Citations for design justifications:

Quotes:

1. “Saraiya et al. investigated a number of features that might or might not make AVs effective. They found that the ability to control the pace of the visualization, versus watching an animation, had the single greatest impact on AV effectiveness of the factors studied” (Clifford, 6).

2. “Other features such as the presence of a good data set and logical break-down of steps also showed promise as indicators of effectiveness.” (Clifford, 6).

3. “They point out the use of analogies for priming students’ understanding of the underlying algorithm” (Clifford, 7).

4. “They concluded that AVs are an effective tool when used to actively engage students’ attention” (Clifford, 7).

5. “The visualization exploration task is the crux of the visualization process, for it is the task in which humans presumably reap the benefits of SV. In this task, the visualization explorer manipulates the visualization’s user interface to explore the visualization. In the seminal work on SV user interfaces, Brown (1988a) suggests four kinds of view exploration to be supported:
    - visualization execution control, by which visualization explorers start, stop, and step through the visualization, and adjust the visualization speed;
    - view selection and arrangement, by which visualization explorers select views of the software to watch from a list of available ones, and arrange those views on the screen; and
    - view zooming and panning, by which visualization explorers select the scale factor of a view, as well as the region of the view to watch.

    Subsequent SV research has expanded that repertoire to include so-called semantics-based interactions (Hundhausen, 1995), such as altering the data and execution path of programs (see, e.g., Brown, 1991; Gu et al., 1994) and semantic zooming (see, e.g., Stasko & Mutukumarasamy, 1996).” (Hundhausen, 6).

6. “...we now need to admit that AV researcher Chris Hundhausen is right when he writes: “The most significant factor (in learning) appears to be not what AV viewers see, but what they do (with the visualizations).” (Naps).

7. There are a list of pedagogical requirements in the paper “A Testbed for Pedagogical Requirements in Algorithm Visualizations.”. The ones that I feel are the most important are:
    - Allowing users to provide input to the algorithm.
    - Rewind capability

- Hypertext explanations of the visual display

8. “Laboratory studies show that taking a test on studied material promotes subsequent learning and retention of that material on a final test (termed the testing effect). Educational research has virtually ignored testing as a technique to improve classroom learning.” (McDaniel)

Citations:

Shaffer, Clifford A., et al. “Algorithm Visualization.” *ACM Transactions on Computing Education*, vol. 10, no. 3, 2010, pp. 1–22., doi:10.1145/1821996.1821997.

Mark A. McDaniel, Janis L. Anderson, Mary H. Derbish & Nova Morrisette (2007) Testing the testing effect in the classroom, European Journal of Cognitive Psychology, 19:4-5, 494-513, DOI: 10.1080/09541440701326154

HUNDHAUSEN, CHRISTOPHER D., et al. “A Meta-Study of Algorithm Visualization Effectiveness.” *Journal of Visual Languages & Computing*, vol. 13, no. 3, 2002, pp. 259–290., doi:10.1006/jvlc.2002.0237.

Naps, T.L. “JHAVÉ: Supporting Algorithm Visualization.” *IEEE Computer Graphics and Applications*, vol. 25, no. 5, 2005, pp. 49–55., doi:10.1109/mcg.2005.110.

Rößling, Guido, and Thomas L. Naps. “A Testbed for Pedagogical Requirements in Algorithm Visualizations.” *Proceedings of the 7th Annual Conference on Innovation and Technology in Computer Science Education - ITiCSE'02*, 2002, doi:10.1145/544414.544446.