Description:

Prior to this project, students have measured sections in the field and have had a lot of experience interpreting physical processes of sedimentation from real sedimentary sequences. They have had in-depth exposure to three depositional systems (deep water, shelf, and beach), but not much exposure to others. I typically show them some good quality seismic lines of a continental margin right before this project begins. I take them on a tour of the tank, but this is not required. Instead, students can read the GSA Today article on Jurassic Tank that summarizes how it works, what it's used for, etc.:

Paola,C., Mullin, J., Ellis, C., Mohrig, D., Swenson, J., Parker, G., Hickson, T., Heller, P., Pratson, L., Syvitski, J., Sheets, B., Strong, N., 2001, Experimental Stratigraphy; GSA Today, Geological Society of America, Vol. 11, pp. 4-9.

The students have three weeks to complete the poster that is the final product for this project and, because this is part of a project-based course, I do very little formal lecturing during this project. I act as a facilitator, directing students to readings, Fuzzim basin modeling software, web resources, and, importantly, the resources that help them understand how Jurassic Tank works. In class, students are given a dip section image of stratigraphy produced in Jurassic Tank, their 'outcrop' or 'seismic line'. They then must answer three major questions (each a different component of their poster). First, what real-world depositional environments might the JT deposit effectively emulate? JT deposits can be viewed as an analog for several different, real-world environments (laterally linked and vertically stacked via Walther's Law); on a digital version of their dip section, students label these different environments by outlining their deposits in different colors and they provide images of these environments downloaded from the web or scanned in. Second, what would measured sections look like at threee different locations on the cross section and what would a correlation diagram look like? The measured sections should embody the real-world depositional environments that they outlined above (i.e. the facies should be realistic representations of facies encountered in each depositional environment). The stratigraphic sections shouldn't just be coal and sand, but should take into account the actual sedimentary features one might expect to find in the depositional environments that they cross. Third, what parameter was changed to create the stratigraphy in the dip section and how was that parameter changed through time? At this point, students know that one of three rates were change rate of base level rise or fall, subsidence rate, or sediment feed rate. They need to choose one and defend their interpretation. The beauty of this exercise is that a defensible interpretation can be made for any of these forcings; this is an important concept to get across in the end.

Comments:

1. I have made Fuzzim, a fuzzy logic-based basin modeling software package available to students during this project, mainly to get them interacting with a simple numerical model. It helps them grasp the connection between Jurassic Tank and numerical simulation. I'm not surehow much it helps them with the final product, though.
2. You *do* need to have a pretty good handle on how Jurassic Tank works to run this project. It is also helpful if you know the parameters that were changed to create the stratigraphy. The article that summarizes the interpretation is Heller et al. (2001)

[Heller, Paul L; Paola, Chris; Hwang, In-Gul; John, Barbara; Steel, Ronald, 2001, Geomorphology and sequence stratigraphy due to slow and rapid base-level changes in an experimental subsiding basin (XES 96-1), AAPG Bulletin, vol.85, no.5, pp.817-838.]

3. I have a video of the run from overhead that shows what the system looked like during the experiment. I make this video available to students. I don't think that it's crucial, but it's helpful. It may be possible to have this video converted to a digital format and made available as needed.
4. I find myself constantly directing students toward different portions of their textbook to get them to answer questions for themselves. They must read up on depositional environments and figure out how to link them to the deposits in their 'outcrop'. They have to read the chapter on sequence stratigraphy to understand the concept of a sequence boundary and a flooding surface. In effect, I try very hard to get the students to learn the material on their own on this project. I nudge them in the right direction, answer *specific* questions when I don't feel that the reading is clear, and I provide them with technical expertise on the experiment.
5. I have provided an example of one of the student posters her.
6. I have also provided a digital video 'fly-through' of the deposit, so that students can see what the entire deposit looks like.
7. Finally, there are beautiful growth faults in the deposit but these are CONFUSING to the students. They think that they are big channels (they really need to get a sense of the scale of the deposit and the scale of an analogue in the real-world). However, I use this confusion to get them thinking about syntectonic deformation and growth faulting. In essence, I try to walk them up to the answer in mini group discussions. If it looks like the whole class isn't getting it, I then do a mini lecture on growth faulting.