ACTIVITY 03

3D Tangrams

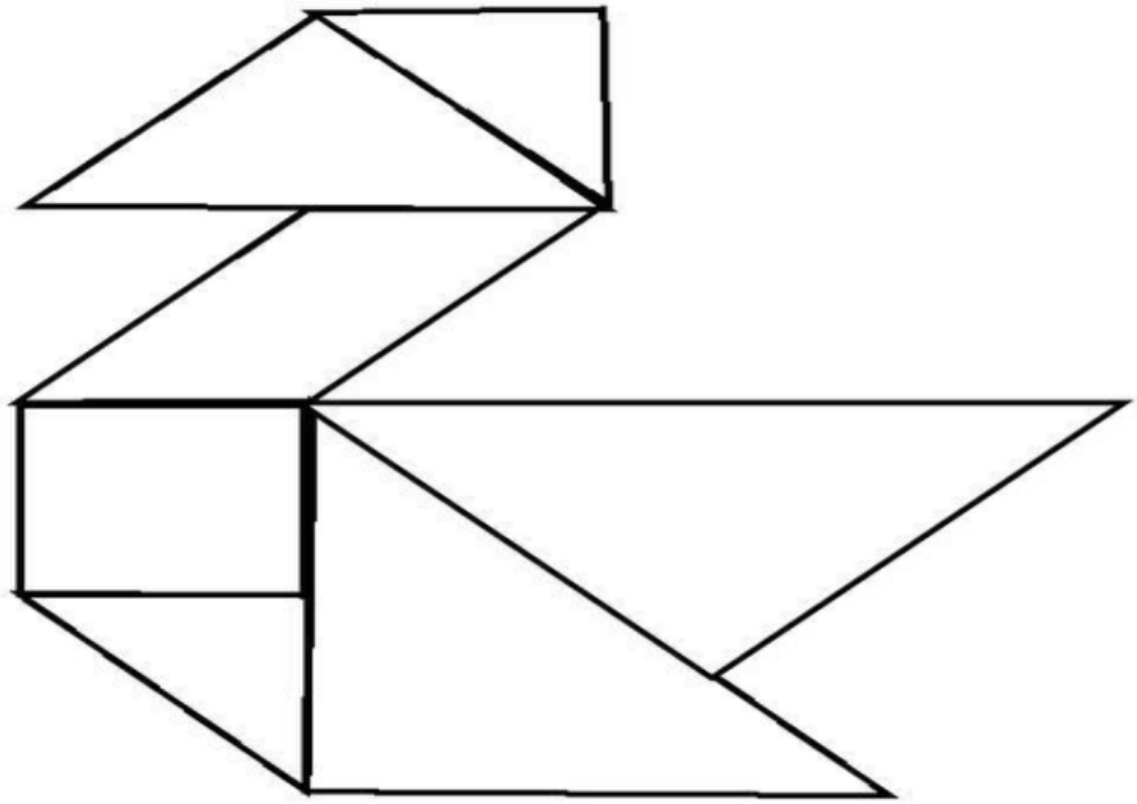

Illustration from the activity

Teaching Planning Tool - 3D Modelling and 3D Printing (STEAM)

Part 1: Conceptual Planning (General Information)

Title of the Thematic (STEAM) Unit

3D Tangrams

Authors / School / Country:
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SUBJECT	Mathematics and Working with Information; Arts and Culture (pre-primary)
YEAR	Children aged 5-6 (pre-primary education)
NUMBER OF LESSONS	2-3 educational activities (free / guided play)
DIDACTIC OBJECTIVES	Develop spatial imagination and basic mathematical concepts by manipulating geometric shapes; gain first experience with a simple technical tool (3D pen).
SPECIFIC OBJECTIVES	The child recognises and names basic shapes (triangle, square, rectangle, parallelogram); understands part-whole relationships; assembles a picture from several parts; observes safety rules.

Note

This activity follows the project's national (SK) pre-primary/primary layout. This page summarises it in the common STEAM template format; the full original activity (procedure, STEAM links, cross-curricular connections, reflection and photo documentation) follows on the next pages.

3D Tangrams

Educational Area	Mathematics and Working with Information, Man and the World of Work, Arts and Culture, Man and Nature
Subject / Domain	Mathematics and Working with Information, Arts and Culture
Age Group	5–6 years (pre-primary education)
Total Time	2–3 educational activities within free play and guided play sessions

CROSS-CURRICULAR LITERACIES

Mathematical Literacy

The child develops the ability to recognise, name and compare basic geometric shapes. Through assembling tangrams, they grasp the relationship between part and whole and orient themselves in simple spatial relationships.

