Chapter 1

Cases about Using New Assessment Approaches

Tessellation Presentation

Last year, I developed a tessellation project for my seventh-grade students to assess their understanding of six key geometric concepts: symmetry, congruence, similarity, reflections, slides, and rotations. My students enjoyed the project very much. Every student was able to make a tessellation. The open-ended nature of this project allowed for creativity and different degrees of complexity in the designs. But I have been hesitant to try this project again. Why? Well, first, this project took a lot of time. Second, I am not sure exactly what the students learned from the project. Did it warrant the amount of time given to it?

The more I thought about this project, the more I remembered the enthusiasm that the students showed. It was a lot of work on my part, but maybe it was worth it. Perhaps I had learned more about the students through this project than I remembered. Perhaps they benefited in ways I had not intended.

THE TESSELLATION PROJECT

The project began as an attempt to enliven my unit on geometry. I was disappointed with my previous units on geometry. They seemed to emphasize and assess just vocabulary. I looked through my mathematics book for ideas. Suddenly it occurred to me that I had some materials about tessellations. They might be engaging and fun. Students could be creative and make their own patterns, like M. C. Escher, or could use pattern blocks to create designs. Furthermore, I could easily assess students' understanding of geometric concepts. Students could grasp important concepts like congruent and similar figures concretely. I could also assess their ability to use the various forms of transformations, such as slides, rotations, and reflections. This was perfect! All these ideas could be built into a tessellation.

The unit began, as my past units had, with the development of vocabulary. We used geoboards to create figures. We used dot paper to draw congruent and similar figures, as well as to show examples of symmetry, rotations, reflections, and slides. Next, I used a handout to describe what I expected from the students in the project. I asked students to create tessellations that incorporated the six concepts we had studied. The tessellations were to be drawn neatly and colored in a way that would make it easy to identify the concepts. At the end of the unit, students gave a short presentation in front of the class about the concepts illustrated in their tessellations. They were also responsible for evaluating each other's tessellations. I even created a checklist to help students assess the presentations. (See **fig. 1.1.**) Their overall grade depended on their tessellation, their presentation, and their evaluations of their fellow students' presentations.

We spent the next few days in the computer lab with a program called Exploring Math with Manipulatives: Reflecting on Patterns. Several activities explored symmetry and reflections. In one section, students had to manipulate pattern blocks and create designs by rotating or reflecting the pattern blocks. I encouraged students to explore on their own and create tessellations that could be drawn for their final project. Since we did not have color printers and the printouts were small, students eventually had to draw and color their designs by hand.

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ASSESSING THEIR PROGRESS

I also encouraged students to use correct vocabulary as they shared their ideas with each other. I listened closely to their animated discussions and recorded my observations on a checklist. (See **fig. 1.1**.)

FIG. 1.1

TESSELLATION CHECKLIST

Tessellation checklist

Student	congruent figures	similar figures	rotation	reflection	slide	symmetry

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If students correctly identified one of the six concepts without any help, I gave them 5 points. I gave 3 points to those students needing clarification. I wrote down some of the dialogue I overheard. In reviewing their comments, I noticed that some students were learning the six concepts:

Wendy: Look, Jane. I have four things built into my pattern. Here's a rotation. See, it turns from here to there. Here're reflection and congruent figures. And this one slides from here to here.

Joe: Ms. Cloyd, how can we build similar figures?

Ms. Cloyd: That's a good question. Does anyone have an idea that might help Joe?

Jane: Yes, I did it! You can arrange four triangles to make one that is two lengths on each side so that your big triangle is similar to the small one, because the angles are still the same. The sides are just twice as long.

Ms. Cloyd: Very good. Are there any other shapes that would work?

Raphael: Yes, I built it with the squares. It works the same as the triangles.

Anika: I did it with the blue blocks. It's a rhombus, I think, yes, that's it. A rhombus.

I continued around the room and checked to see if every student could identify the concepts in their pictures. They explained to me where each concept occurred, and I recorded it on my checklist.

PRESENTATION DAY

The day for presentations arrived. I set up the video camera and passed out checklists to each student. The checklists, similar to the one I used in the computer lab, included a place for everyone's name and the six concepts. I asked students to check the concepts as class members made their presentations. I also asked them to write comments on the back explaining why they disagreed with concepts shown by other students. At this stage I used a point-based evaluation form for each student. (See **fig. 1.2.**) Later, I compared my evaluations of each presenter with the evaluations from other students. If students recognized mistakes made by others, I felt that they had a good grasp on the concepts. If not, I believed that they probably had only a partial understanding of the concepts.

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FIG. 1.2

TESSELLATION PROJECT EVALUATION SHEET

Evaluation of Tessellation Project

Each of the six concepts was apparent in the tessellation, and the oral presentation demonstrated an understanding of each concept listed below.

Concept	**Points Possible**	**Points Earned**
1. Congruent figures	10	_____
2.. Similar figures	10	_____
3. Translation (slide)	10	_____
4. Reflection	10	_____
5. Rotation	10	_____
6. Symmetry	10	_____
7. Pattern is apparent	10	_____
8. Covers entire posterboard	5	_____
9. Neatly drawn	5	_____
10. Neatly colored	5	_____
11. Size equals 12″ × 15″	5	_____
12. Appropriate voice clarity, projection, and speed	10	_____

Total Possible = 100 Points **Total Earned =** _____

Letter Grade = _____

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THE RESULTS

I was delighted with both the presentations and evaluations. It was obvious that the students were very proud of their beautiful tessellations. In addition, they were very complimentary of each other's work. Most of the students commented how creative or neat the projects were. I was very pleased with how engaged they were in the evaluation process.

Most students had learned the six concepts very well, gaining a much deeper understanding of these geometric concepts than they had in past years. I also got a better sense of what they understood through their presentations and evaluations. This assessment, however, had definite limitations. It took a very long time to get to students in the computer lab and for them to describe and demonstrate each concept to me. Even after interviewing students, I was sometimes uncertain if they really understood the concepts. For example, if the tessellating figure was a regular polygon, it was impossible to tell the difference among slides, reflections, or rotations. When students used regular polygons in their designs, I could not assess whether they understood the distinction among the different transformations. I also noticed that some students had difficulty in coloring their designs to highlight congruent figures. Did these students really understand congruence? Doubts about what the students actually learned crept into my mind. It took a lot of time to plan and implement this assessment. I wonder how I might get more evidence about what they really understand when I use this task again.