

Pentominos and the pavior

Opportunities for learning

Content-based

- The kids create Pentominos with 5 tiles each
- The kids draw Pentominos on structured paper
- The kids parquet a surface with a Pentomino

Process-based

- Problem solving : The kids have to independently generate new shapes and develop strategies throughout this process
- Representing: They transfer Pentominos from material level to an iconic drawing
- Communicating: They verbalize their solution process and comprehend solutions of others
- Arguing : They support or oppose different opportunities within personal interaction with others and justify their opinion about the uniformity of two Pentominos in particular

Material

Tiles in two colors (e. g. red and blue), flipchart paper, blue and red wooden pencils, scissors

Introduction

The teacher tells the story of *Pavior Schmitt* who tiles a lot of bathroom and kitchen floors every week by using the same square pattern (meanwhile an ordinary tile design can be shown) Yet, he thinks that his pattern got very boring throughout his work. Therefore, he considers to invent a new tile pattern. As he comes home he finds 10 tiles in his bag. Pavior Schmitt uses those tiles to create two patterns with 5 tiles each. These 2 patterns will be shown to the kids.

Now Mr. Schmitt asks himself whether there are more possibilities for arranging a pattern with 5 tiles.

Stimulus questions: *Can you invent further Pentominos?
How would you approach this task?*

Learning process: *to comprehend the main example and acquire term knowledge*

Activity I

The kids work in mixed tandems. They have to find new Pentominos for Mr. Schmitt.

Every tandem receives enough tiles to build various shapes with 5 tiles each. As soon as the kids found a new Pentomino shape they have to draw it on the flipchart paper and cut it out afterwards. The new Pentomino shapes stay on the table.



- Stimulus questions:** *Which tile are you going to use?
How did you get from the first Pentomino to the second?*
- Learning process:** *To get familiar with the material
To create Pentominos through active testing*
- Additional challenge:** *Find all Pentominos! How many are there?
Compare these two Pentominos! Are they any different?*

Intermediate exchange - reflection

The tandems can start a "museum tour" within the classroom. Here, they can collectively look at the Pentomino shapes of other kids. In doing so they are able to compare their own Pentomino shapes (on paper) with the shapes of their classmates.

Subsequently the kids will sit in a circle for a discussion about the previous activity.

- stimulus questions:** *How did you proceed?
Which group has found the most shape variations?*
- How many forms are there?
Are both shapes different or the same?
Which shapes do you still want to create?*
- learning process:** *To describe the own approach
To argue for or against a conformity of particular shapes*

Activity II - create and document own patterns

All kids commit themselves on one Pentomino. They have to parquet a flipchart paper, or to put it in another way, the bathroom floor for Mr. Schmitt. How to approach this task will be discussed in the group: The cut out Pentomino shape is used as a template. It can be repeatedly placed onto the Pentomino shape drawn previously. Then it will be copied with the colored pencils. Here, it is particularly expected that careless mistakes will occur. The teachers have to make the kids aware of those mistakes right away. If the kids lightly press the pencils on the paper, colouring will be faster and mistakes can be corrected more easily. The paper provides as structural help and should be used accordingly.

- Stimulus questions:** *How did you come up with this pattern?
Can you close this gap?
Are you able to parquet this Pentomino differently?*
- Learning process:** *To parquet with Pentominos
To transfer and document displays*



Closing exchange and reflection

The kids exemplarily present their bathroom floors. They have to show their picture and describe how they came up with their tiling. In addition, problems that may have occurred and appropriate solutions should be reviewed.

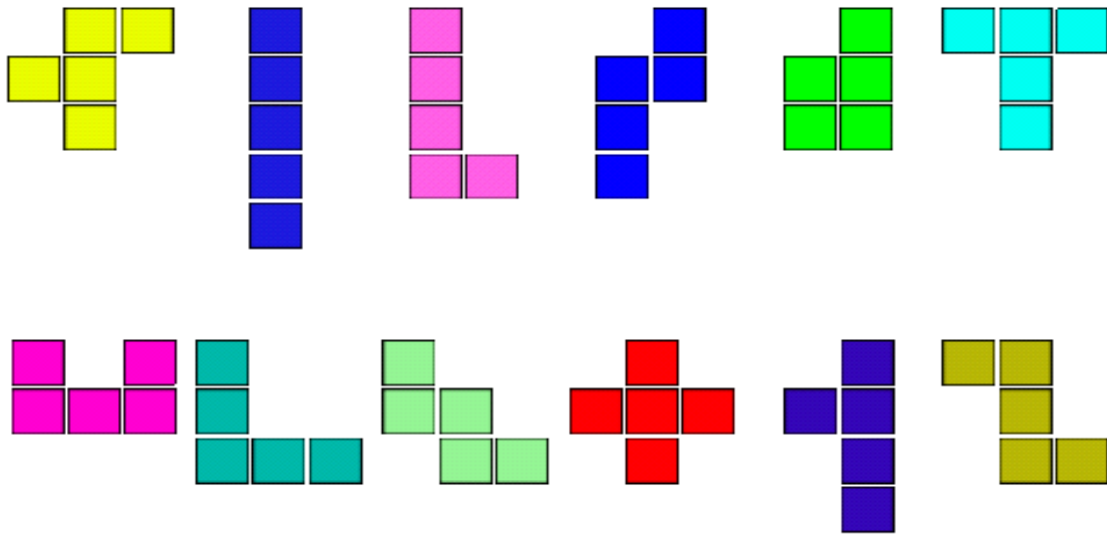
The reason why some patterns were used more frequently/more scarcely can be discussed subsequently. Furthermore it is interesting, that some tiles have to get cut in order to finish the tiling in the end, as the space is not infinite. It is possible to ask the plenum about which pattern the kids would use for a new space after they saw all shapes their classmates created (without the need to cut something in the end).

