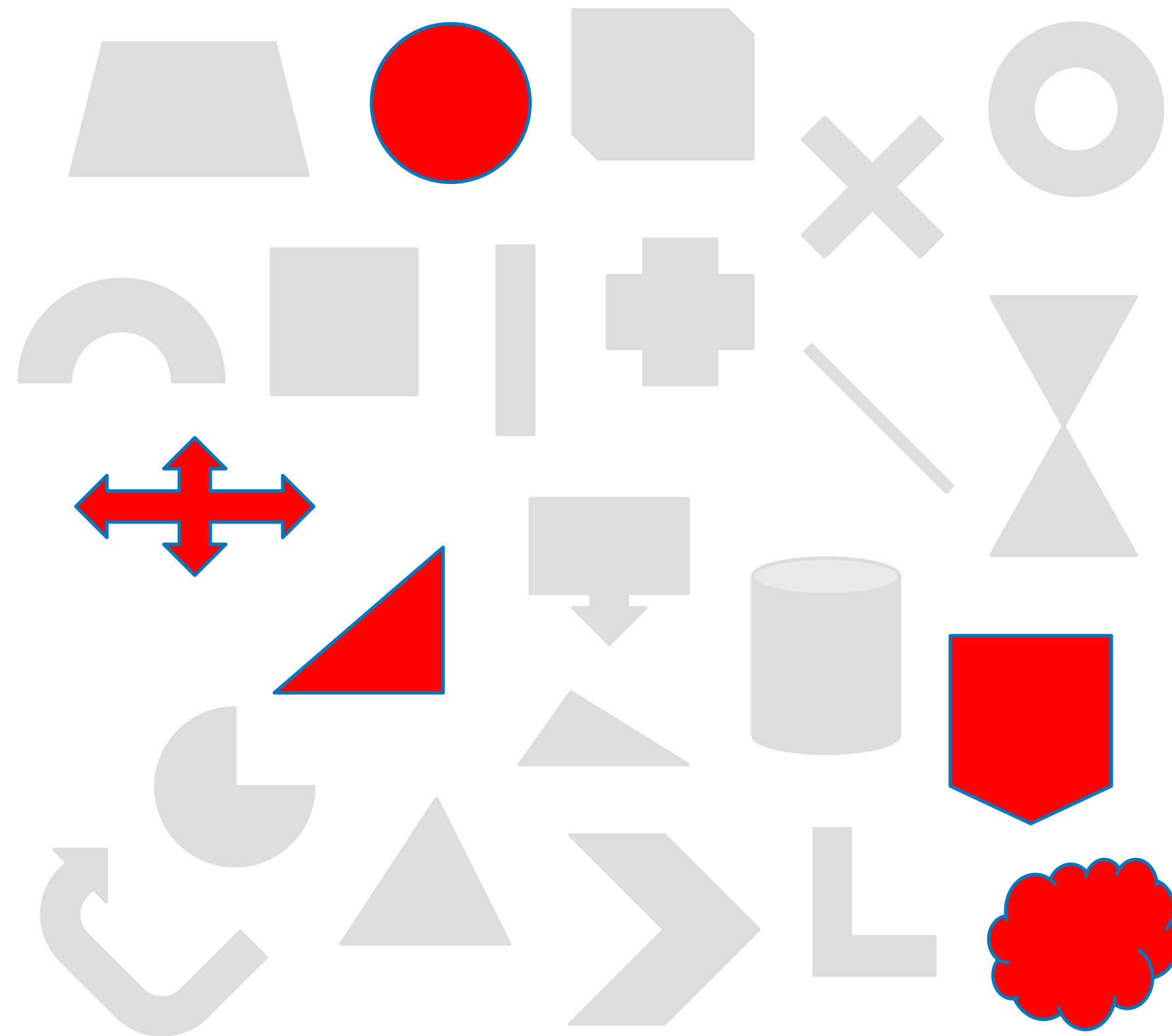


PROBLEM

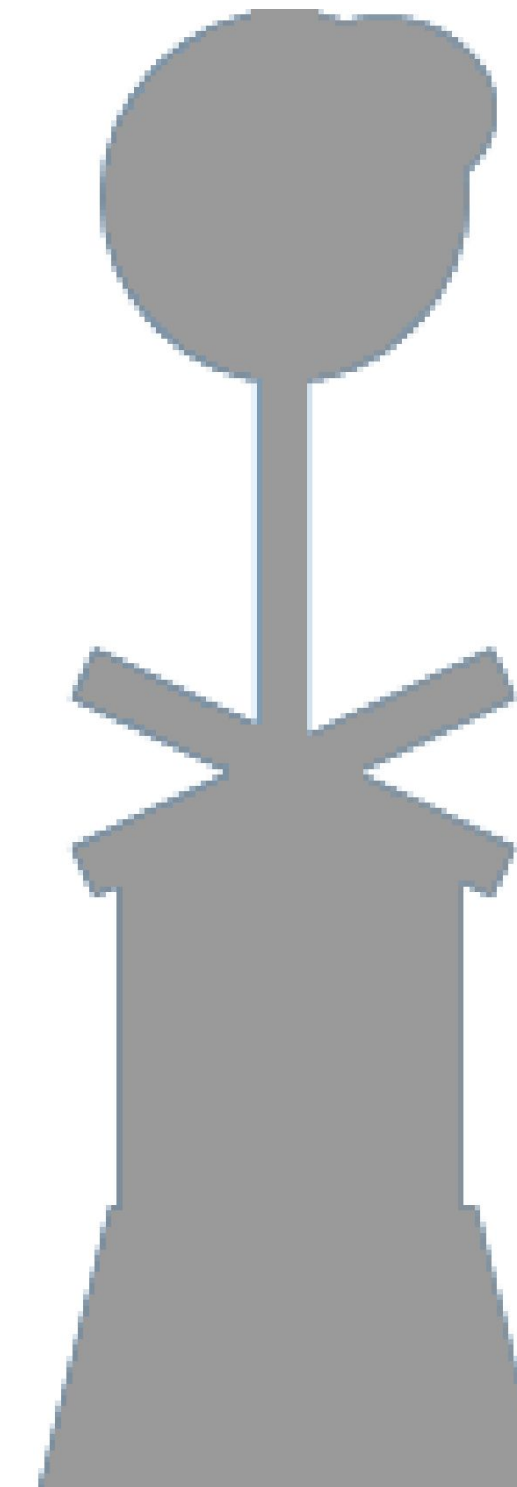


DIFFUSED THOUGHT

MEMORIES

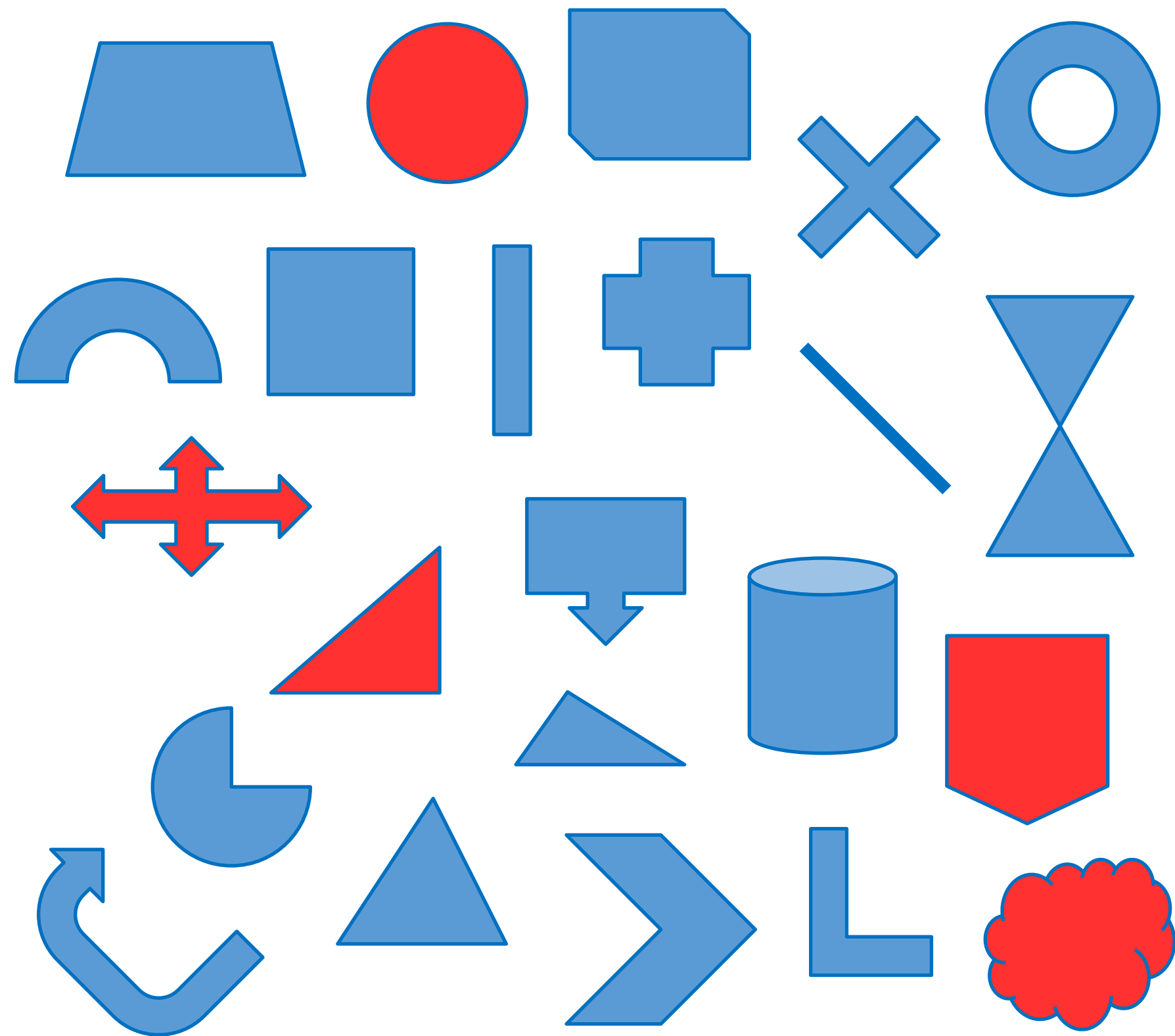


PROBLEM

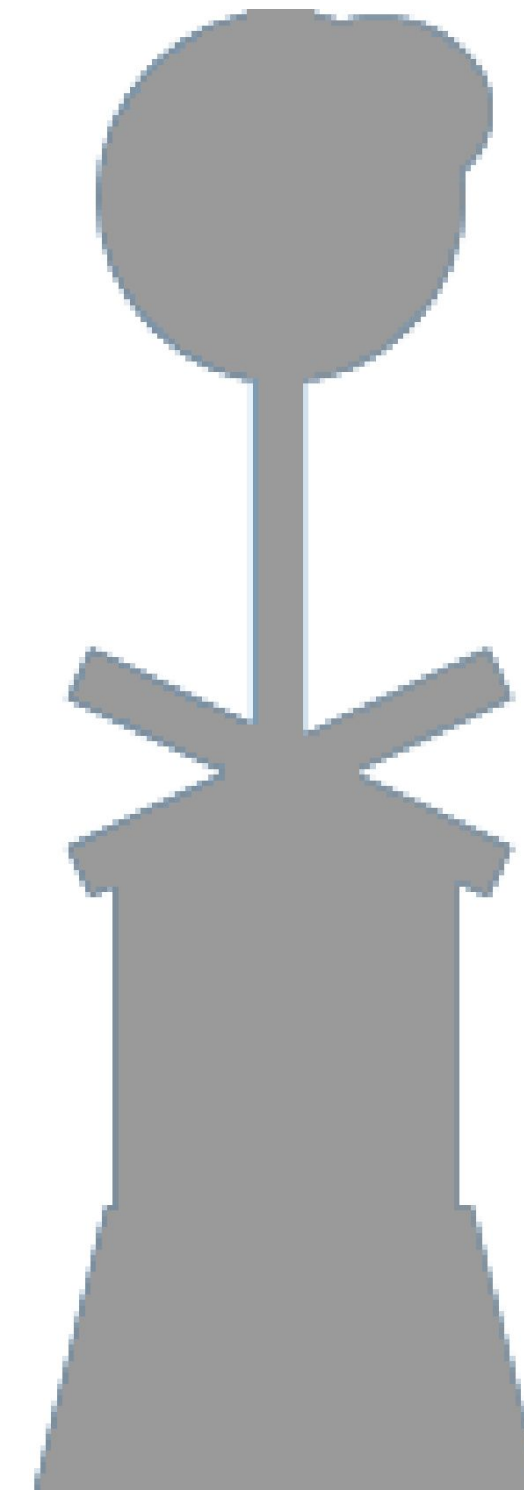


DIFFUSED THOUGHT

MEMORIES

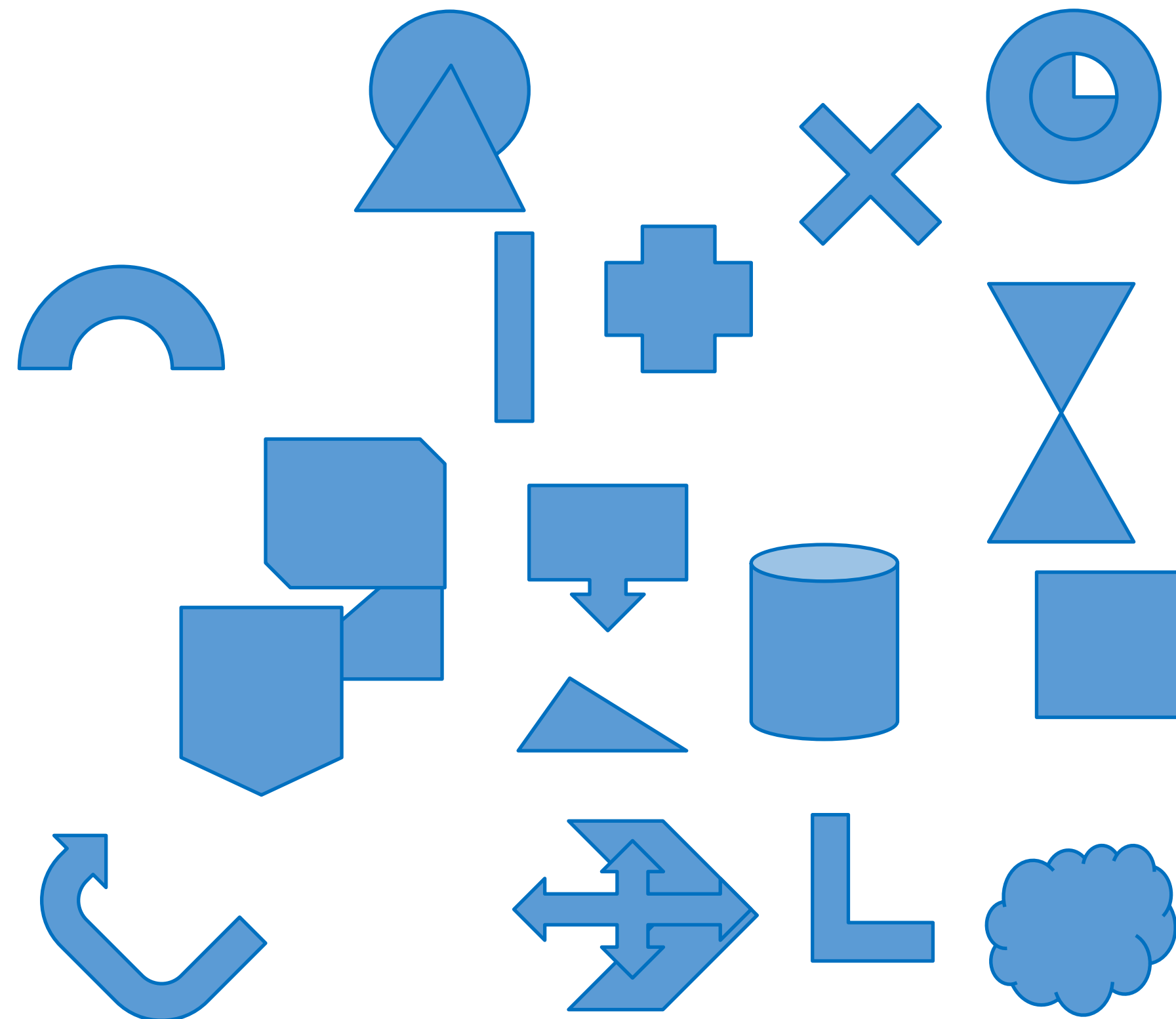


