The results of our experiment indicate:

• No significant difference in learning occurred between students using our visualizations and those reading textbook materials.

• Students interacting with our visualizations were significantly more engaged than those reading textbooks.

• Our randomized control and treatment groups were academically imbalanced.

To assess our visualizations, we identified two research questions:

• **RQ1**: Does interacting with our visualizations improve long-term recall of these problems, compared to reading a textbook?

• **RQ2**: Do students find our visualizations to be a more engaging way to explore these problems, compared to reading a textbook?

To answer these questions, we ran an experiment comparing a control group reading textbooks to a treatment group interacting with our visualizations (N=22 students). Two weeks later, both groups took an online quiz about the problems and rated their engagement.

The results of our experiment indicate:

• No significant difference in learning occurred between students using our visualizations and those reading textbook materials.

• Students interacting with our visualizations were significantly more engaged than those reading textbooks.

• Our randomized control and treatment groups were academically imbalanced.

Our visualizations, videos, and quizzes are available upon request.

Full source code available at: [github.com/Calvin-CS/TSGL](https://github.com/Calvin-CS/TSGL)

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**References**


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**Acknowledgements**

We would like to thank the Calvin College Science Division and the Calvin Research Fellows program, whose support made this work possible.