Interdisciplinary Learning: Using Educational Software in the Classroom

LA-SiGMA RET
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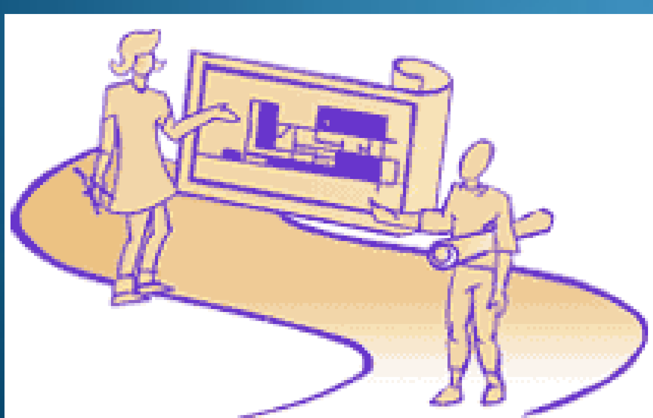


Classroom Technology

- For several years researchers have gathered information on factors affecting student retention and concluded that student determination requires a strong academic background, achievement of good grades and **academic motivation**.
- Using audio-visual materials in the classroom is nothing new and educators have recognized the power of audio-visual materials to capture the attention of learners, increase their motivation and enhance their learning experience.

Classroom Technology

- The use of educational video and television in classrooms has risen steadily over the past 20 to 30 years, according to a series of studies conducted by the *Corporation for Public Broadcasting*.
- Perhaps the most significant survey finding that supports the value of these multimedia tools, is the direct relationship between frequency of use and perceived student achievement and motivation.
- Among teachers who use video for two or more hours per week, two-thirds find that students learn more when video is used, and close to 70% find that student motivation increases.

Classroom Technology

- Mayer (2001) defined a media instructional message as a communication using words (printed or spoken text) and pictures (graphics, animation or video) that are intended to promote learning.
- Hoey and Manning (2005) indicated that "this generation (the Millennial-born 1982-2002)" has used some type of technology such as educational software and computer games.
- In general, instructors use media in the teaching process and plan to organize instructional procedures and generate authentic assessments of student learning.

Technology Learning at BRCC

- Traditional learning methods typically focus on one learning style at a time, but the integration of multimedia in the classroom addresses the issues of learning differences and styles.
- **In this project** "effective use of media instruction" that all authors pointed out along with **specialized software** will be applied to physics and engineering topics.
- Physics and engineering at BRCC often suffers from the perception that it is boring and in some cases unconnected to real life situations.

Benefits of Technology Learning at BRCC

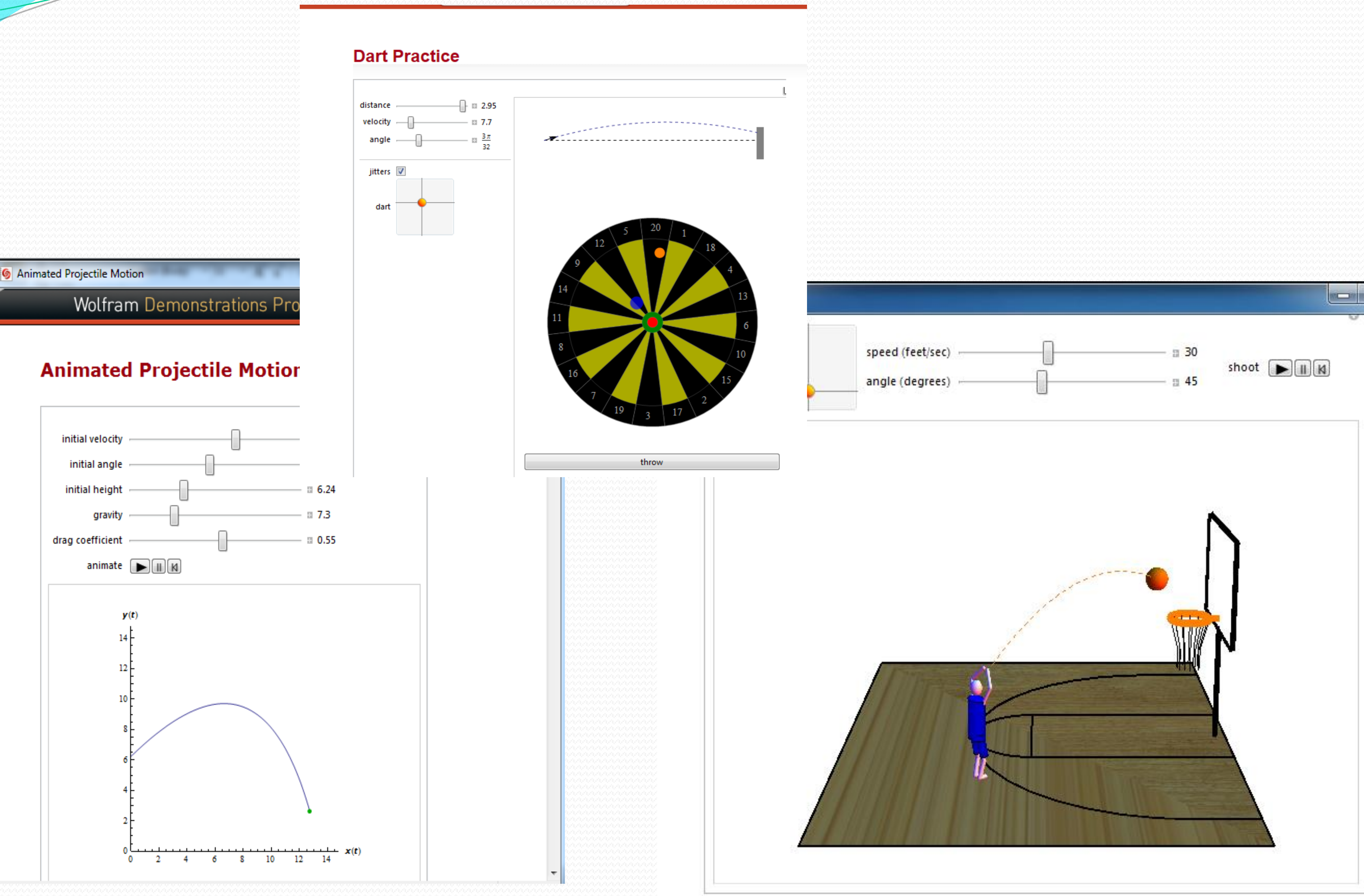
- By using graphics, audio, and interactive activities, utilizing specialized software with multimedia instruction can fit a range of interests and learning styles, including the visual, the auditory and the experimental.
- Specialized software opens the horizon for students to communicate and discuss science with classmates and relate more to subjects.
- The main idea is to develop dynamic real-life examples related to science subjects, where students can relate to, and at the same time understand the physics behind each concept from mathematical representation.