PROBLEM

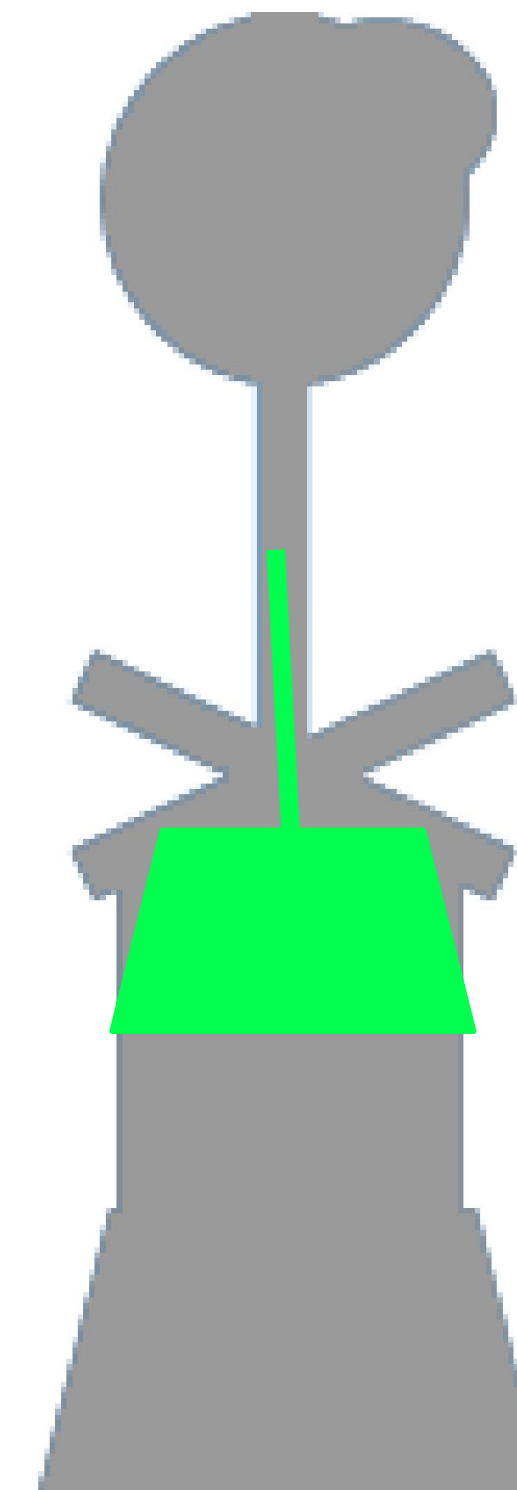


FOCUSED THOUGHT

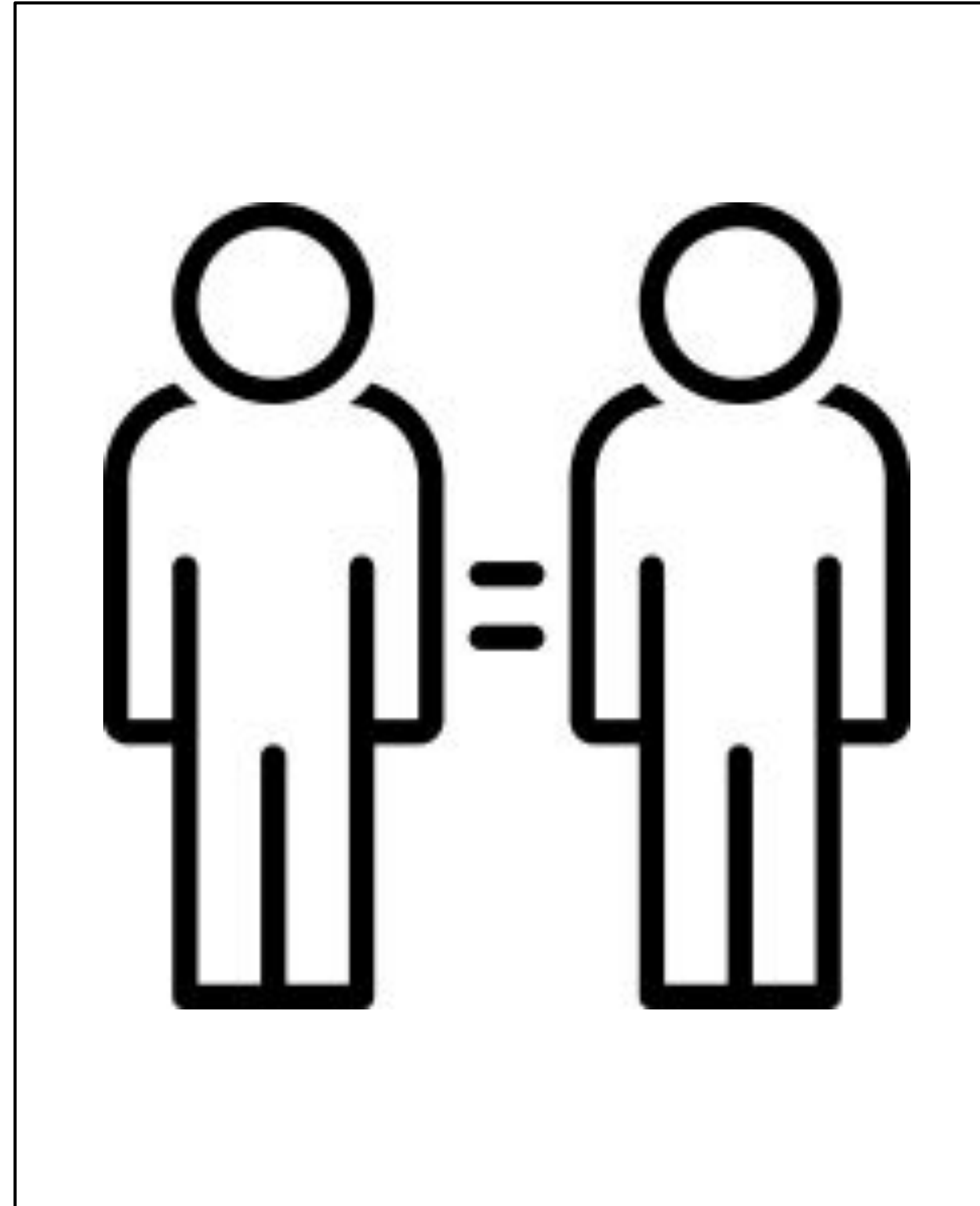
MEMORIES



PROBLEM



**Everyone Alternates
Focused / Diffused**



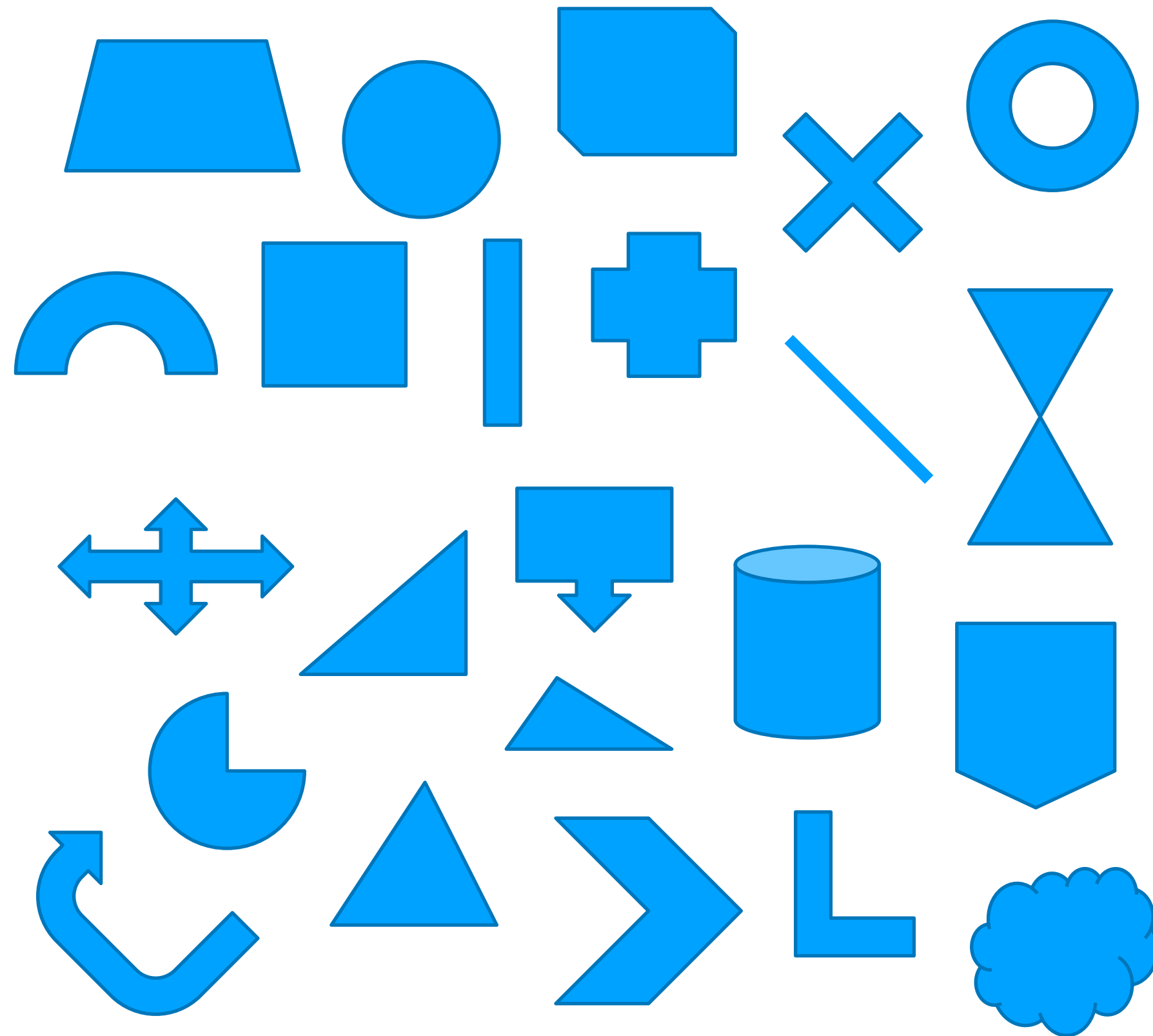
What Separates Small- from Expert-C

KNOWLEDGE!

