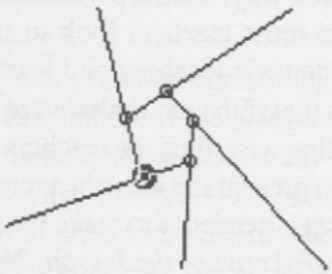
*Synergy from page 3*

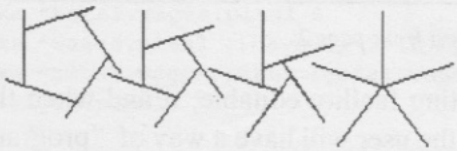
T: Why? Let me show you.

The teacher then clicks on the multifinder icon and gets a picture of the pentagon (see below) on the screen. He selects all the points on the pentagon and proceeds to shrink the pentagon until it becomes a single point. He then enlarges and shrinks the pentagon again.



T: What am I demonstrating?
S: That all the exterior angles add up to 360. But I knew that before!
*TT: This is getting frustrating.*
T: Lets go back to Logo.
*Teacher clicks on multifinder icon, chooses Logo, and looks at the drawing of REPEAT 5[ FD 50 RT 72].*
T: Now do you see the exterior angles?
S: I still only see interior angles.
*TT: Be patient. Let her discover it. Don't tell her.*
T: Try these examples. Think about what the turtle is doing.

```
repeat 5 [fd 40 bk 10 rt 72 ]
repeat 5 [fd 40 bk 20 rt 72 ]
repeat 5 [fd 40 bk 30 rt 72 ]
repeat 5 [fd 40 bk 40 rt 72 ]
```



S: Hey, this is like the Sketchpad example! I get it now....the turtle turned through 360 degrees. It's the *exterior* angles that are all 72, not the interior. There are 5 of them and all the exterior angles add up to 360. And this works for any polygon. (She now makes the connection with yesterday's work.) The turtle has to turn through a circle in order to draw any polygon. So that means I can draw any polygon as long as the sum of the turns adds up to 360.

*TT: That's amazing. She really got it! Did it work because she also had the Sketchpad experience?*

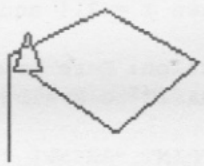
Sara begins to explore as the teacher gloats over his success - which doesn't last very long.

S: How come this doesn't work? The angles add up to 360. But I don't get a nice pentagon like before.

Sara's procedure:

```
To penta
fd 40 rt 65
fd 40 rt 55
fd 40 rt 110
fd 40 rt 75
fd 40 rt 55
end
```

Result:



The teacher is a bit dumbfounded, wondering why he hadn't thought about this before.

T: I'm not sure. Let me see. The Total Trip Theorem works if angles and sides are the same. But what happens when the angles are not the same? What should the sides be for the angles she chose?

This is one the teacher took home to work on. He decided to work with triangles first. Given three exterior angles, a, b, and c of a triangle, what can be said about the sides of the triangle? What conclusions can be drawn about quadrilaterals? pentagons? polygons?

Math tool synergy can lead to teacher-student learning synergy. Have you had any similar experiences with your students? □