

pedagogy corner

The architect's puzzle

with
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I'm a lesson collector. I keep seeing interesting and creative lessons designed by teachers that orchestrate a happy, healthy and productive learning environment for students. Having collected many such lessons which clearly have worked successfully in many classrooms, I like submitting them to some serious scrutiny from several perspectives. What makes them so successful and effective? While there are clearly various interconnected reasons for the success, I would argue the most critical aspect is pedagogy—those teaching strategies and insights, the wisdom of practice—that makes the difference between engagement, commitment and productive learning or unintentionally disengaged, unproductive boredom.

Some years back I found the following problem in a spatial puzzle book.

How many ways can you put four blocks together, face to face (with no vertical rotation symmetry)?

So I gave each student just four blocks and we collectively tried combinations to eventually agree on the answer of 15.

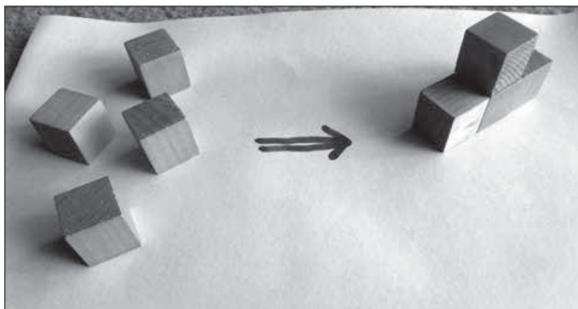


Figure 1.

I used to think it was a halfway decent task, being visual, concrete and encouraging problem solving. I don't think that anymore. Unbeknown to me at the time, other teachers had been developing much the same task but had made it much richer through deliberate pedagogical tweaks. Some of these are:

Tweak 1: Adding a story context

My uncle and aunt are architects. They have a block of land down a road by the school, and the council has given permission to build some town houses on the block, but as you might expect, the council has put conditions on the buildings. Each house has to be made of four main rooms, all have to be different from each other, have full face-to-face connections and no vertical rotation symmetry.

Students know the story is fantasy but it is believable in that it faithfully tells and develops the stages that an architect would go through: building some models, submitting plans to council, costing the houses and finally selling to the public.

The story is not a spurious gimmick. It gives purpose and meaning, and sustains the lesson throughout.

The International Baccalaureate, in its learning profile for MYP (Middle Years Program), states that students learn best when:

- their prior knowledge is considered to be important;
- learning is in context; and
- the context is relevant.

My original lesson had no such context and was accordingly less engaging and purposeful.

Tweak 2: Modelling the context with concrete materials and promoting group work



Figure 2.

Giving each small group an A3 piece of paper (a model of the land) and lots of blocks (a minimum of 60 per group) allows groups to solve the problem; “How many different houses can we put on this estate?”

The context and the materials greatly set the scene for animated group problem-solving discussions to agree on the answer of 15.

Tweak 3: An explicit teaching segment representing 3D shapes on 2D isometric paper

The teacher kept the story going.

My uncle and aunt are happy—they built the models and now know the answer to be 15. But the Council don't want to look at blocks. What do they want to see? Plans on paper!

This has always been a difficult skill for me to teach but using triangular dotted paper (isometric) and the technique of starting with a ‘Y’ shape made this a very effective skill development segment.

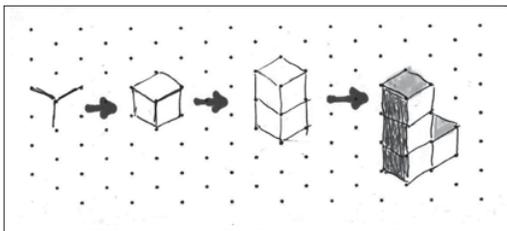


Figure 3.

This tweak turns out to be very powerful.

- Students seem to get a great deal of pleasure in being able to draw the buildings and they actively support each other. For many students this is the highlight of the lesson.
- It is worth noticing that the skill is taught in the middle of the activity when it is seen as relevant, not prior to the start as happens in so many ‘traditional’ lessons.
- The shading adds an aesthetic element as well as enhancing the visual 3D effect.

Tweak 4: Making connections to number (money) and measurement through costing the houses

My uncle and aunt are happy and so now is the council, but what do the customers want to know? The cost!

While students were drawing their pictures the teacher displayed a cost poster on the board.

Building costs: \$10 000 for any rooms at ground level, \$20 000 for 2nd story rooms, \$30 000 for 3rd and \$40 000 for any 4th floor room. Plus \$2 000 to paint or protect each exposed external face.

Cost this house as an example:

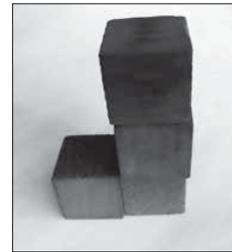


Figure 4.

The two rooms at ground level cost \$20 000 plus \$20 000 for the second floor and \$30 000 for the third floor which totals \$70 000 for the rooms. Add to that \$2 000 for each of the 16 exposed faces (a surface area counting task) which is \$32 000. Total cost = \$102 000.

Students now price all the houses they have drawn, making interconnections between geometry, measurement and money—all guided by the contextual story.

Tweak 5: Differentiation

One teacher using the task at a lower grade level declared we were building toy houses to sell in the toy shop. Ground floor rooms cost \$1, second floor cost \$2 etc. This simple tweak makes the task more accessible to students at different levels of confidence and development.

Tweak 6: Designing an advertising poster

The main closure of the lesson revolves around the group making a poster of the layout of the estate, displaying the costing, adding trees and garden etc and also adding some creative writing ‘selling’ the merits of each house.

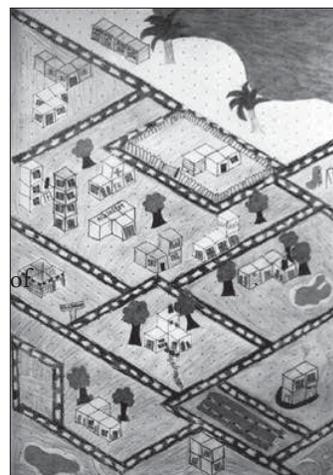


Figure 5.

This final display brings all the various elements of the activity together—including prices, links to advertising and the psychology selling.