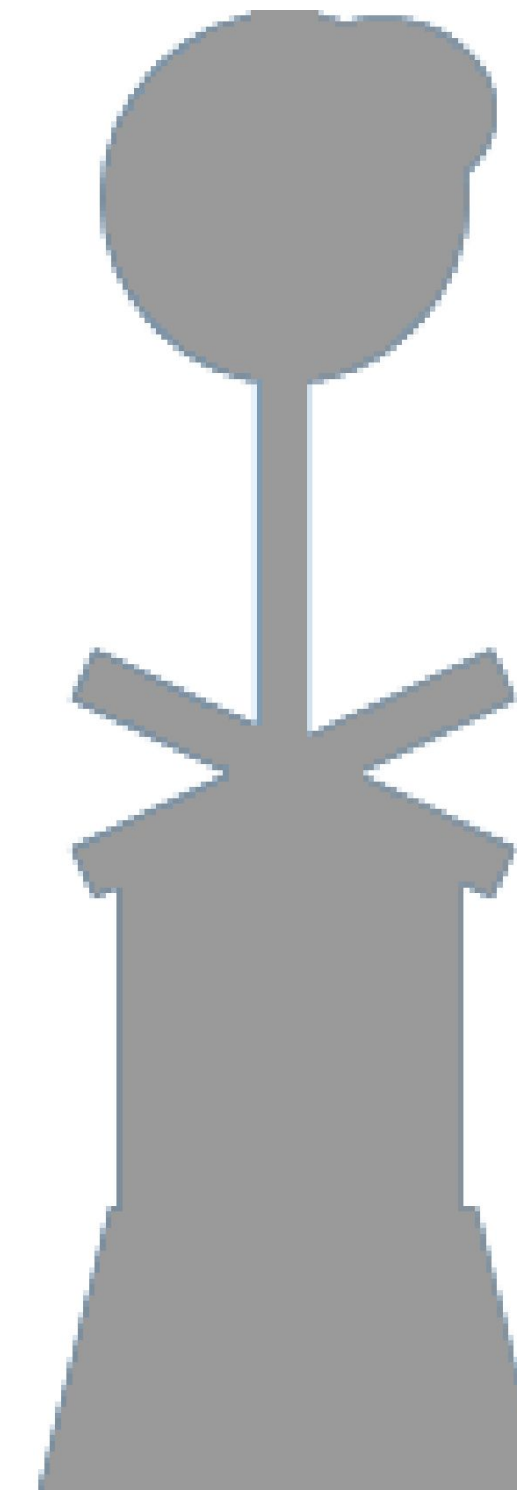


LBTG-EC

MEMORIES



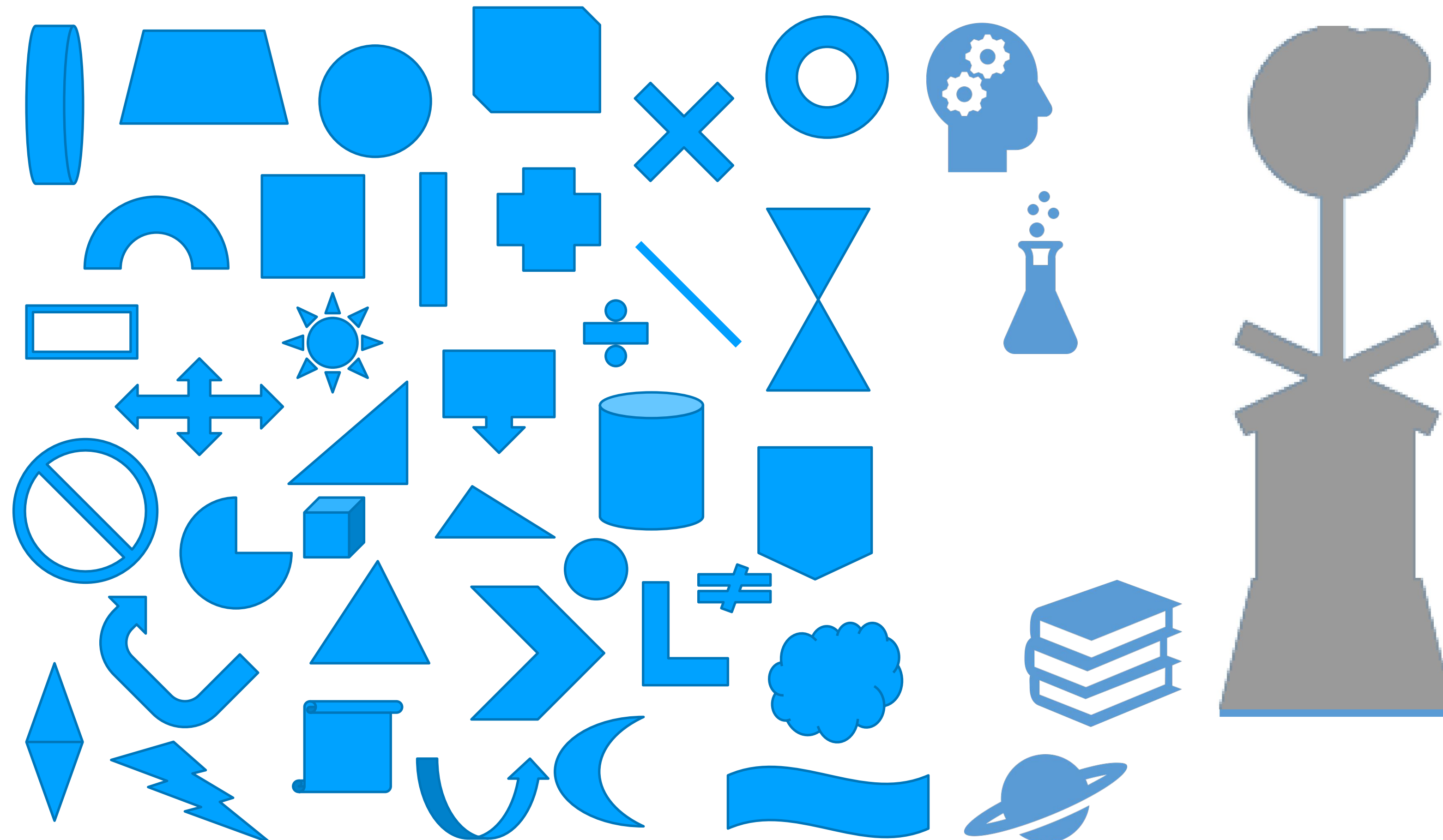
PROBLEM



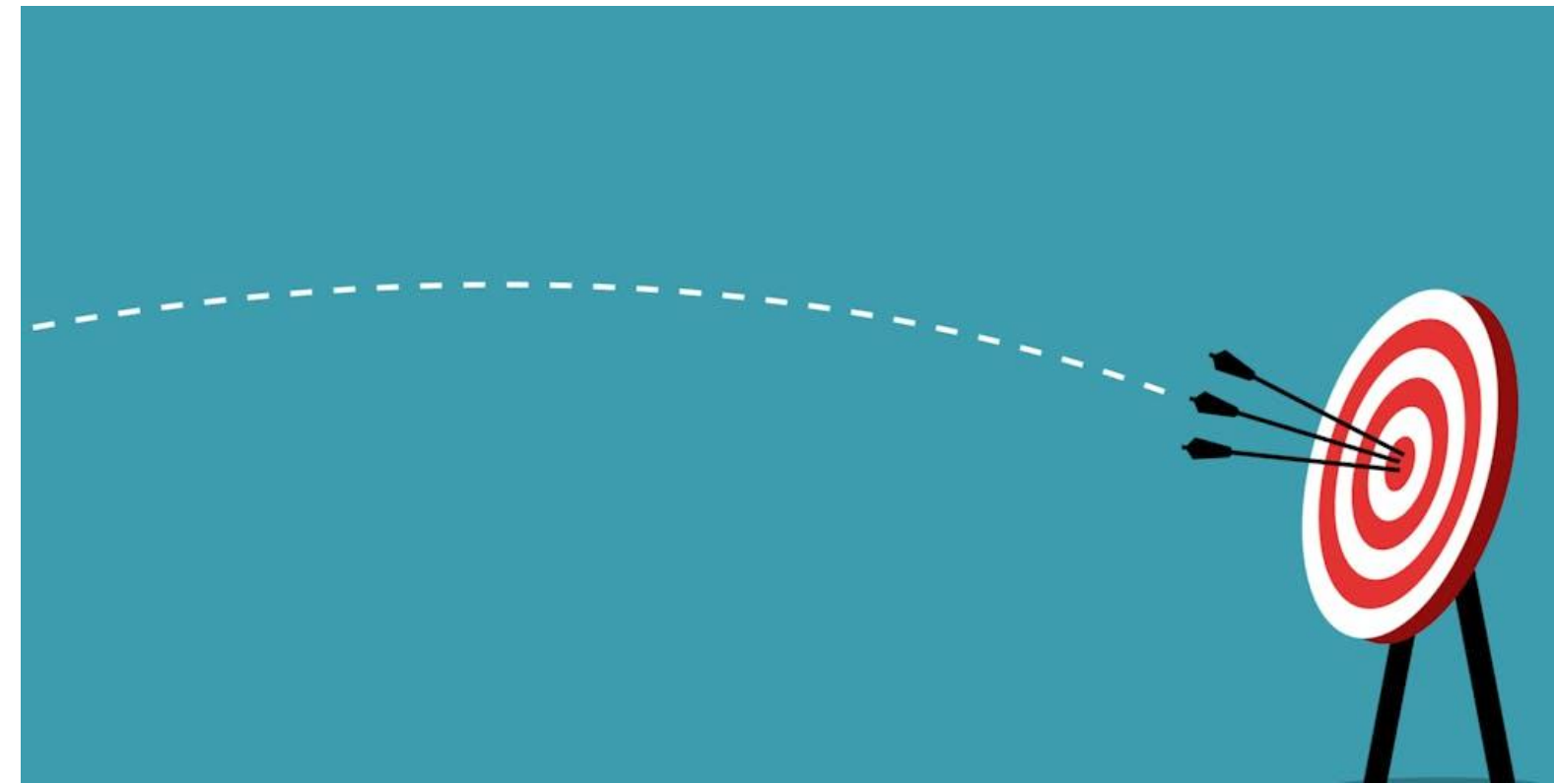
EXPERT-C

MEMORIES

PROBLEM



Creativity Comes After Expertise



Frank Lloyd Wright

Engineering - Age 9

Uni - Age 19

Adler & Sullivan - Age 21

First Solo Work – 23

14 Years of Training



Pablo Picasso

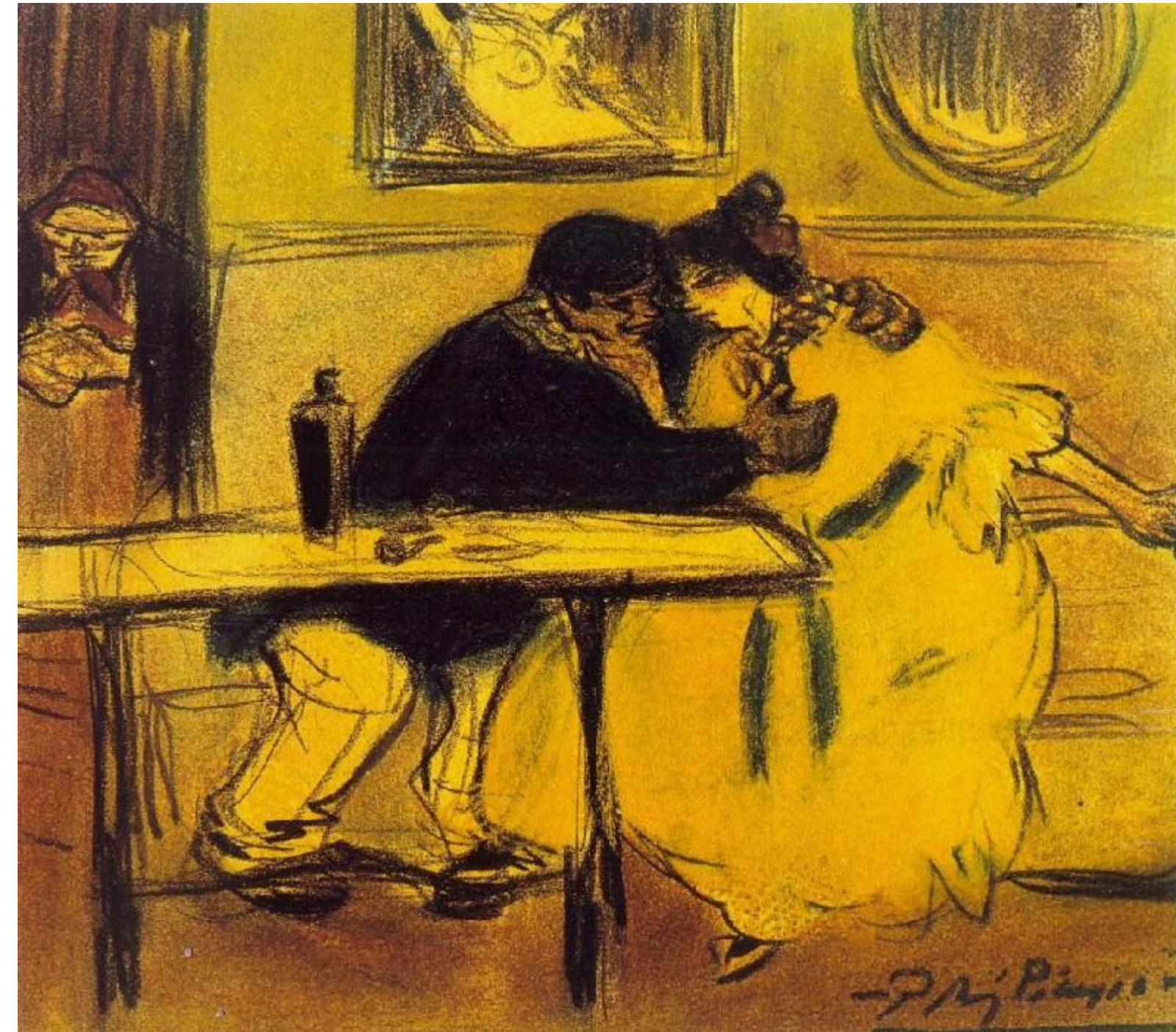
Oil w/ Don Ruiz – Age 7

Fine Arts School – 13

Academy - 16

First Original Piece – Age 18

11 Years of Training



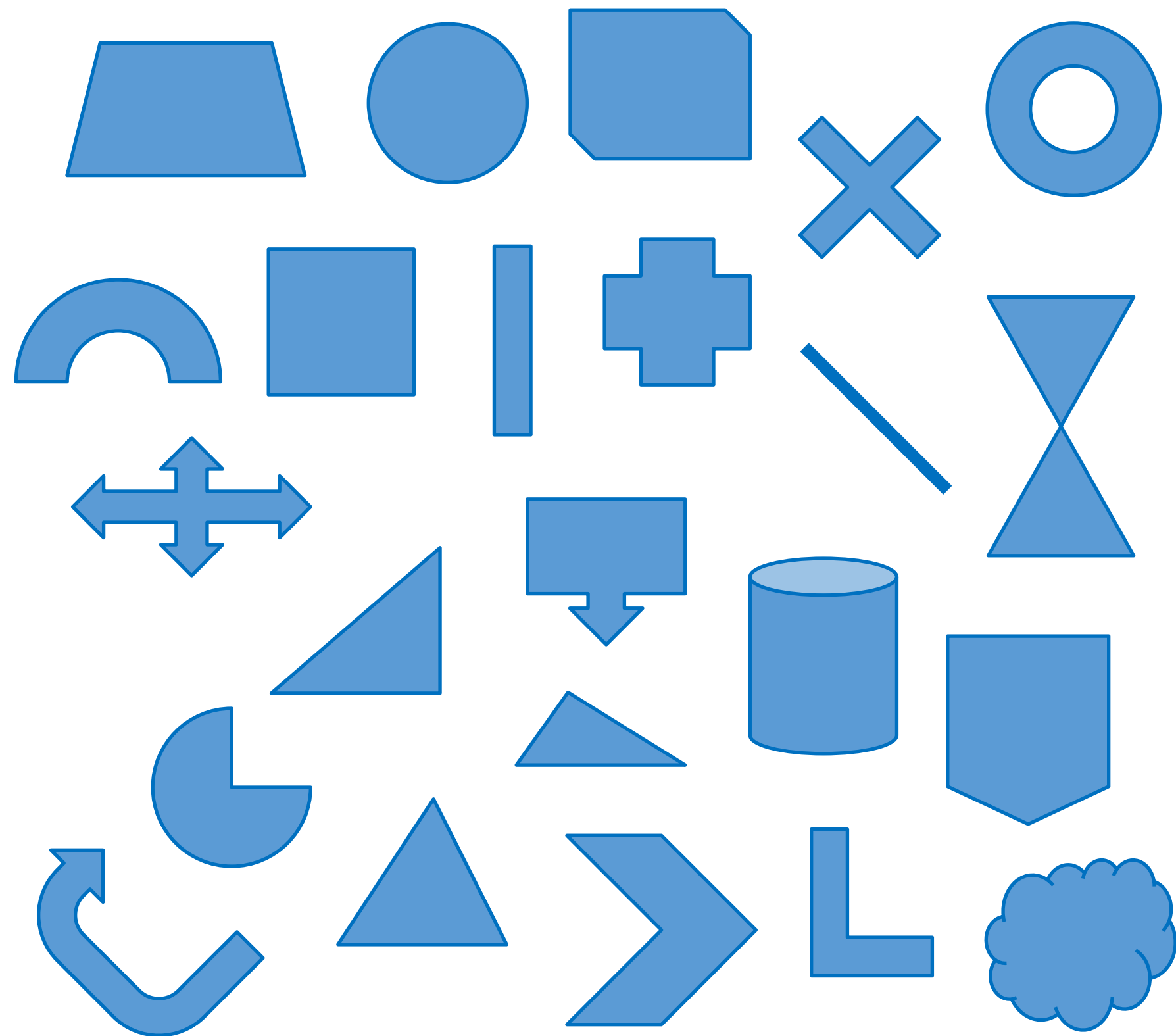
Myth #3

*The Internet Makes
Everyone an Expert*

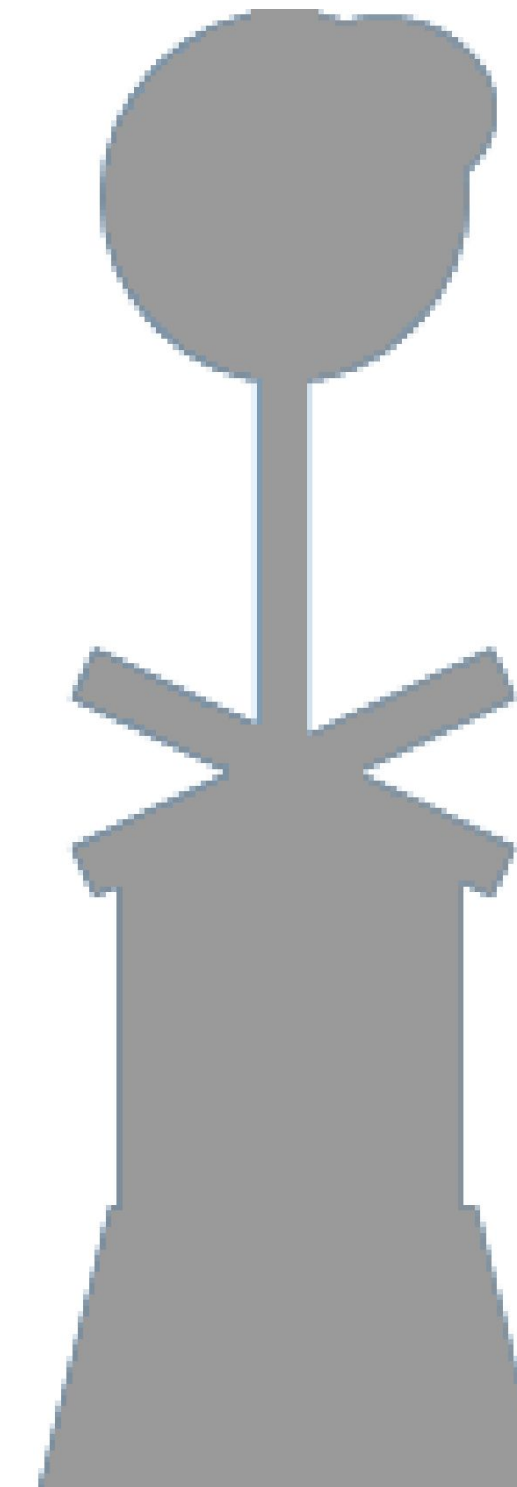


DIFFUSED THOUGHT

MEMORIES



PROBLEM



Creativity Emerges from Long-Term Memory



Myth #4

*Expert-C Comes in
Fully-Formed Bursts of
Insight*



Robert Weisberg

*“Creative thinking is
inside-the-box: all creativity
springs incrementally from
the known...”*



Antecedents & Progress



Fallingwater