Digital and Technical Literacy

The child is introduced to a simple technical tool – the 3D pen – gaining basic experience of creating three-dimensional shapes and learning to handle age-appropriate technology safely.

Visual Literacy

The child perceives shape, colour and composition. They observe how individual geometric shapes come together to form an image or figure.

Social Literacy

The child collaborates in a small group, communicates, takes turns and respects agreed working rules.

STANDARDS

Content Standard

The child develops spatial imagination, orientation in space and basic mathematical concepts through manipulation of geometric shapes. Through play, observation and creative activity, they explore relationships between shapes, their position and their role within a whole. They gain basic experience of using a simple technical tool.

Performance Standard

The child recognises and names basic geometric shapes; creates geometric shapes using the 3D pen; assembles a simple picture from several parts following a template or their own imagination; orients themselves in basic spatial relationships; collaborates in a small group; follows safety rules when using the 3D pen; and expresses the outcome of their activity in simple sentences.

SPECIFIC OBJECTIVES

Cognitive Objectives

- The child recognises and names basic geometric shapes (triangle, square, rectangle, parallelogram).
- The child understands the relationship between part and whole.
- The child distinguishes the position of shapes (above, below, beside).

Affective Objectives

- The child shows joy in discovering and assembling shapes.
- The child engages in the activity with interest and curiosity.
- The child collaborates with other children.
- The child experiences a sense of achievement from their own creation.

Psychomotor Objectives

- The child manipulates tangram pieces.
- The child develops fine motor skills and hand-eye coordination.
- The child observes or, under supervision, uses the 3D pen.

- The child follows basic safety rules.

STEAM CONNECTIONS

S	The child observes the formation of shapes and the change in material as the plastic cools.
T	The child becomes familiar with the function and use of the 3D pen.
E	Assembling shapes into a single whole; planning the procedure.
A	Creating pictures from shapes; working with colour and imagination.
M	Recognising geometric shapes; orientation in space; part–whole relationship.

TEACHING ORGANISATION

The activity takes place in the kindergarten classroom within free play and guided play sessions. Tables are arranged into smaller workstations. Children work in small groups (3–5 children). The activity proceeds at a calm pace, with emphasis on an individual approach and the joy of play.

Organisational Forms

- Teacher-led activity – the teacher explains the task, demonstrates the procedure and supervises safety.
- Individual work within the group – the child assembles a tangram following a template or their own imagination.
- Group work – children observe each other, communicate and cooperate when assembling shapes.

Teaching Methods

Learning through play, experiential learning, teacher demonstration, practical hands-on activity, guided conversation and discussion, encouragement and positive feedback, age-appropriate verbal reflection.

Didactic Materials

Low-temperature 3D pens designed for children; filaments in various colours; heat-resistant mats; finished 3D tangram pieces (prepared in advance by the teacher); paper tangram templates (animals, objects, figures); classic tangrams or building blocks (supplementary activity); tables and chairs adapted to the age of the children.

METHODOLOGICAL PROCEDURE

Motivation

The teacher sits with a small group of children at the table and spreads the tangram pieces out in front of them.

Teacher: "Look, children – what do I have here? These are different shapes. Let's try to put something together with them."

Teacher picks up a piece: "What shape is this?" (Triangle / Square)

Teacher: "Let's try to make a picture from these shapes. What could it be?" Children: "A house." / "A cat." / "A boat."

Explaining How the 3D Pen Works

"This is a 3D pen. When we switch it on, a thin thread comes out. We will use that to draw along the path." The teacher demonstrates briefly and emphasises safety.

Main Activity

The teacher places a paper tangram template in front of the children. They try placing the pieces, rotating them and comparing with the template. The teacher then shows the finished 3D tangram pieces – raised

versions they can pick up and examine by touch. Selected children may briefly try guiding the 3D pen under direct supervision. Children assemble pictures from the 3D pieces and invent their own shapes.

Closing Activity

Short conversation: "What did you like most today?" / "Which shape was the biggest?" / "How many pieces did you use?"

CROSS-CURRICULAR CONNECTIONS

Mathematics and Working with Information

The child develops basic mathematical concepts by recognising and naming geometric shapes, orienting in space and grasping the part–whole relationship.

Language and Communication

The child names shapes verbally, describes what they created and expresses their ideas in simple sentences.