Specialized Software

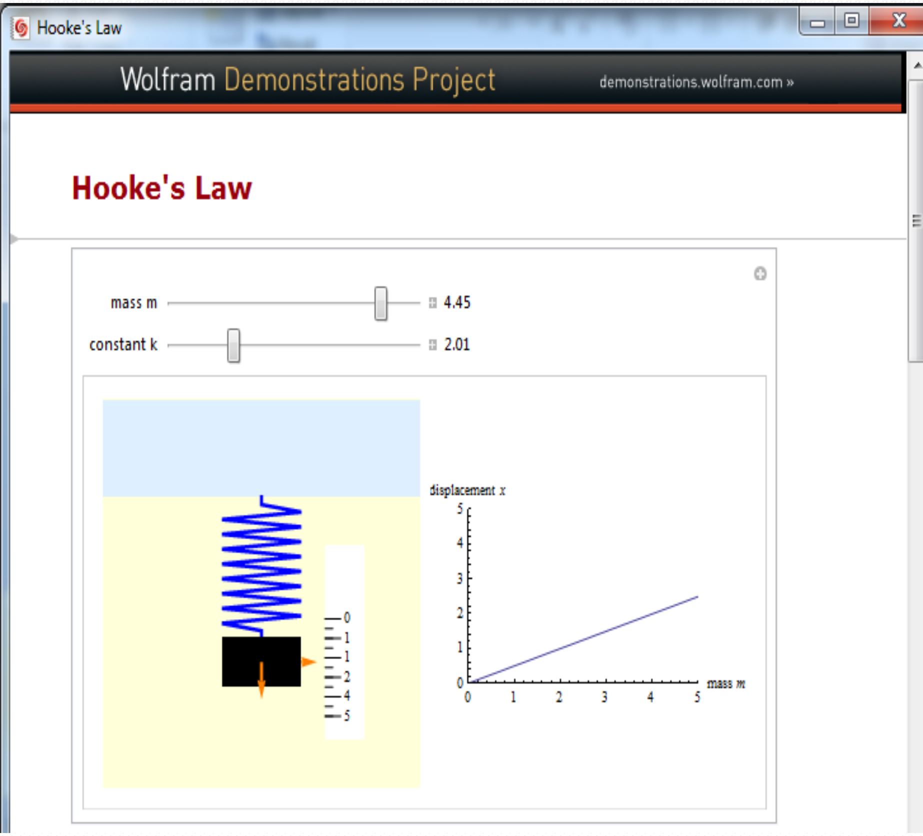
(Video/Graph + Equation + Real-Life Example)