“The design just poured out of him.”



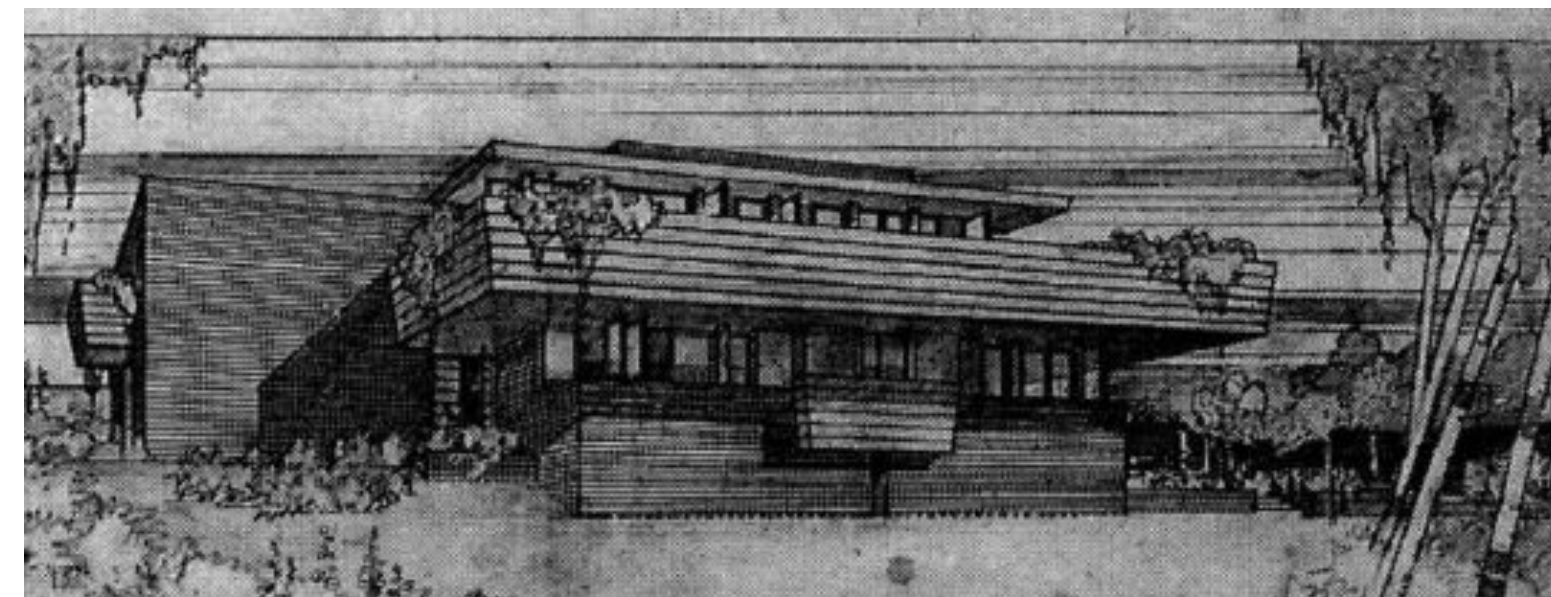
Fallingwater

Two Cantilevered Balconies



Fallingwater

Two Cantilevered Balconies



Prairie Houses

Fallingwater

Two Cantilevered Balconies



Rudolph Schindler
Lovell Beach House

Fallingwater

Two Cantilevered Balconies

Glass Window Column



Fallingwater

Two Cantilevered Balconies

Glass Window Column



Freeman House

Fallingwater

Two Cantilevered Balconies

Glass Window Column

*Cantilevered Over a
Waterfall*

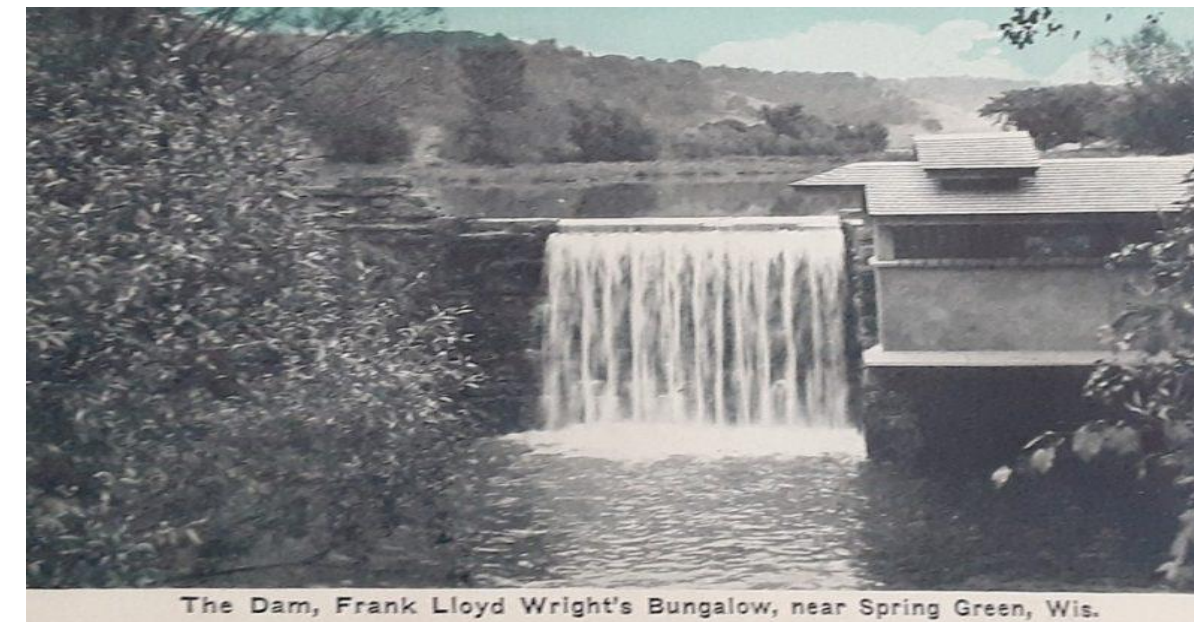


Fallingwater

Two Cantilevered Balconies

Glass Window Column

*Cantilevered Over a
Waterfall*



Taliesin East

Wright

*“The ideas involved here
are no wise change from
earlier work ...
[Fallingwater] is entirely
consistent with the Prairie
Houses.”*



No Drawing?

“One must know every detail – inside and out - before putting pen to paper...”

...I never sit down at a drawing board until I have the whole thing in my mind.”



