Guidelines for designing DSE software

- **Get lots of data in easily**—It should be trivially easy to get data into the software and there should be many different ways to do it. CODAP makes it easy to import csv data through drag and drop. CODAP plugins make it easy to create front ends to large datasets and databases.
- **Be context neutral**—Adapt to any and all data situations so that learners have a tool they can use again and again in different subject areas and over a range of grade levels.
- **Make data moves natural**—Even if they have to be learned rather than discovered, they should be easy to remember and make sense. In CODAP dragging attributes to graph axes is a successful example of this.
- **Be structural**—To get a taste of data science and to engage in data modeling, students should experience at least one data structure other than flat, row by column. CODAP allows for dynamic hierarchical restructuring and limited join of separate datasets through use of lookup functions.
- **Handle more than numbers and strings**—Data come in a wide array of types. Experiencing some of these will broaden learners' understanding of what is possible. Go gently, inferring type whenever possible so as not to require uninformed decisions. Beyond strings and numbers CODAP works with dates, geojson boundaries, and colors. Consider images, sounds, …
- **Do GIS**—Data are often distributed geographically. Provide tools for visualization on maps. CODAP plots lat-long points and geojson boundaries.
- **Be extensible**—Rather than attempt to provide all the capabilities users might want, allow the environment to be extended. Drop-in "plugins" extend CODAP's capabilities with data frontends, simulations, games, new kinds of visualizations and analyses, and more.
- **Automate**—Create the ability to pour data in one end and have it come out the other transformed.
- **Do big data**—Make it easy to work with very large datasets without getting bogged down.