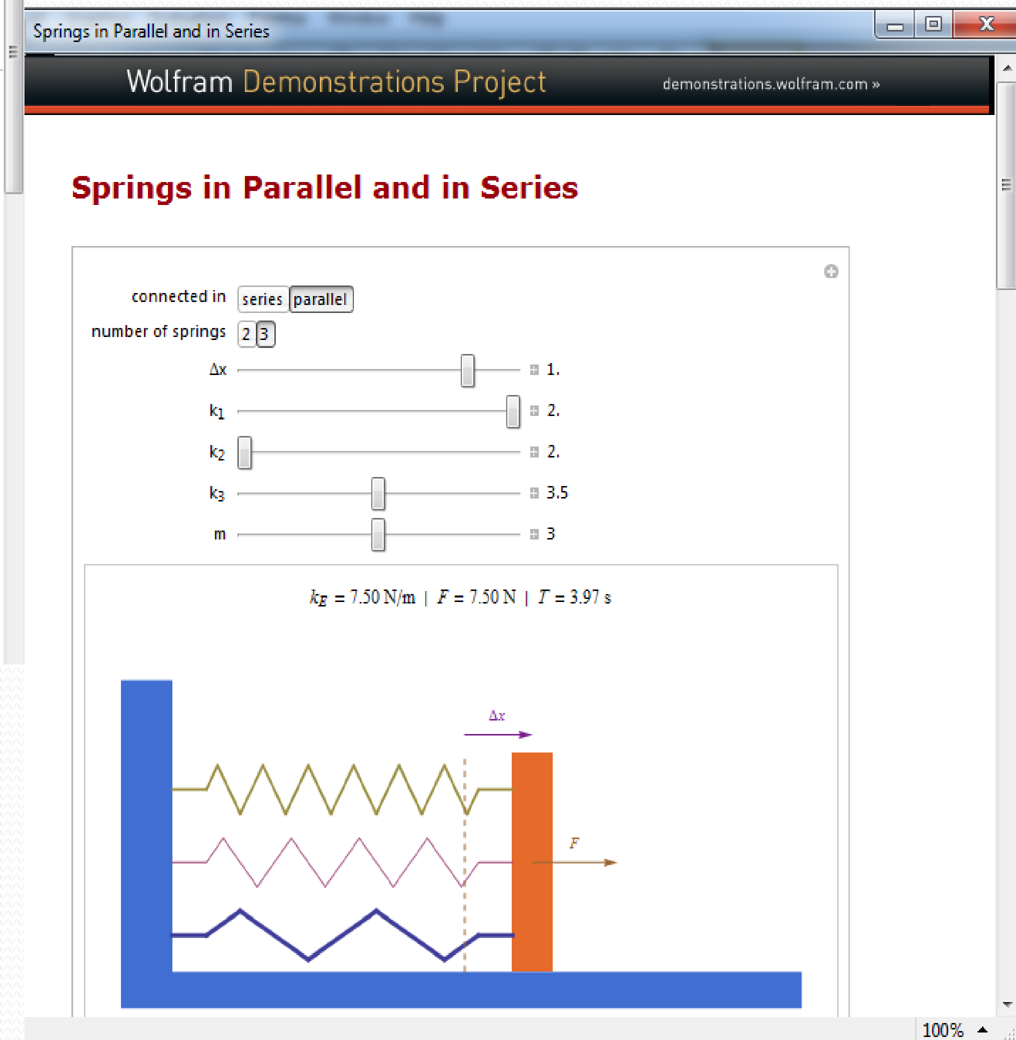
- In the beginning of the project, software such as ***Excel*** and ***Matlab*** were utilized to plot curves and do some basic computations …etc. but the representation was not in real time.
- ***Mathematica*** software offers a new form of truly interactive presentation with its unique integration of documents, graphics and computations to modify or generate in real time, so that a presenter can adjust parameters or controls on the fly and the audience can immediately see the result.
- It was decided at the end to use ***Mathematica***, and its dynamic capabilities, makes it reachable to generate compelling visual material for any subject with some knowledge of the coding language.