Guernica

May 1

June 4

35 Days



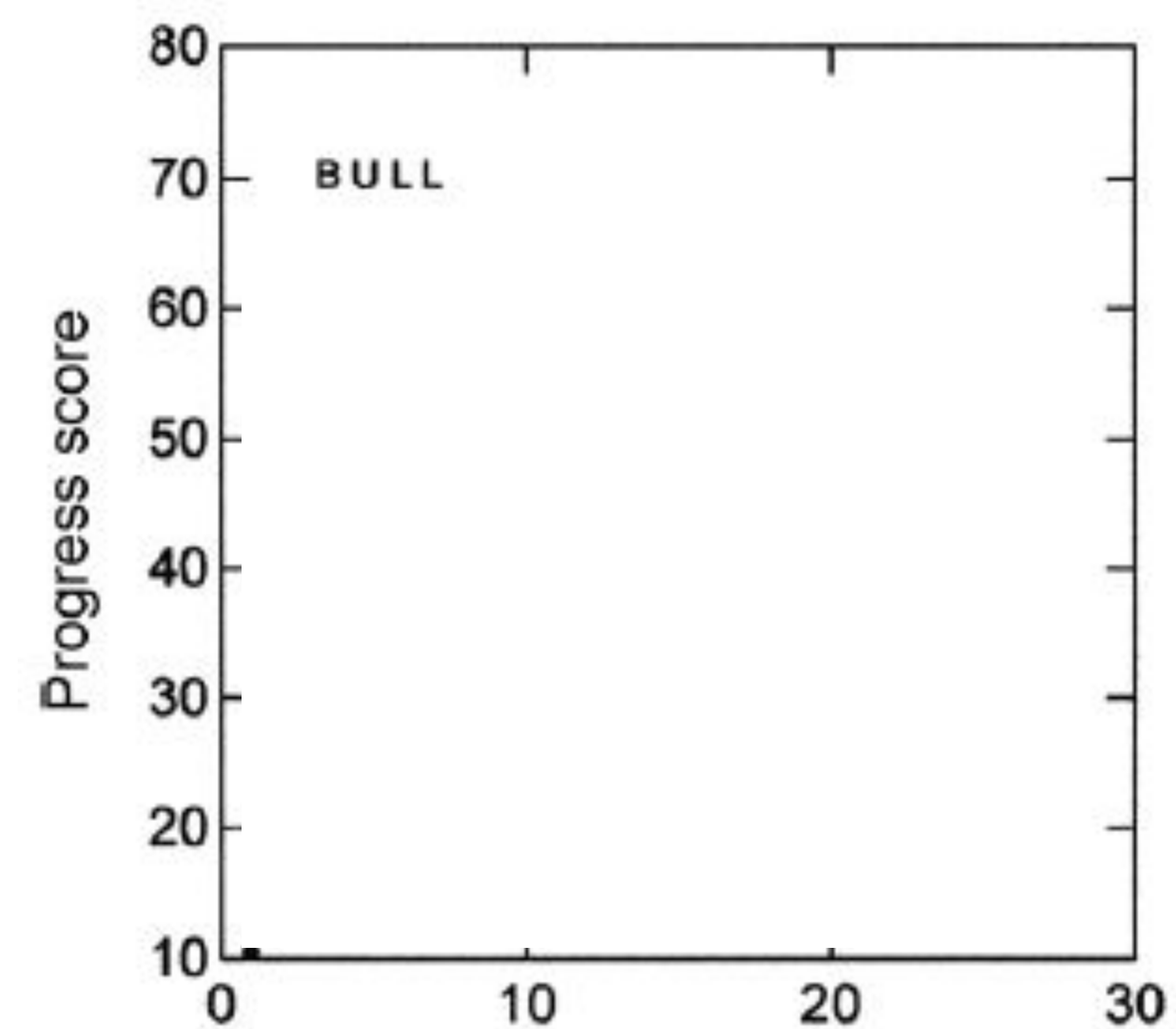
Guernica

45 Drafts



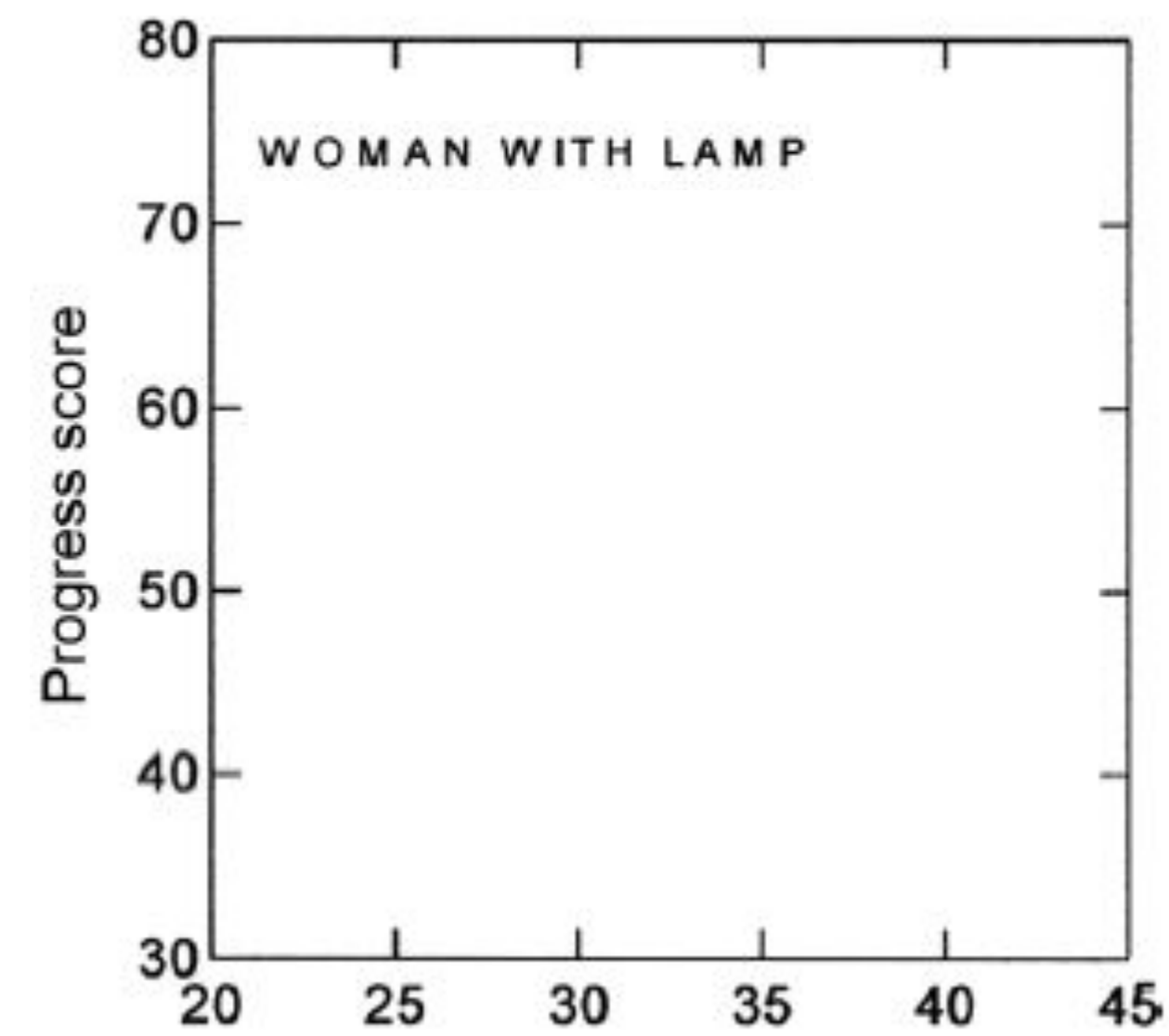
Guernica

45 Preliminary Sketches



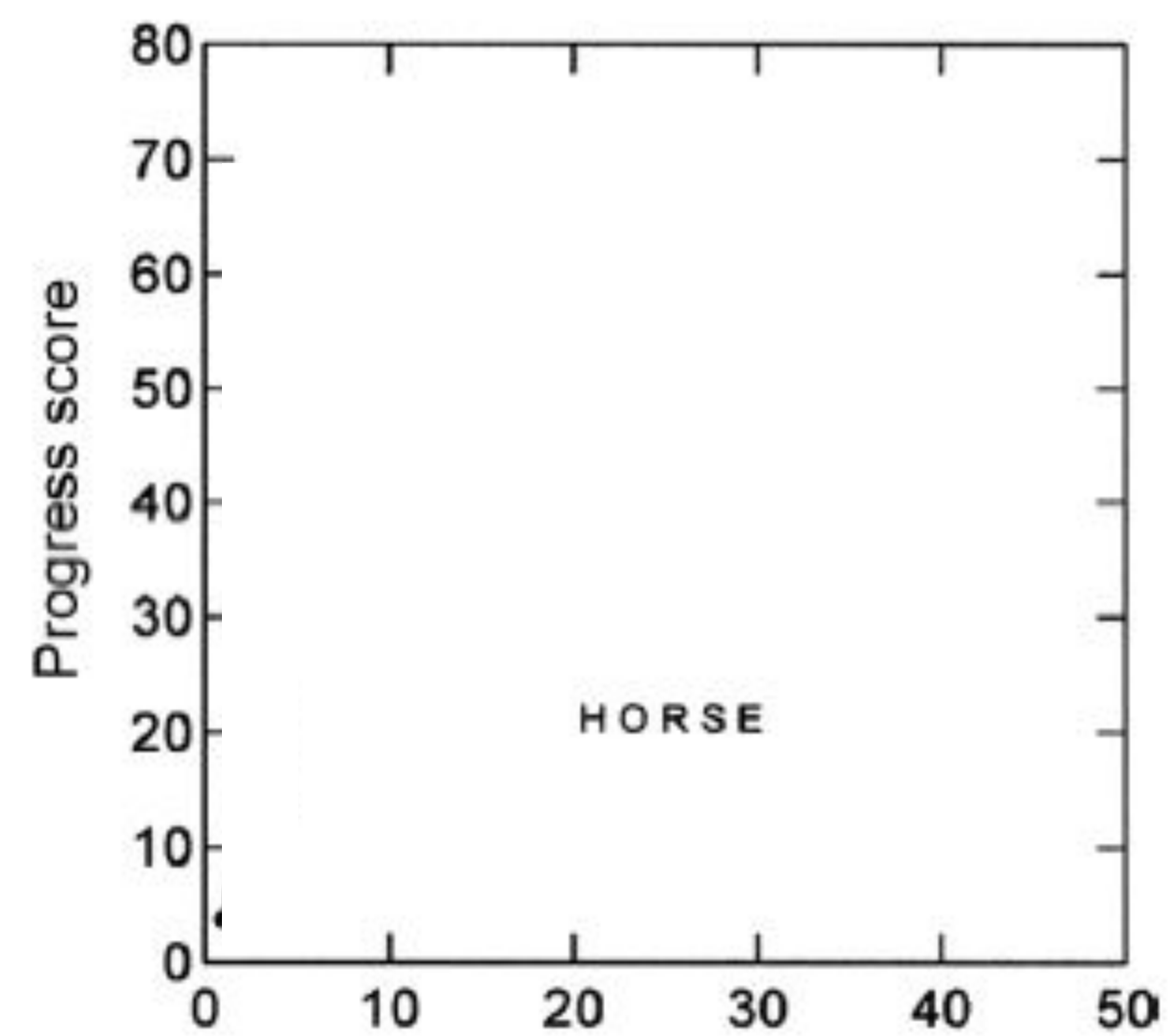
Guernica

45 Preliminary Sketches

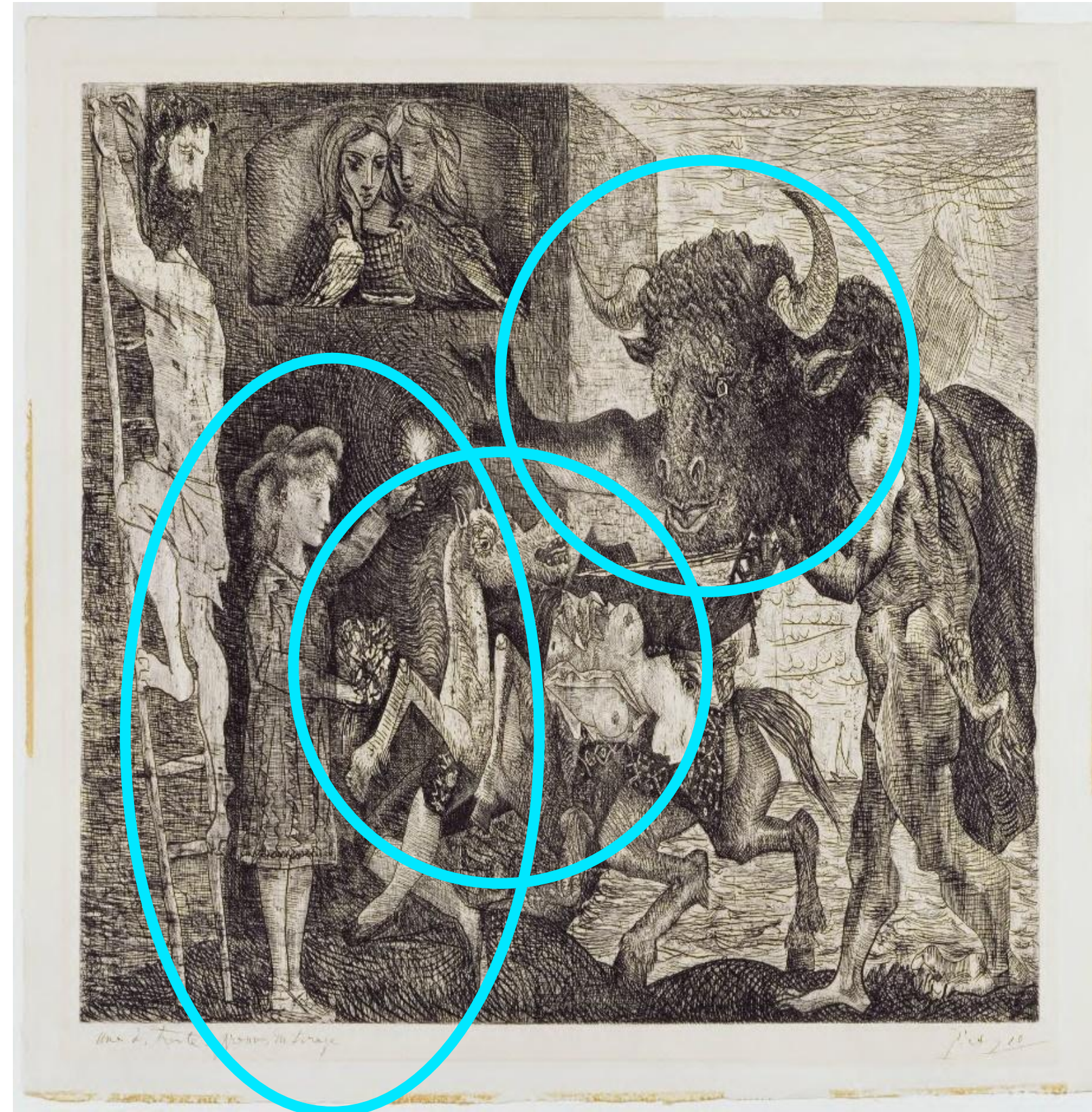


Guernica

45 Preliminary Sketches



Guernica
Minatauromachy
1935



Robert Weisberg

*“Creative thinking is
inside-the-box: all creativity
springs incrementally from
the known...*

*...the reason why we are
struck by the novelty of
Expert-C is that we don't
know what's inside the box
said expert is drawing
from.”*



Myth #5

Expert-C Never Fails



Quantity Breeds Quality



Mozart

300

500

60%



Frank Lloyd Wright

110

532

~21%

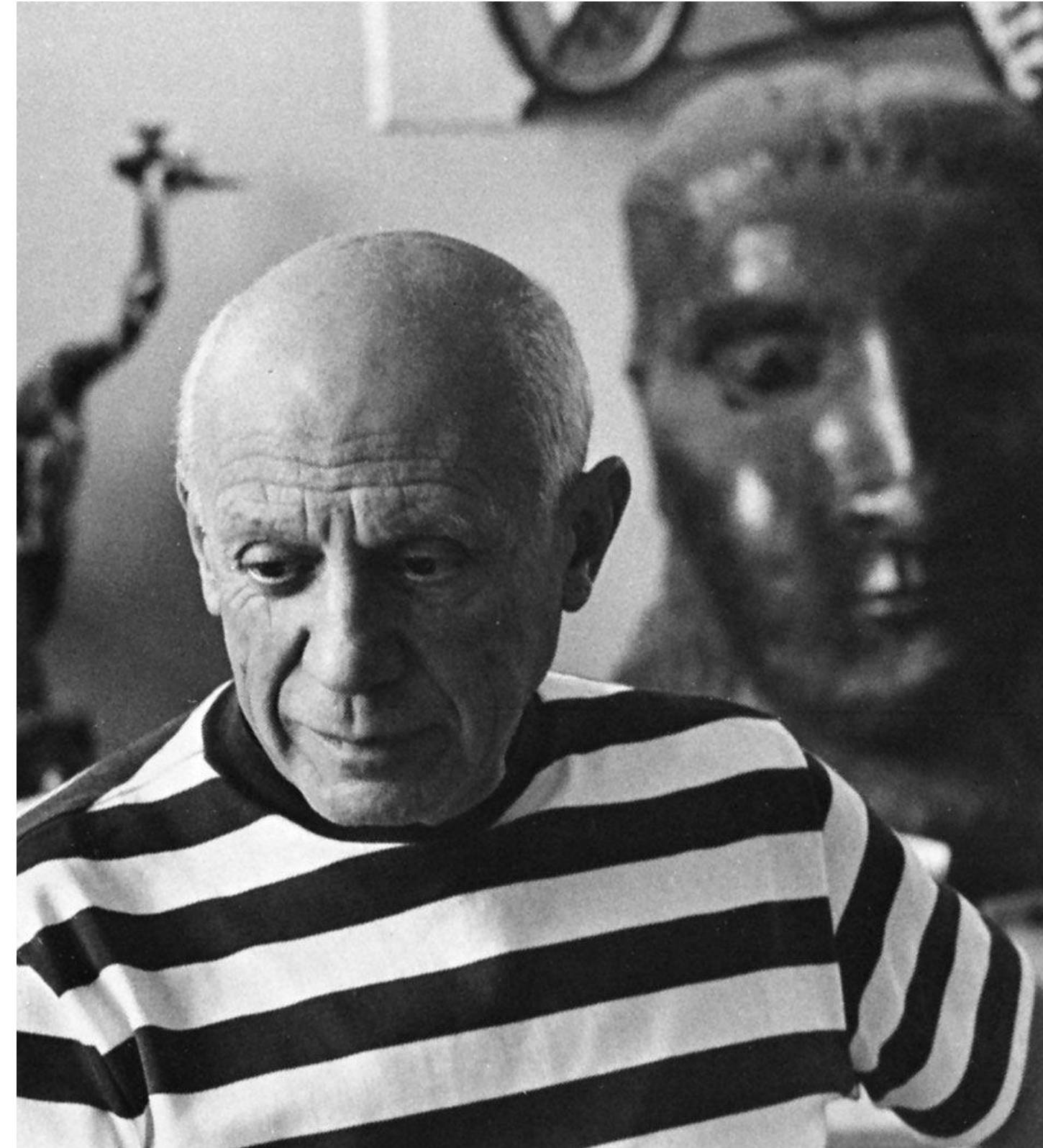


Picasso

350

13,000

~3%



Quantity Breeds Quality
FAILURE!



