What types of discursive features emerge when people—students or teachers or mathematicians—use Sketchpad, and how do these features interact with learning, mathematics, and the instrumentation of the tool? We use “discursive features” here broadly, to include both linguistic and extra-linguistic communication acts and artifacts. At the level of language, we focus on key words such as ‘drag’ and on when or where mathematical phenomena and observations are phrased in the highly temporal language of motion or dragging as opposed to the expository march of theorem/proof, or calculation/result. We also look at how users name objects within the software environment—both mathematical objects regulated by usual naming conventions (vertices in a geometric illustration, or variables in an equation) but also and more specifically how learners summon into language and encapsulate certain personally-significant or demonstrative actions, events, and conceptual entities (through the use of “action buttons,” “pages,” “custom tools” and other environment-specific functionalities). We also look at how word meanings shift in dynamic geometry: when does triangle refer to a static shape, when to a set of properties, and when to a continuously transforming set of shapes? Beyond the linguistic, we also attend to the particular routines and behavioral idioms of dynamic geometry investigation, such as ‘performing the drag test’ or ‘showing hidden objects.’ And finally we include not just the various visual mediators found in Sketchpad that are different from pencil-and-paper environments—the bonanza of available colors (through which one both communicates and decorates results); the rays and lines that extend as far as one cares to look (figures embedded in planes rather than in pages); the determined stride or wandering dance of objects set into motion under varying degrees of geometric constraint—but also how learners deploy this visual language in their attempts first to explore and then communicate mathematics within the dynamic medium.

These interests connect to the themes and questions of strand 3. We recently co-taught a college-level geometry course in which students used Sketchpad intensively, both in classroom lectures and for assessment purposes. We want to know how the discursive features of Sketchpad led, in our classroom and in others, to different mathematical concepts and conceptualisations, and how these concepts/conceptualisations interact with more traditional ones. What kinds of discursive features did students use to make sense of the new meanings they were encountering? What might a college teacher do to make these new meanings more explicit in a Sketchpad-based class?

While our interests at this level of substrate align, the larger agenda of our work diverge into separate projects. Nick’s work (as Sketchpad’s developer) focuses more on tool
design: how can observations and hypotheses about users’ discursive practice inform future generations of the technology? Through the iterative cycles of Gravemeijer’s design research, how can design intention inform user instrumentalisation? Nathalie’s research focuses instead on practice, and in particular on how aesthetic responses to mathematical activity motivate mathematical inquiry, generate mathematical ideas, and communicate and evaluate them within mathematical communities. These interests become experimental in technology environments, which serve as more manageable laboratory spaces than full textbooks or curricula. Some of the discursive features mentioned here not only parameterize the ways in which students appropriate the software, but may give rise to, or reflect, particular aesthetic responses capable of affecting learners’ fundamental goals and values.