Sample Activity: Projectile Motion

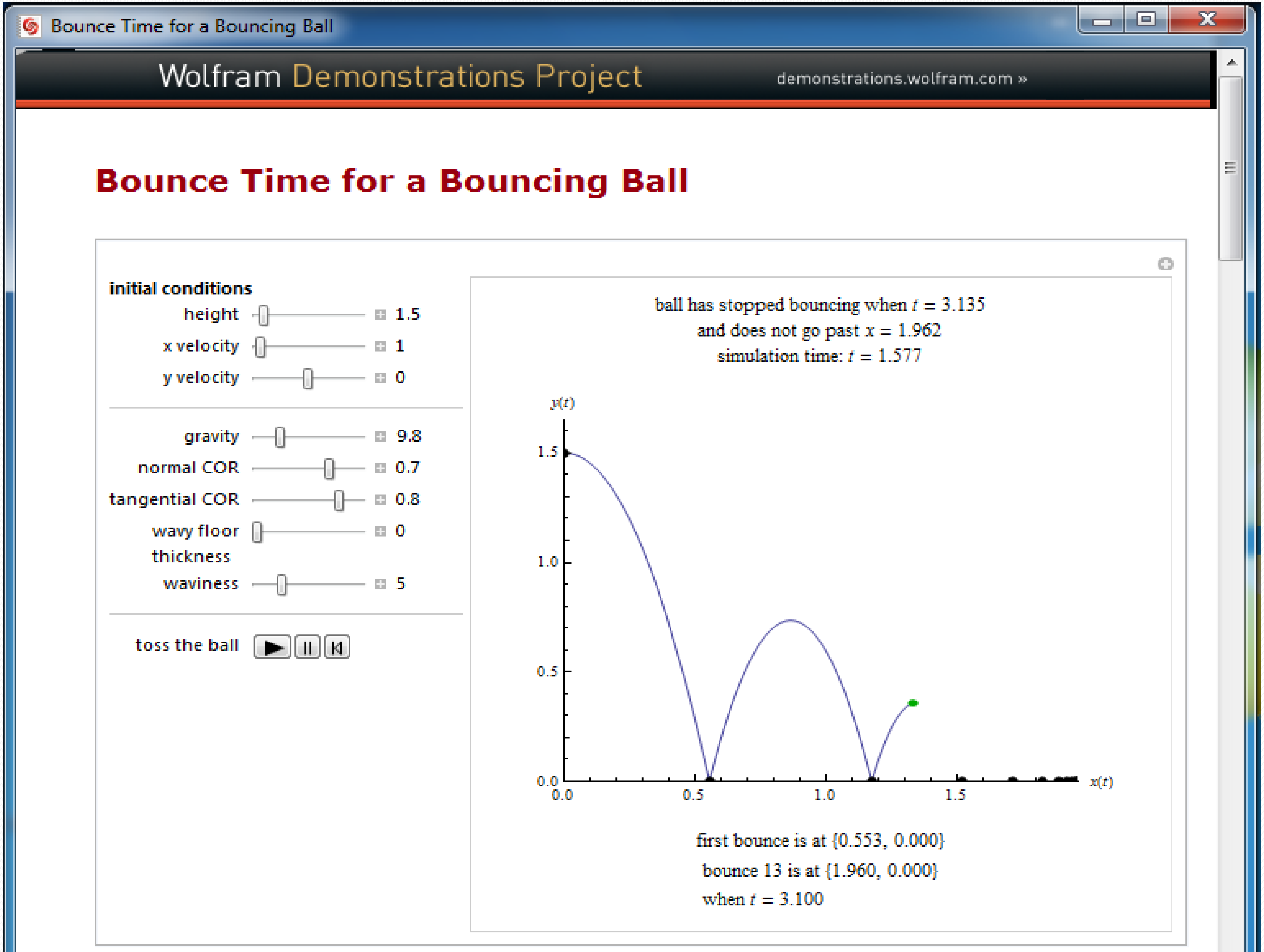


Sample Activity: Hooke's Law

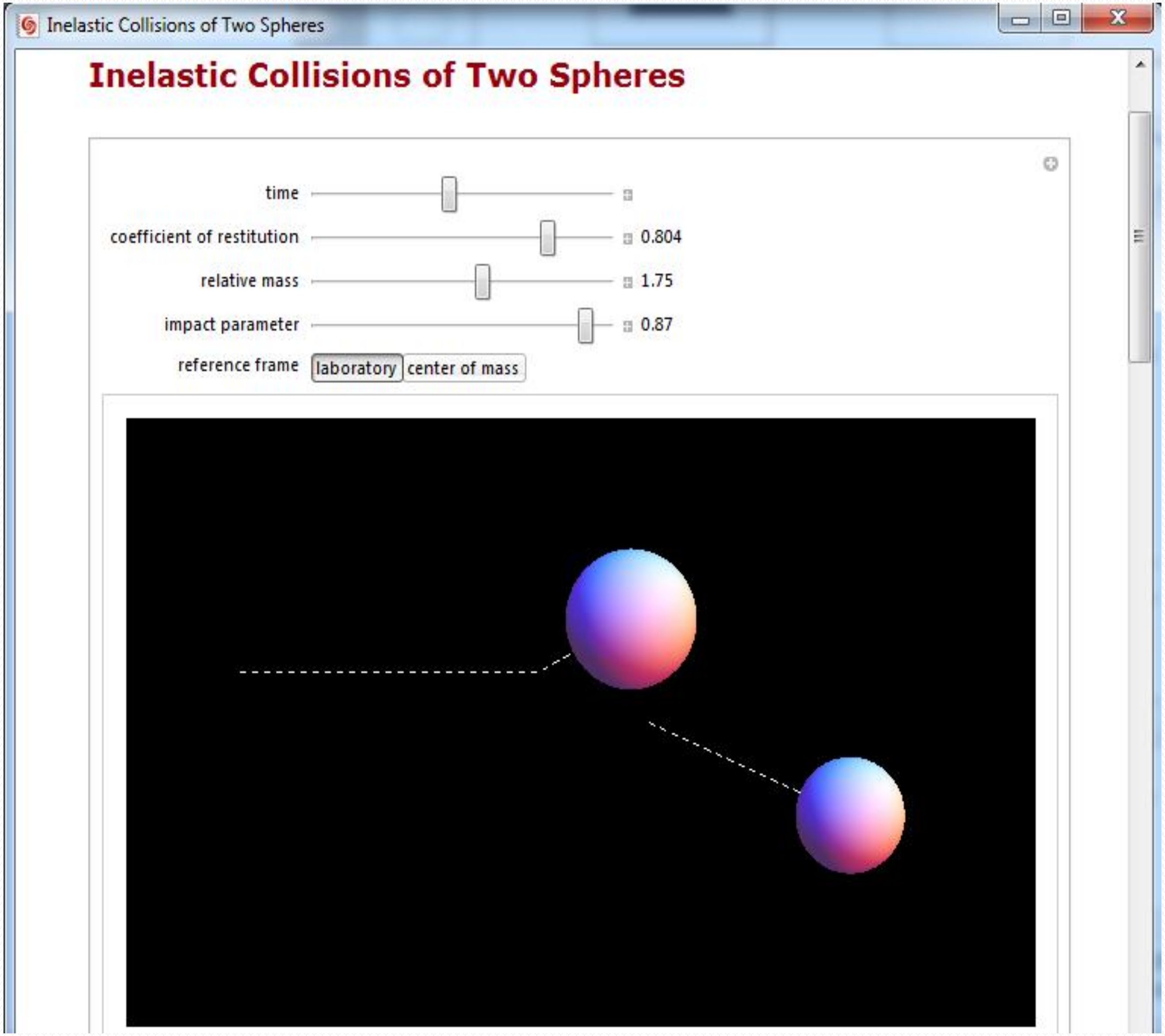




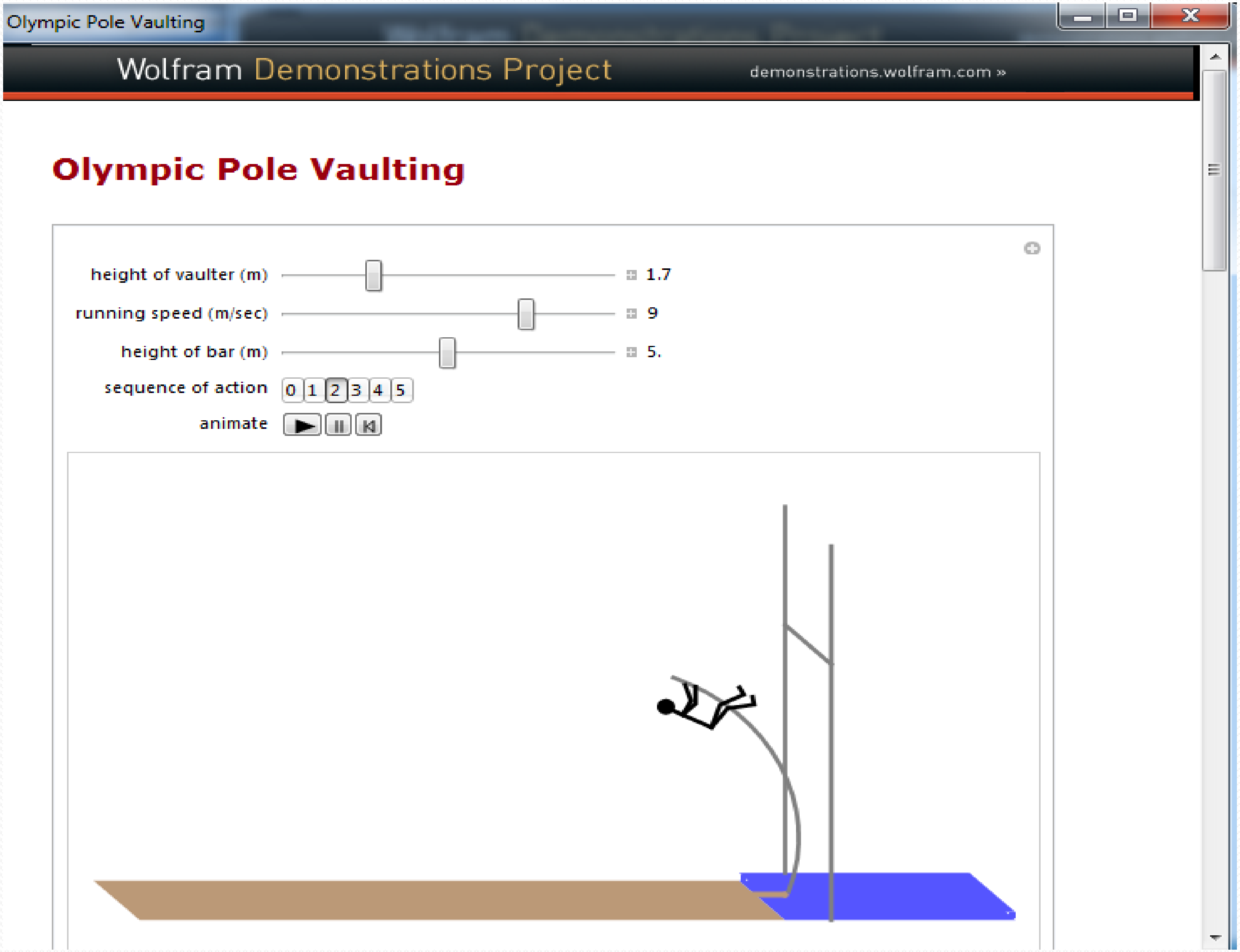
Sample Activity: Restitution



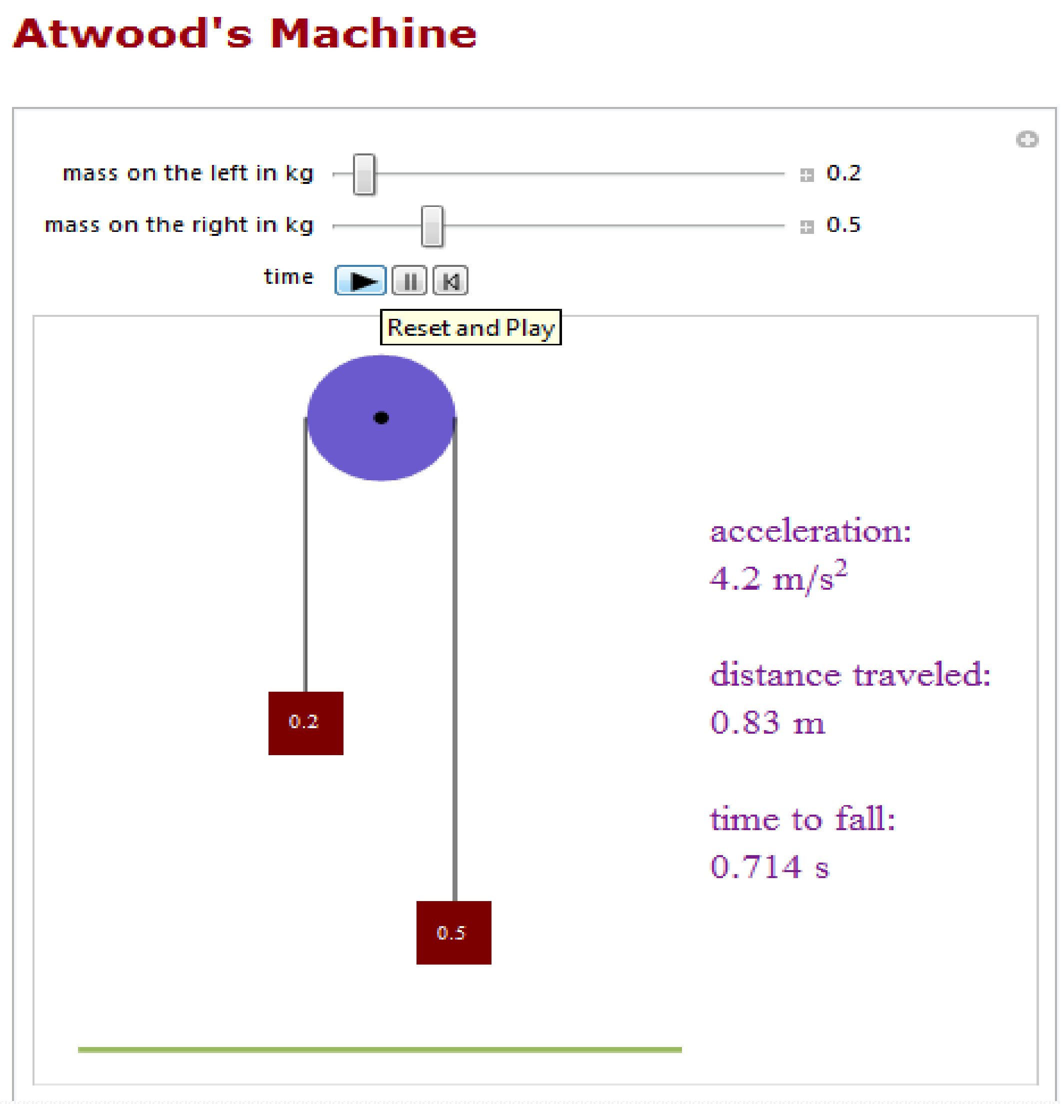
Sample Activity: Impact



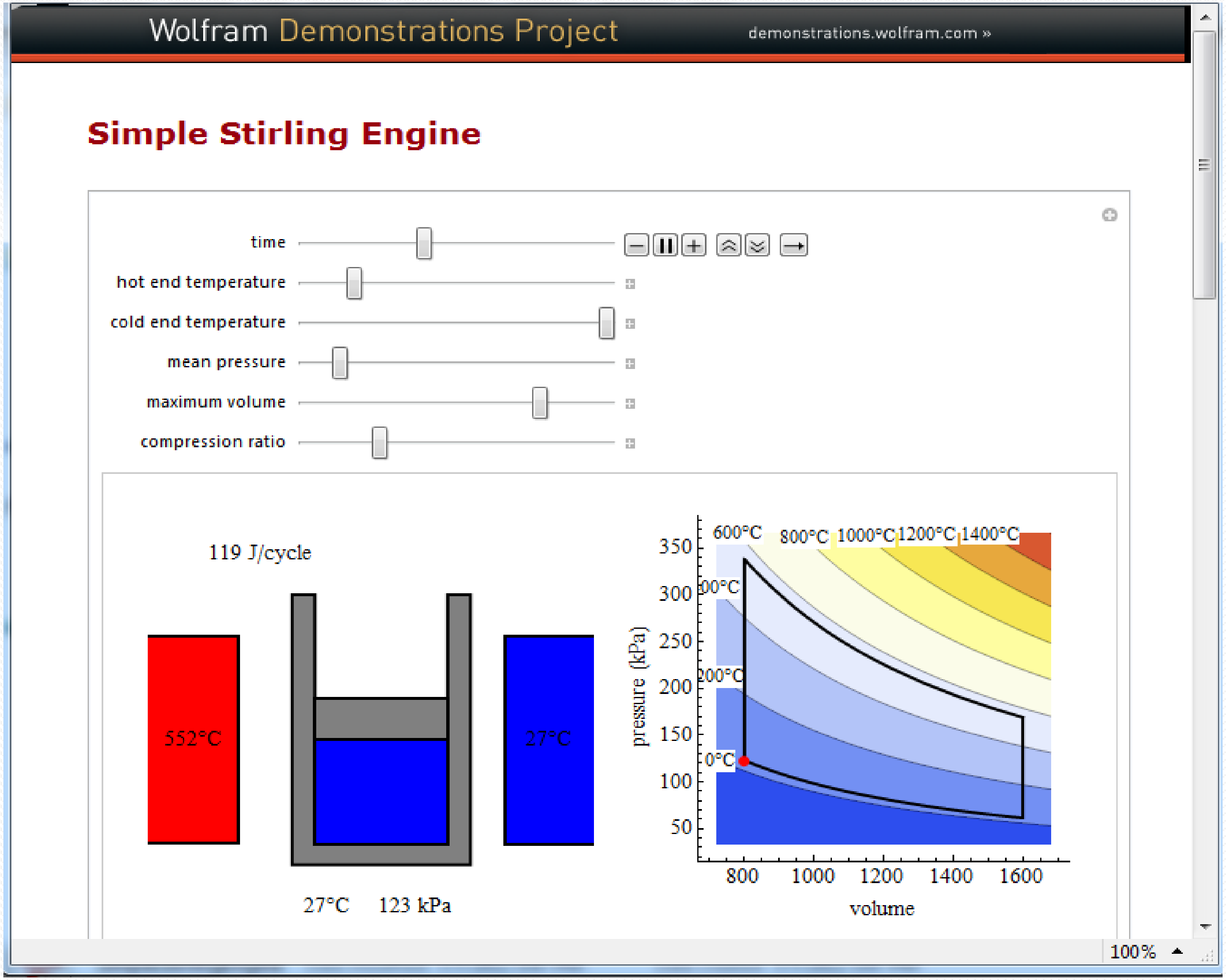
Sample Activity: Conservation of Energy



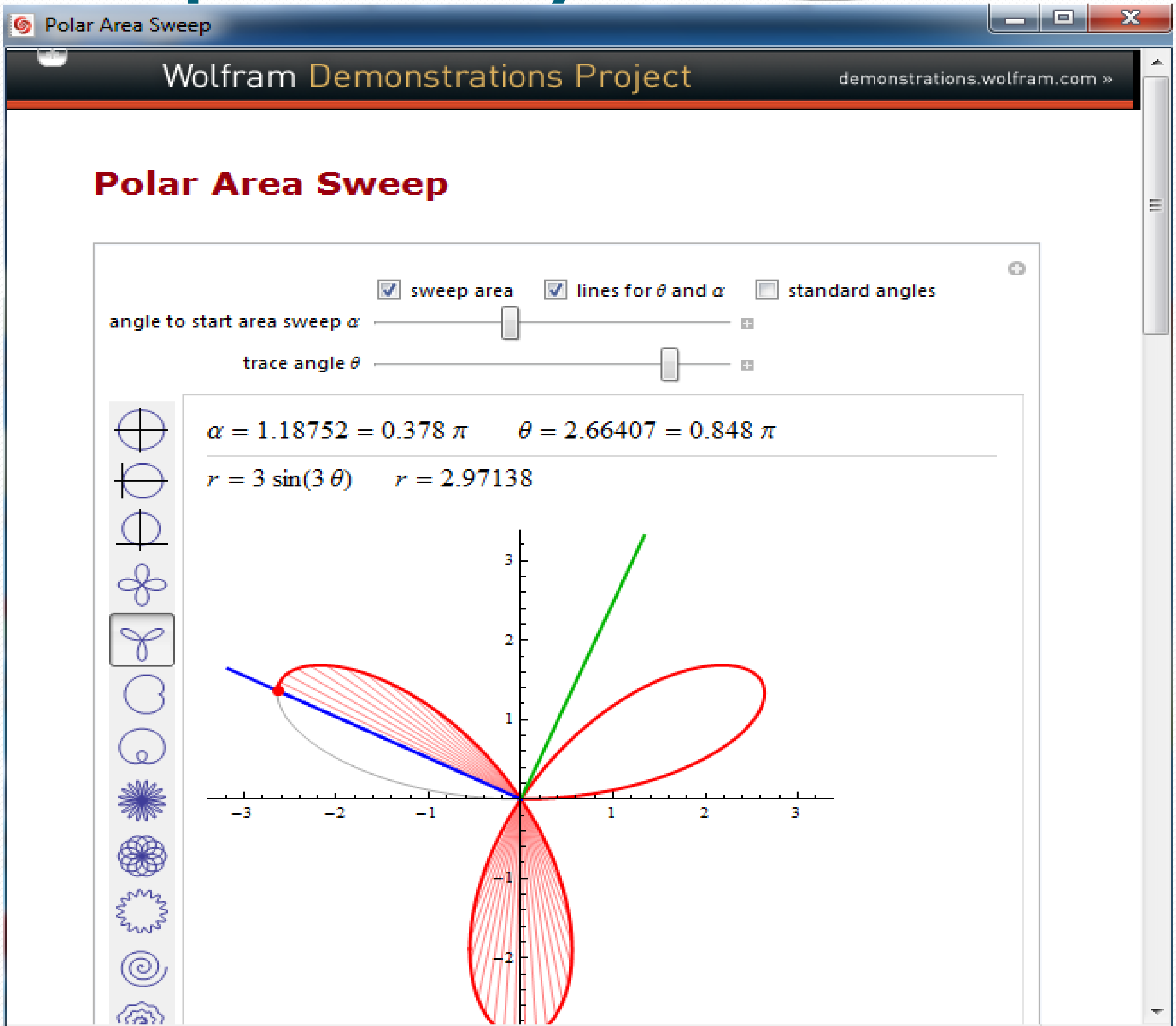
Sample Activity: Newtonian Mechanics



Sample Activity: Stirling Engine – PV diagram