Let's Pull it Together



Creativity Requires Three Things

Knowledge

Time

Failure



Is Creativity General or Specific?



Is The Creative PROCESS General or Specific?

General

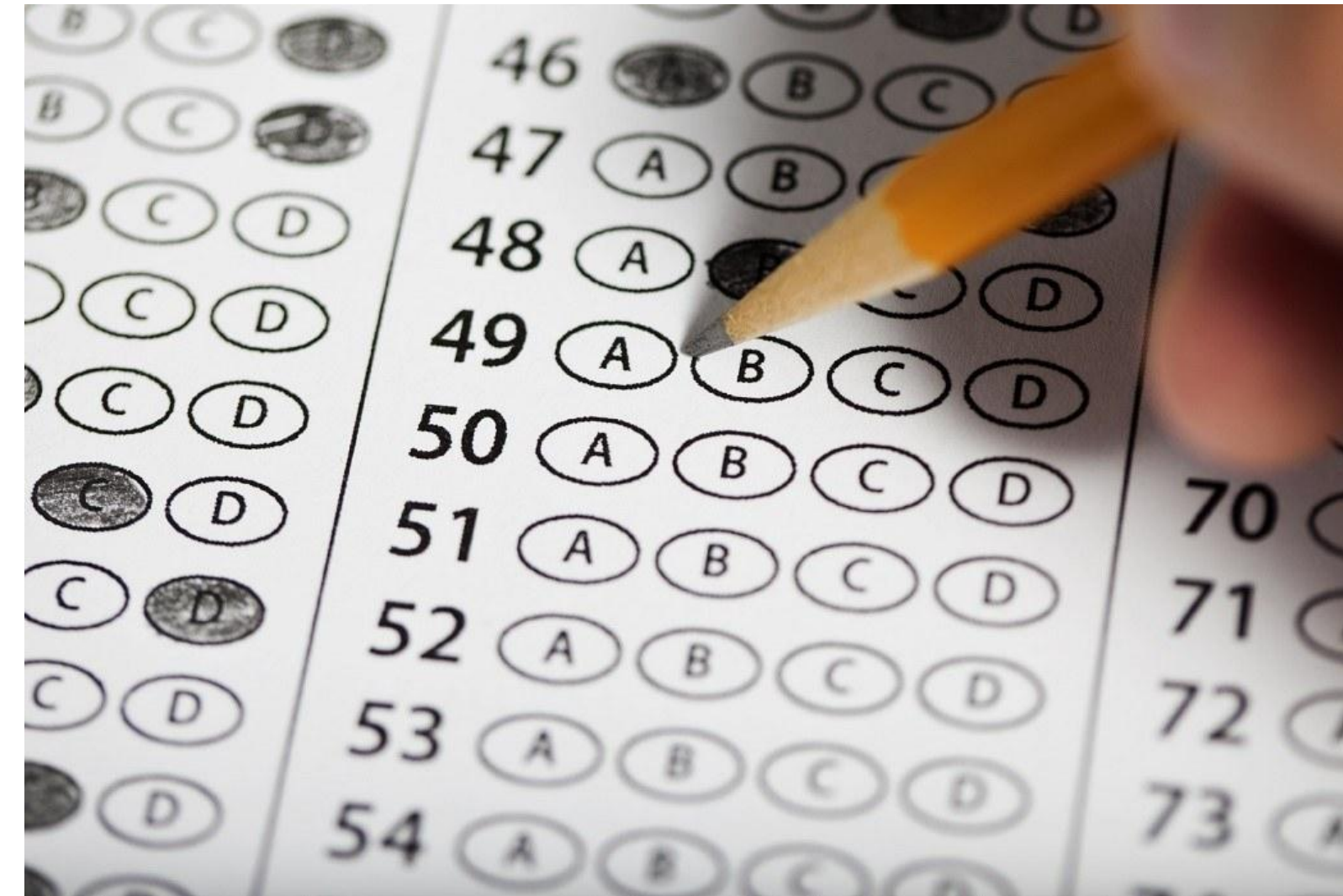


Is The Creative OUTPUT General or Specific?

*Specific
(knowledge)*



Standardized Tests

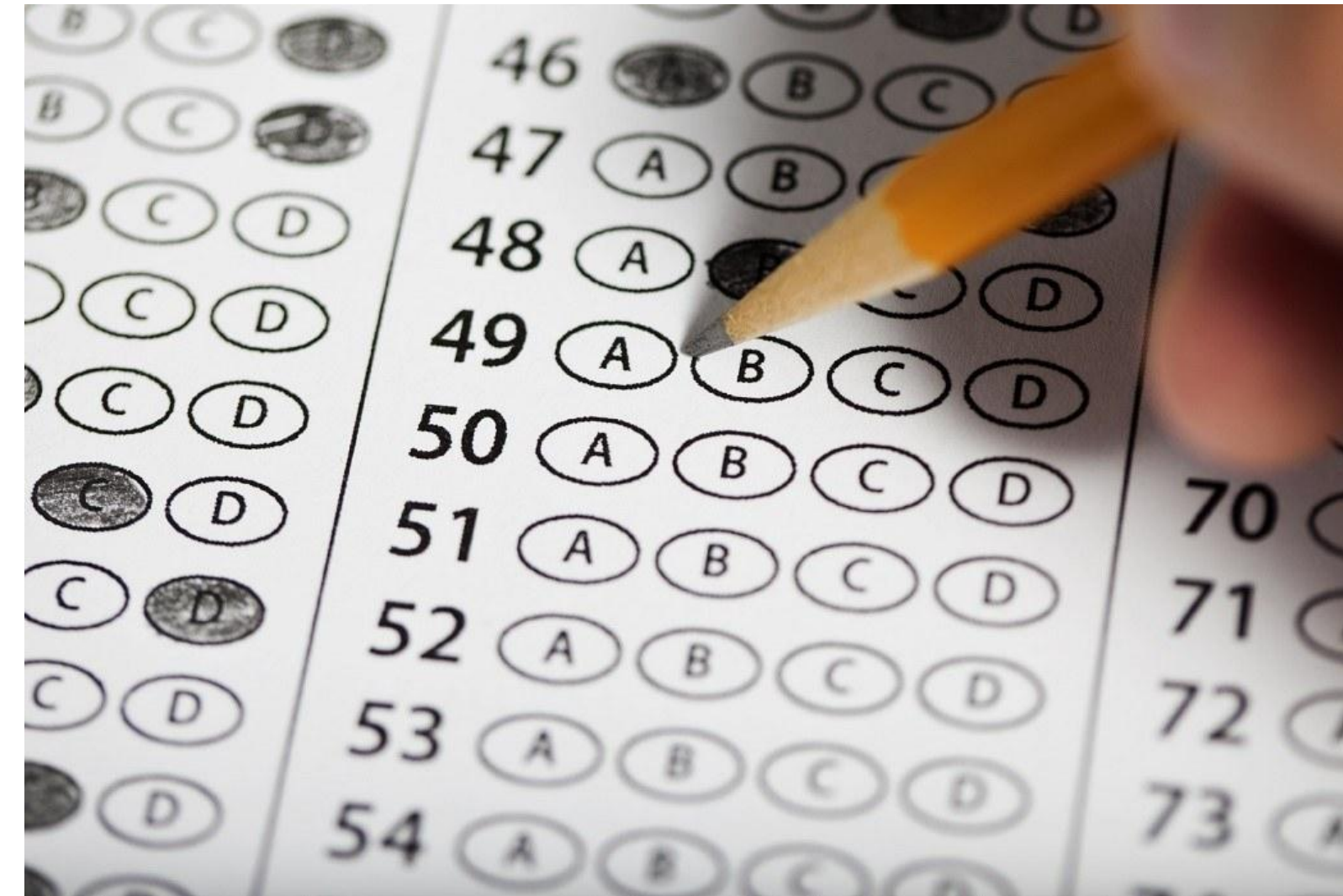


Does Creativity Happen In Sudden Bursts?

Gradual
(time)



Standardized Tests



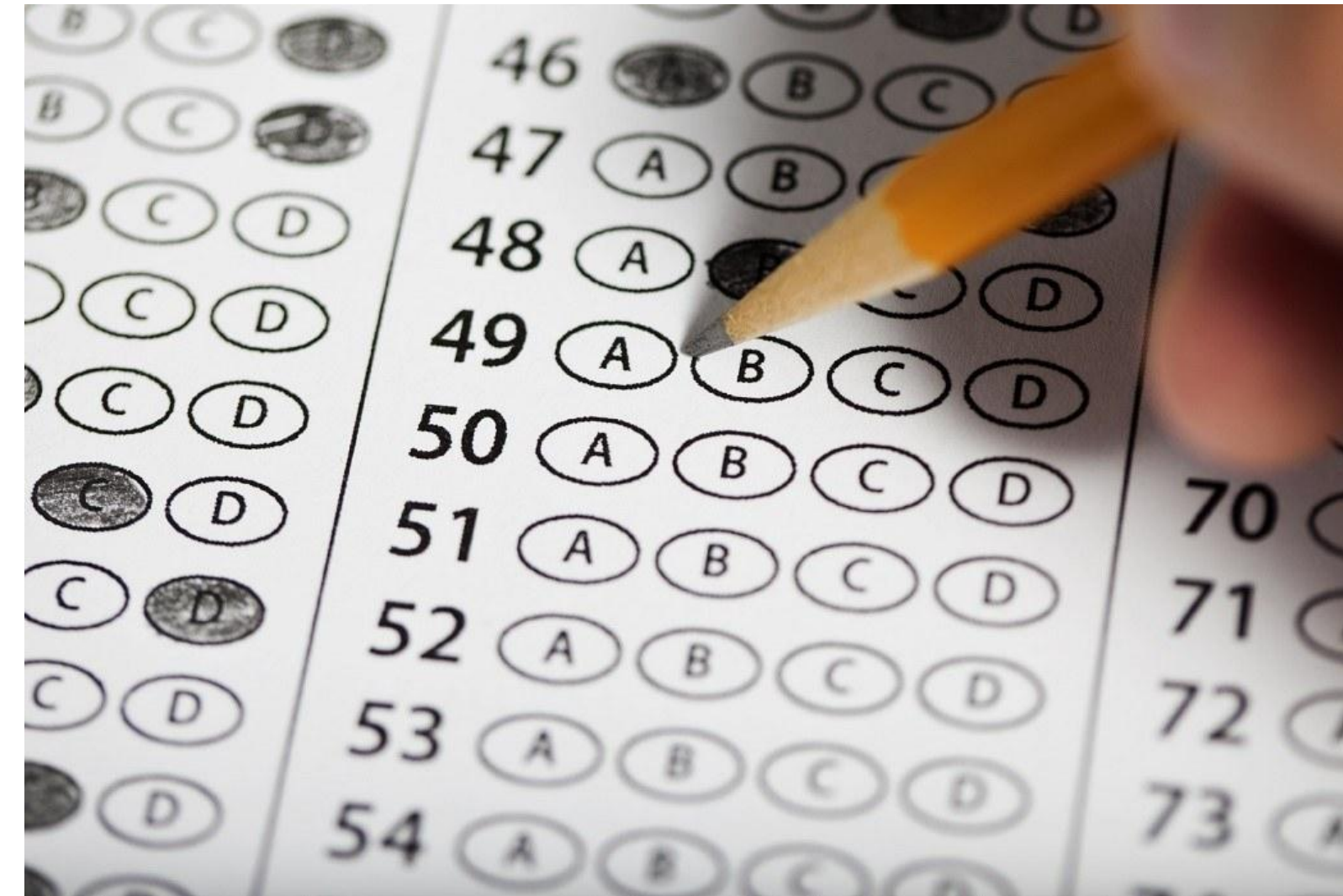
Does Creativity Happen Flawlessly?

Iterative

(failure)



Standardized Tests



Completely Hackable!