Stimulus questions: *How did you approach the task?*
 What kind of difficulties did you face?
 Can there be gaps?
 What happens to the edge of the space?
 Did you have different continuation ideas (within the tandem)?

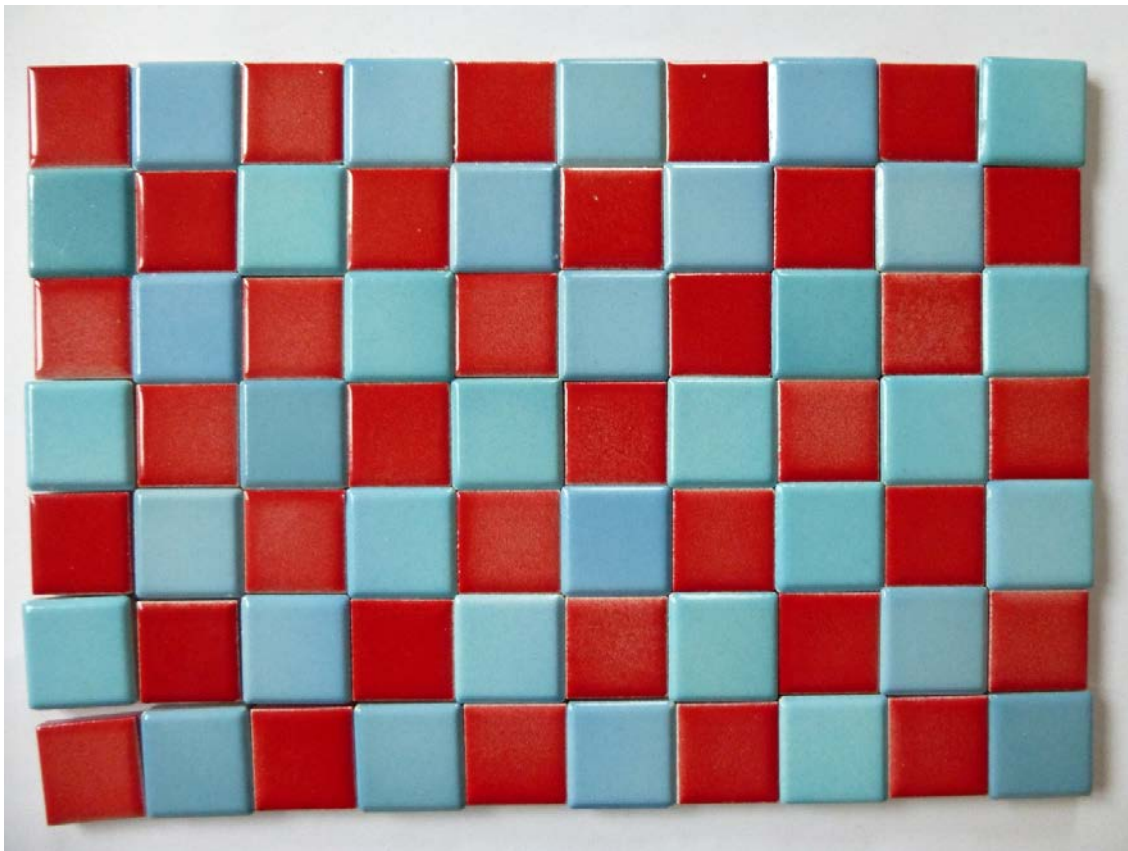
Learning process: *To describe and reflect on the own process*
 To comprehend different solutions
 To communicate about tiling



ATTACHMENT 1: Twelve Pentomino options



ATTACHMENT 2: Ordinarily tiled floor



ATTACHMENT 3: Pentominos examples

