**What is being learned? What mathematics is the focus of the activity/technology? Is relational or instrumental understanding emphasized?**

Students learn about and explore the difference between instantaneous and average rates of change. They see how decreasing the distance between the x-values makes the average rate of change approach the instantaneous rate of change. This builds a relational understanding of how the instantaneous rate of change is the limit of the average rate of change. The technology does this by providing a large number of data points quickly, and making it easy to graph and manipulate the data.

**How does learning take place? What are the underlying assumptions (explicit or implicit) about the nature of learning?**

Learning takes place through active manipulation of the data, and trial and error. Students can try different things that change the data and the graphs, and see what fits well and what doesn’t. The assumption is that students learn by doing and answering their own “what if” questions in a given context.

**What role does technology play? What advantages or disadvantages does the technology hold for this role? What unique contribution does the technology make in facilitating learning?**

The technology plays two roles. It simplifies the task of creating coordinate pairs, calculating the rates of change between each of the pairs, and graphing the points. It also provides students a way to visualize rates of change in two different formats: numerically and graphically. Unfortunately, students can lose sight of how the average rate of change is calculated because the familiar slope formula and the calculating are “hidden” from them.

**How does it fit within existing school curriculum? (e.g., is it intended to supplement or supplant existing curriculum? Is it intended to enhance the learning of something already central to the curriculum or some new set of understandings or competencies?)**

This activity would be a supplement to an already central idea to calculus. It provides students a deeper understanding of the connection between the average rate of change and the instantaneous rate of change. This

**How does the technology fit or interact with the social context of learning? (e.g., Are computers used by individuals or groups? Does the technology/activity support collaboration or individual work? What sorts of interaction does the technology facilitate or hinder?)**

Fathom would work best individually or in pairs. The working file is limited to one computer (unlike shared files, like Google Docs). The program lends itself to a model of individual/paired exploration and then reporting to the full class.

**How are important differences among learners taken into account?**

The activity provides both numerical and graphical representations of rates of change. This is helpful to both the logical learners and the visual/spatial learners. Because students can move sliders and observe how the data changes, it also provides some limited kinesthetic opportunities.

**What do teachers and learners need to know? What demands are placed on teachers and other "users"? What knowledge is needed? What knowledge supports does the innovation provide (e.g., skills in using particular kinds of technology)?**

Mathematically, students need to be very familiar with slope and rates of change. They also need some beginning knowledge of derivatives and limits. Technologically, they need to know how to create sliders and graphs in Fathom