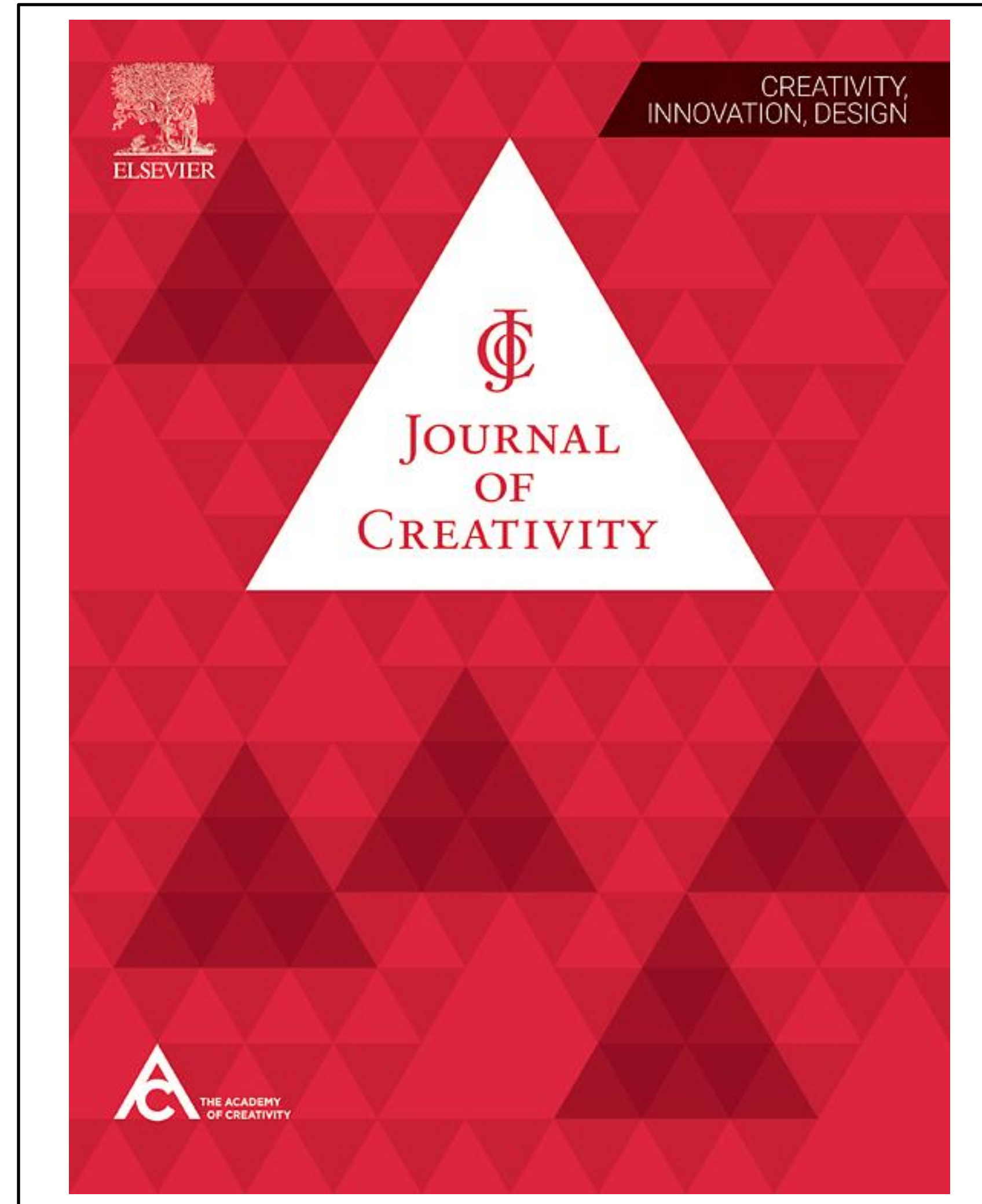


Torrance Test

Divergent Object Use

Complete the Picture

Consequences



Divergent Object Use

Total Number of Answers

Total Number of Categories

Originality



Divergent Object Use

Little-C Creativity

(no utility)



Divergent Object Use

Used to Image a Brain

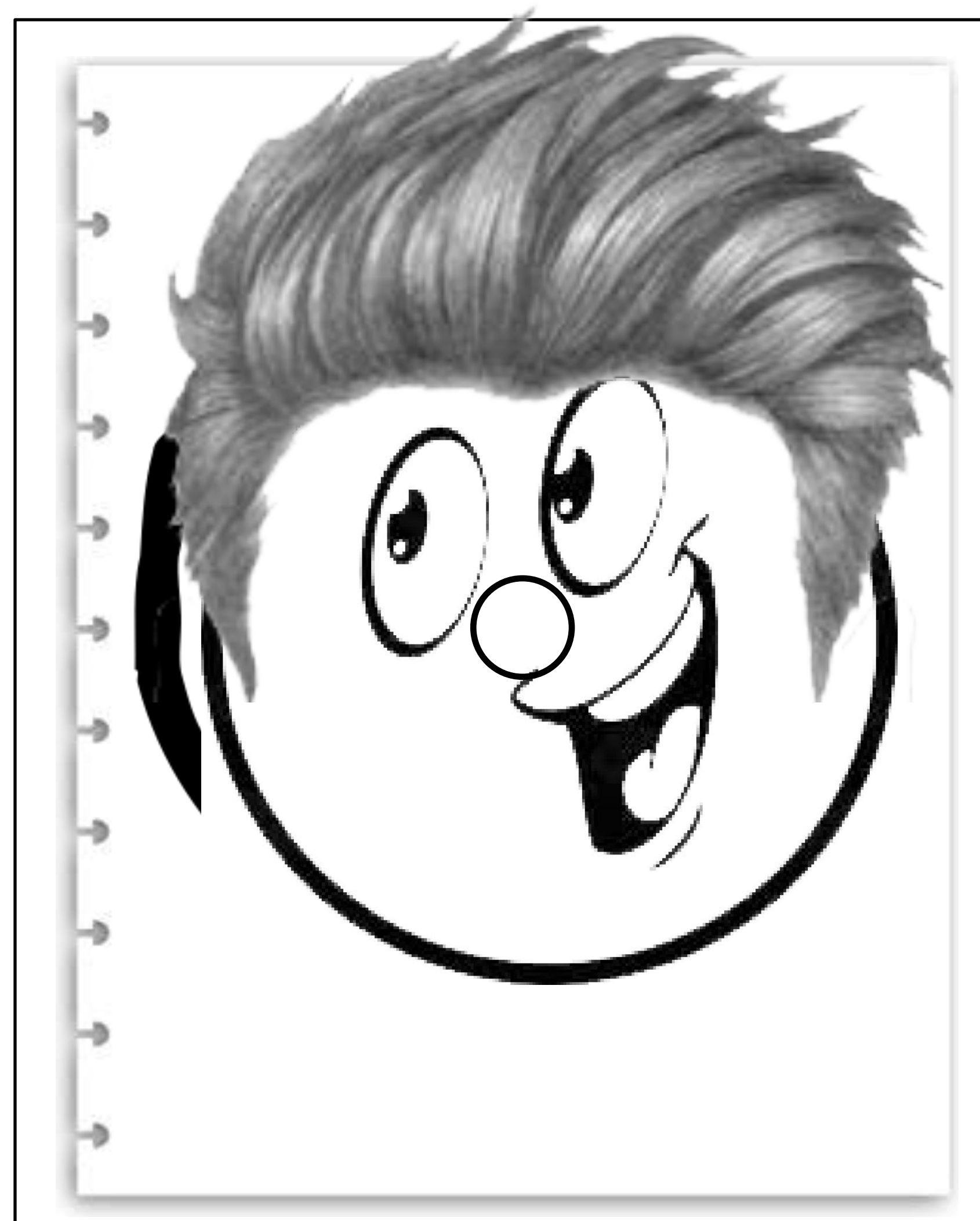


Complete the Picture

Detail of Drawing



Complete the Picture



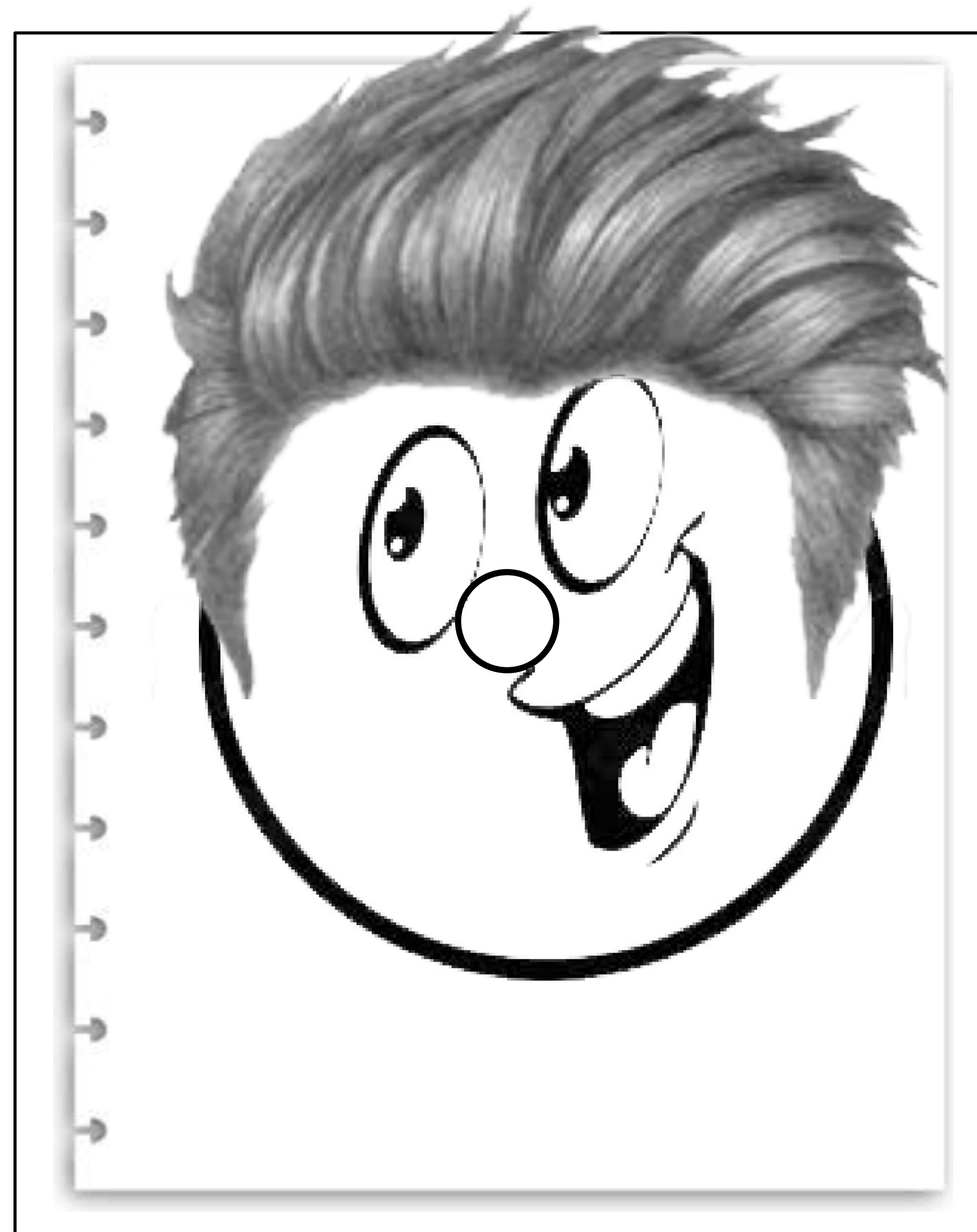
Complete the Picture

Detail of Drawing

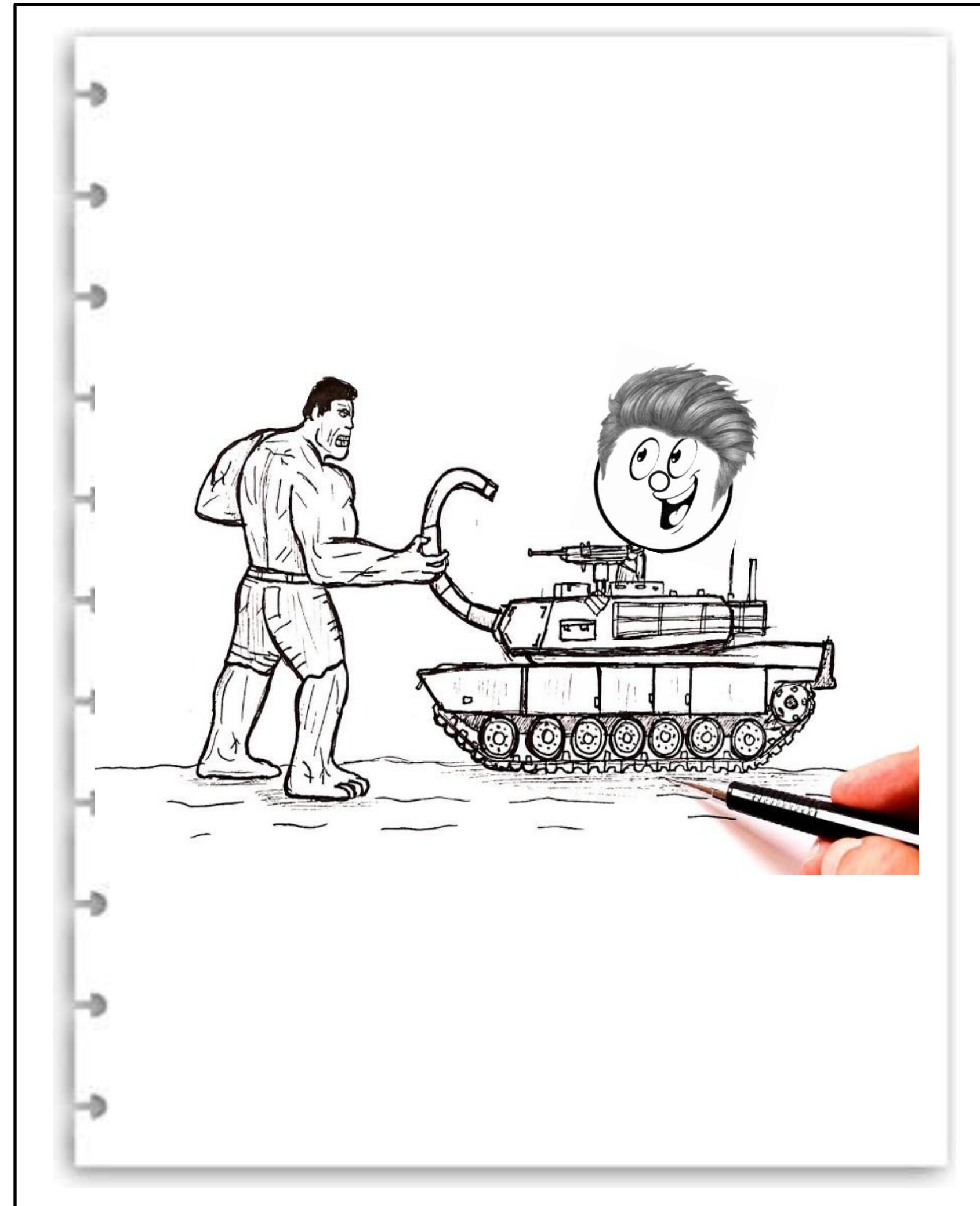
Originality of Use



Complete the Picture



Complete the Picture



Complete the Picture

Little-C Creativity

(no utility)



