**Transcription: WHAT MAKES A STRUCTURE STABLE?**

**Mark**: So let's get to an email that was sent in. This one is from Emily, who is eight. How do you know when a structure is stable?

**Teacher Aldo**: It’s a tough question but I think we can answer it.

**Mark**: Ok, I’m excited! So what do we need for this experiment or this demonstration?

**Teacher Aldo**: Well, first we need to understand what a structure is. And a structure is anything that we build or that exists in nature that is used for a specific purpose. So think about a bridge for example. And structures are made up of different things to help support a weight or a load.

So for example, if you think of a tree log across a river bank, and we are gonna walk across that tree log, that’s supporting our weight. When you look at bridges in our world right now, they are made in very special shapes.

Structures have forces acting on them: pulling forces and pushing forces, and here’s an example. I’m gonna show a little model where we have a rectangular shape and pretend that this is a structure. Let’s pretend that this is a bridge. It’s on the surface of the ground. Acting on it are pushing forces and pulling forces. What do you notice happens, Mark, when you push or pull the structure?

**Mark**: It’s changing the shape of the structure, it almost looks like the structure is breaking or bending

**Teacher Aldo:**That would probably a structure that you probably wouldn’t like to go across and walk along.

**Mark**: I’ll tell you. I’m definitely not walking along or riding my bike across this paper structure that you made, Teacher Aldo

**Teacher Aldo**: So now the question is: how do we make this structure more stable? In other words, how will it be created or changed so that it’ll support a load.

**Mark**: It sounds like a science experiment here. You could try different materials and maybe different designs?

**Teacher Aldo**: Absolutely

**Mark**: Ok

**Teacher Aldo**: Take a look at different designs and let’s see what we come up with

**Mark**: So I see that you’ve made this design. Can you talk to us about this?

**Teacher Aldo**: Right. We took our original shape…

**Mark**: Ok, I’ll hold this one

**Teacher Aldo**: … and we added a cross beam across the original rectangular shape and what you notice is… Can you just pull on that? Tell me what happens when you pull on that.

**Mark**: It’s not changing shape the way the other one did. The other one would, you know, change into a diamond shape or, you know, almost become flat

**Teacher Aldo**: So it’s a lot more stable.

**Mark**: It is, yeah!

**Teacher Aldo**: Right, what about the other side? Look when I do this. See? It still changes. So what can we make to the shape to make it even more stable?

**Mark**: Well, would it be possible to put another piece in?

Teacher Aldo: Bingo

**Mark**: Ok, so this would be the one that you got here

**Teacher Aldo:**So now no matter how we push or how we pull, this structure is now 100% (one hundred per cent) stable

**Mark**: Teacher Aldo, I wanna touch that. I wanna make sure that you’re not pulling my leg here. Ok. I’m really giving it some force here. Yeah, this is much stronger. Look at the original example, here we go. No, I’m not walking across this one teacher Aldo. Look at this! No.

**Teacher Aldo**: Absolutely

**Mark**: Ta-dah! So I guess the design principle here is… What are these pieces called again? They go across

**Teacher Aldo**: Those are trusses. Those are trusses and what’s really interesting is… Take a look at… We started off with an original geometrical shape which was a rectangle and now what kind of geometrical shape d we have what you look at this new structure that we created?

**Mark**: Well, I see a bunch of different shapes, teacher Aldo. I still see the original rectangular shape but I also start to see triangles.

**Teacher Aldo**: A three-sided figure: a triangle.

**Mark**: Look, I can see four triangles: I see one here, I see one on the top, I can also see a little ones … More than four!

**Teacher Aldo**: Absolutely. It’s those triangular shapes that make the structure stable. So if you take a look at the bridges around in our cities, our towns, and you look at them closely you’re gonna see trusses and you’re gonna see the geometrical shapes of triangles in them to make them more stable.

**Mark**: So as a scientist, we could observe the structures that we build, we could apply weight to them and see how strong they are. And we could start with something like this and eventually find your way to this just with science.

**Teacher Aldo**: Absolutely, it’s amazing

**Mark**: It’s totally amazing. So I hope that answers your question about structures and what makes them stable.