Sample Activity: Mathematics



Concluding Remarks:

We have the confidence that demonstrations of some subjects in engineering and physics using *Mathematica* will:

- Aid in the development of a common base of knowledge among students.
- Enhances student understanding of certain subjects and will increase in-class discussions.
- Increases student motivation and enthusiasm and consequently the retention rate.
- Provides greater accommodation of diverse learning styles.
- Promotes teacher effectiveness and creativity.

Future Work

- In the process of implementing through the source code of each activity, dynamic equations and to display the main symbolic equation/s in order for students to visualize the change in parameters while playing the videos.
- Learning extensively the coding language in *Mathematica* will allow one to have the flexibility of creating other interesting ideas.
- Statistical analysis need to be done in the classroom to evaluate the success of this method on the understanding of students.
- Add more activities in other subject in the STEM discipline.

References

- Schwartz, J.E., & Beichner, R.J. (1999). *Essentials of educational technology*. Boston: Allyn and Bacon.
- Mayer, R. E. (2001). *Multimedia learning*. Cambridge, UK: Cambridge University Press.
- Bishop, M.J., & Cates, W.M., (2001). Theoretical foundations for sound's use in multimedia instruction to enhance learning. *Educational Technology Research and Development, 49*(3), 5-22.
- Maddux, C., Johnson, D., & Willis, J. (2001). *Educational computer: Learning with tomorrow's technologies*.
- Hoey, Joseph & Manning, Terri (2005). *Assessing Online/Hybrid Courses and Curricula:Concepts, Tools, and Frameworks*.
- http://www.libraryvideo.com/articles/article26.asp
- http://www.demonstrations.wolfram.com/?actkey=2735-7617-J4T6XK&version=8.0&os=Windows&buildid=2615665&source=welcomescreen

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