Consequences

Total Number of Answers

Total Number of Categories

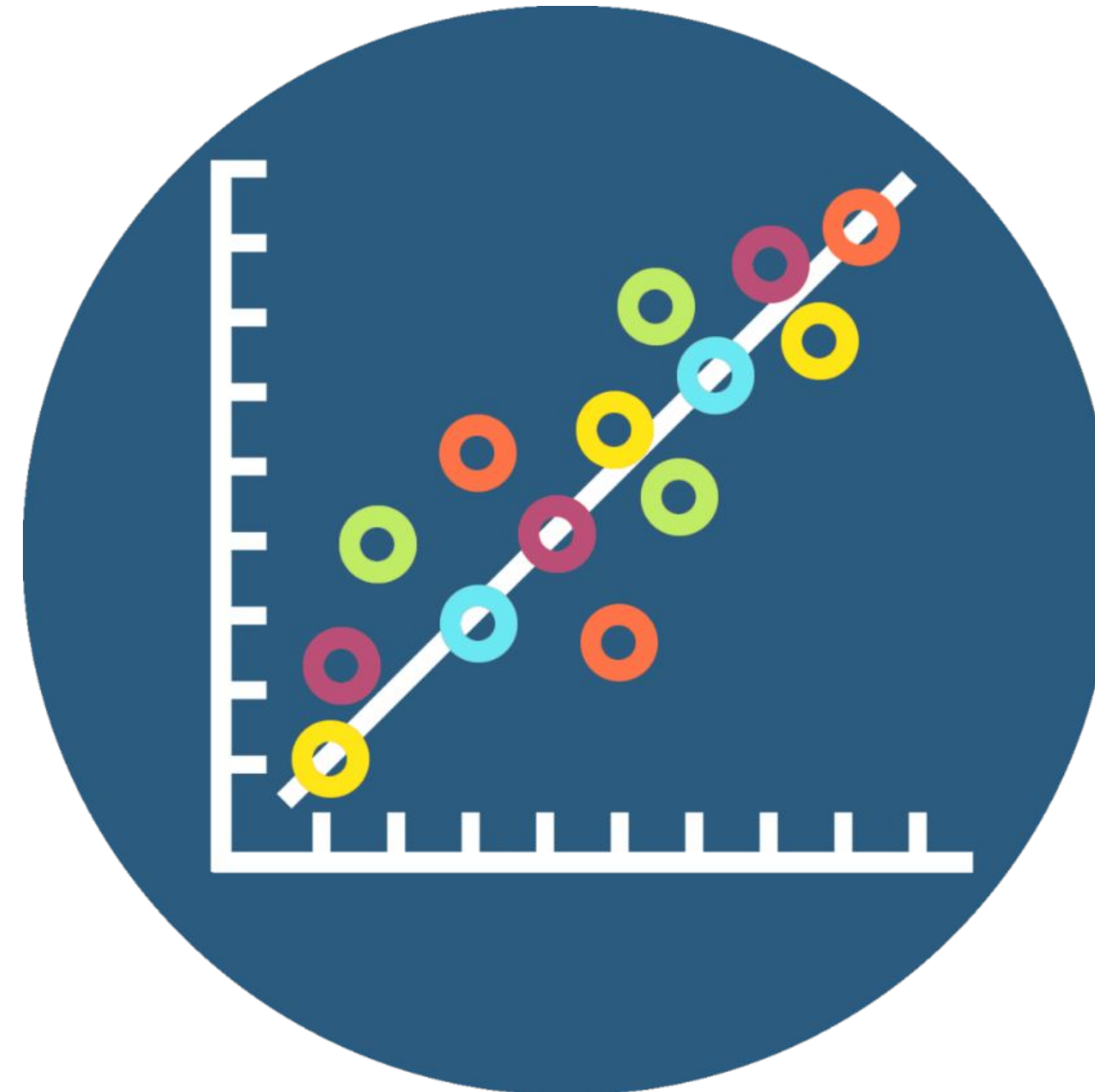
Originality



Consequences
Little-C Creativity
(no utility)



Correlation
0.06



Back to School



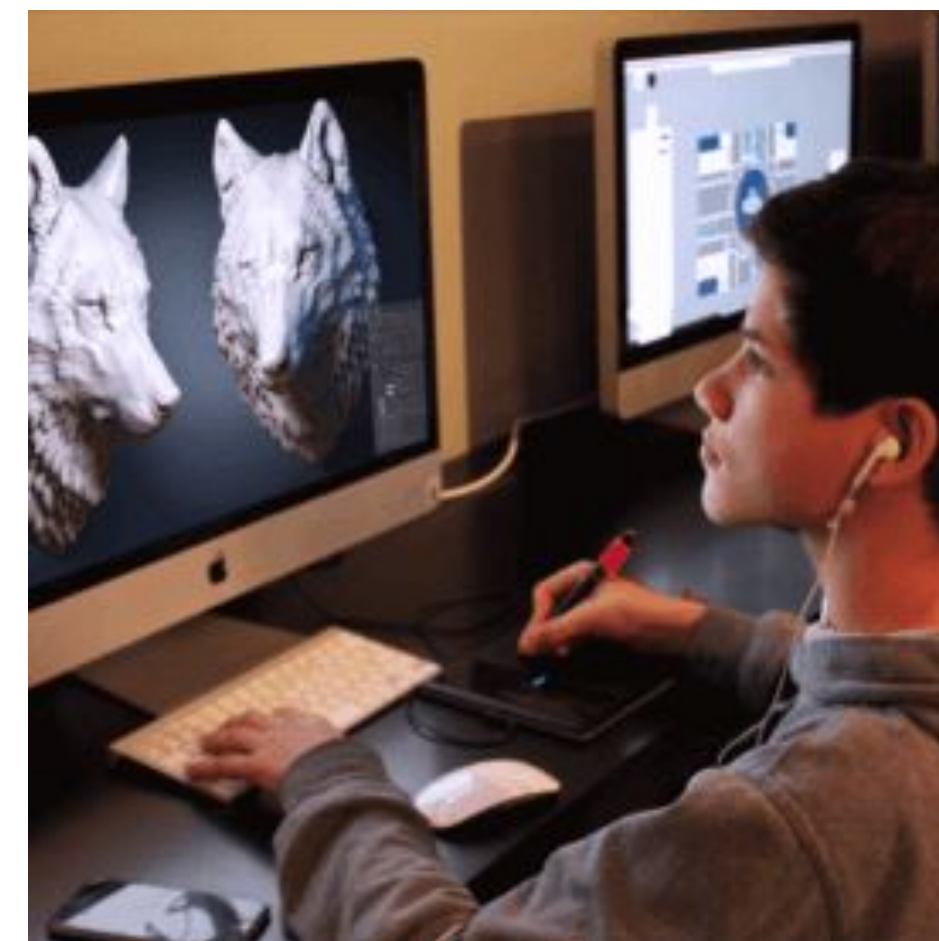
Don't Expect General Creative Output

KNOWLEDGE

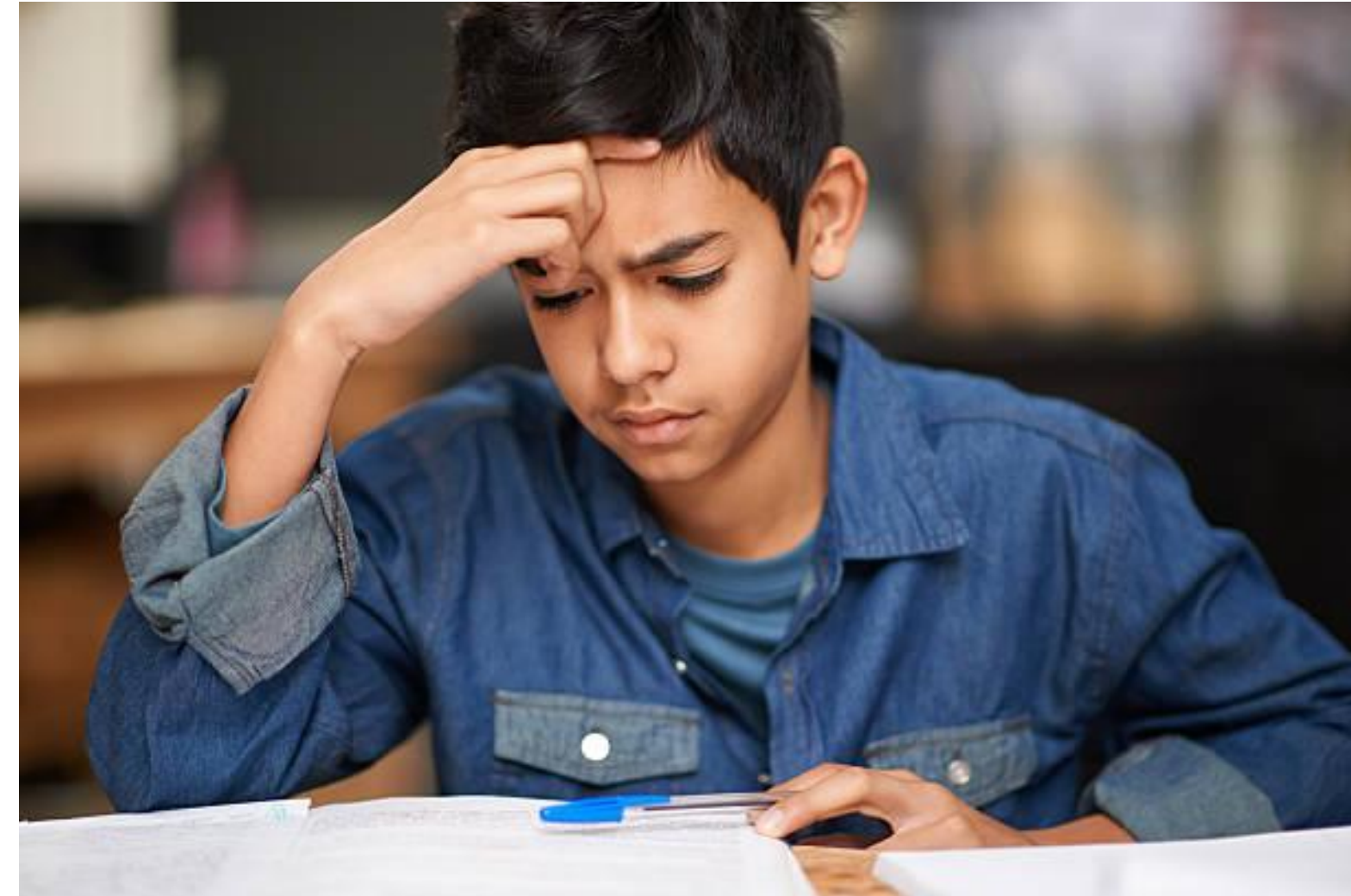


Don't Expect General Creative Output

KNOWLEDGE



**Don't Push
Creativity Too Early**
KNOWLEDGE



Don't Trust Forced Creativity

TIME



Don't Use One-Offs to Assess Creativity

FAILURE



So Now Then

Do Schools Really Kill Creativity?

Knowledge

Time

Failure



Do Schools Really Kill Creativity?

Knowledge

Time

Failure

Structure



Chaos vs Creativity

Knowledge

Time

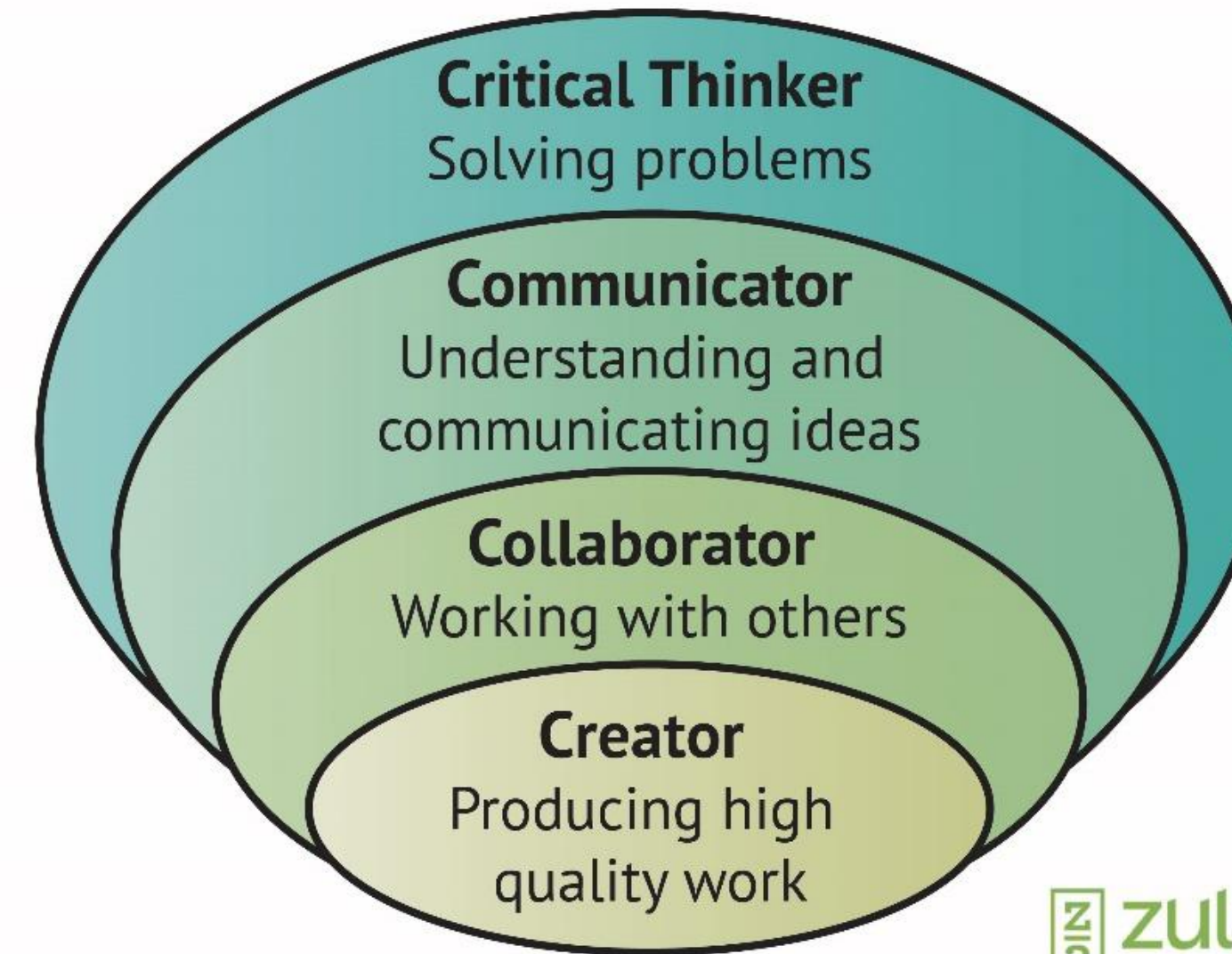
Failure

Structure



Competencies

The Four Cs of 21st Century Skills



Don't Expect General Competencies *KNOWLEDGE*



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