Arts and Culture

When working with tangrams, the child develops creativity and aesthetic sense, perceiving colour, shape and composition.

Man and the World of Work

The child learns safety rules, work procedures and group working rules.

Movement and Health

Handling the tangram pieces develops fine motor skills and hand-eye coordination.

PHOTO DOCUMENTATION

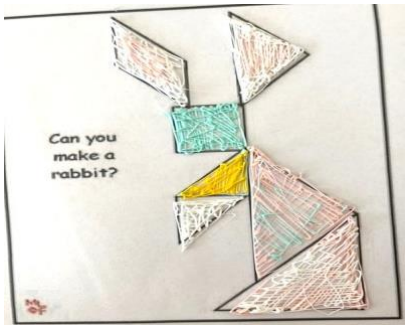

Fig. 25 Working with the 3D pen

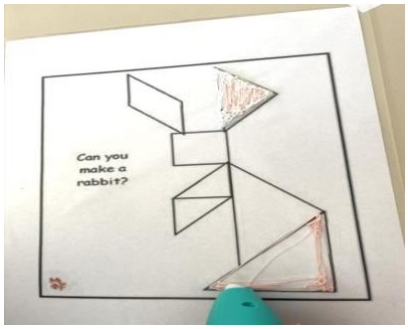

Fig. 26 Template – can you make a rabbit?

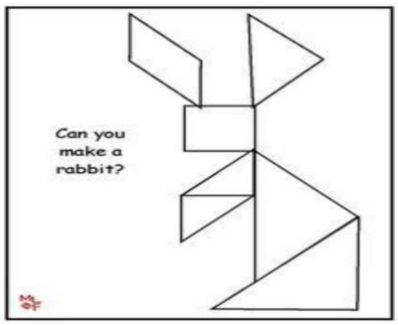

Fig. 27 Template – can you make a polar bear?

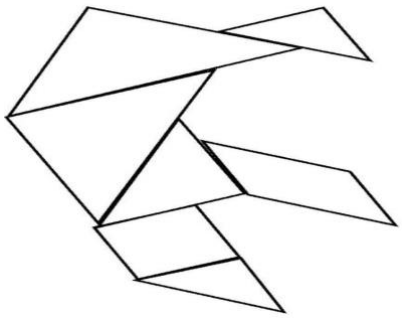

Fig. 28 Template – can you make a swan?

Tangram templates – animal figures:

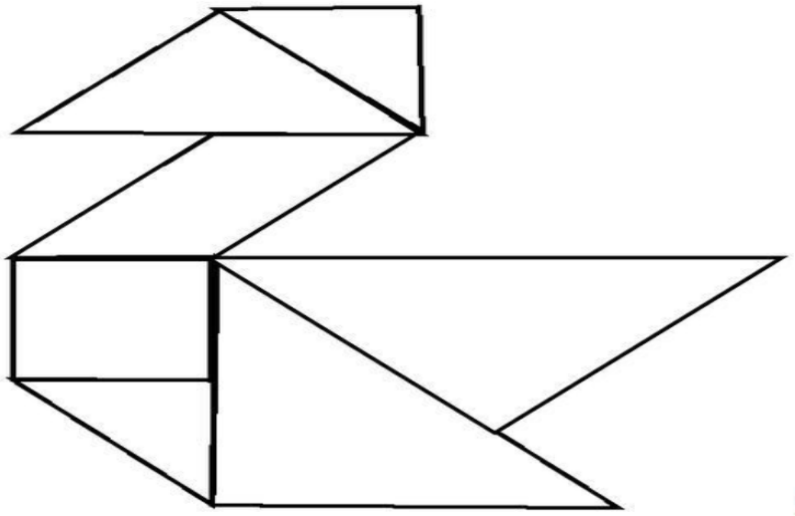

Fig. 29 3D tangram activity

REFLECTION

The educational activity "3D Tangrams" was carried out within free play and guided play sessions with children aged 5–6. The children showed great interest and enjoyment in assembling shapes and creating pictures. The raised 3D shapes were attractive and allowed them to engage tactile perception. Combining ready-made 3D pieces with classic paper templates and building blocks proved highly effective.

Recommendations for the future:

- Expand the range of templates to include various difficulty levels.
- Work with smaller groups of children.
- Include the activity repeatedly throughout the school year.

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3D STEAM

This material was developed within the framework of the Erasmus+ KA2 project named Accelerating STEAM-related Knowledge and Skills via 3D Modelling and 3D Printing (reg. no. 2023-1-CZ01-KA220-HED-000160664).

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