PICUP

Summer
Faculty Development Workshop

Join us!

July 9-14, 2017
U. of Wisconsin - River Falls

Apply at www.gopicup.org

Local expenses paid.
Travel funds limited.

Local Community Faculty Development Workshop:

NES-AAPT Meeting
October 22, 2016; Wesleyan College

Washington Section AAPT Meeting
October 29, 2016; Peirce College

Half-Day Demonstration Workshops:

APS March Meeting
March 12, 2017
New Orleans, LA

AAPT Summer Meeting

PICUP

PARTNERSHIP FOR INTEGRATION OF COMPUTATION INTO UNDERGRADUATE PHYSICS

gopicup.org

This project is funded in part by the National Science Foundation under DUE IUSE grants1524128, 1524493, 1524963, 1525062, 1525525, 1504786, 1505180, and 1050278.

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Organizers

Danny Caballero, Department of Physics and Astronomy, Michigan State University, caballero@pa.msu.edu
Marie Lopez del Puerto, Department of Physics, University of St. Thomas, mlpuerto@stthomas.edu
Robert Hilborn, American Association of Physics Teachers, rhilborn@aapt.org
Norman Chonacky, Yale University, norman.chonacky@yale.edu

Agenda

1. Introductions
2. Intro, brief overview of PICUP (~15 min)
3. Website & structure of one item (~15 min)
4. Support structures for adopters - mailing list and Slack (~5 min)
5. Working through an example – falling with air resistance using Trinket.io (limit to 1 hr)
6. Discussion of how people do this at different institutions
   benefits & challenges (limit to 1 hr)
6. Expectations for future local community interactions – CUSPS (30 min)
7. Invitation to upcoming workshops
8. Post-survey

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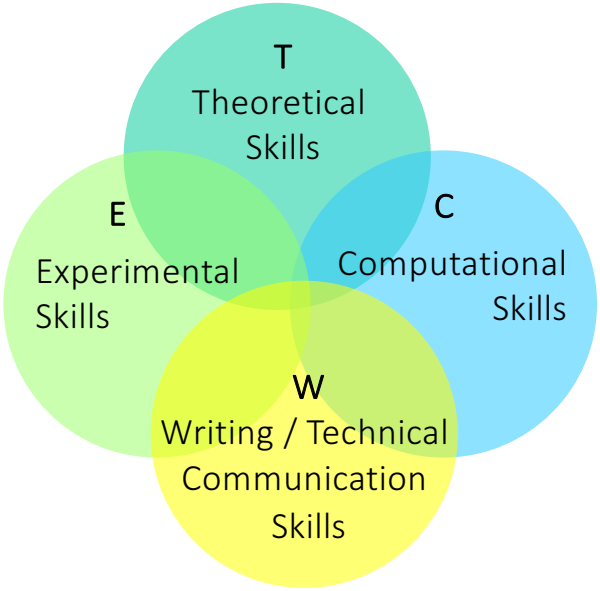
Mission

Create a vibrant community of educators, a forum for open discussion, a collection of educational resources, and a set of strategies and tactics that support the development and improvement of undergraduate physics education through integration of computation across its curriculum.



M.E. Johnston, "Implementing Curricular Change," Computing in Science and Engineering, Vol. **8**, No. 5, p. 32 (2006).

Guiding Principles

For lowering barriers to computational integration in undergraduate physics courses

1. Provide faculty with a variety of simplified tactics to start using computation
   - Address/lower barriers to integrating computation
   - Easily adopted/adapted/created computational education materials

2. Respect institutional diversity and faculty autonomy by not overprescribing the methods used for computation
   - Computational platform/language/environment
   - Ways to implement computation

3. Recognize community support as a crucial mechanism for transformation
   - Strong faculty support system
   - Open Source materials

4. Emphasize the importance of multi-generational involvement and sustainability
   - Community-building towards a formal organization
   - Faculty rewards for involvement

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Current projects:

1. **National Survey**
NSF IUSE DUE-1432363 and DUE-1431776.

2. Local Communities
NSF IUSE DUE-1505278, DUE-1504786, DUE-1505180.

3. National Scale Faculty Development and Community Building
NSF IUSE DUE-1524128, DUE-1524493, DUE-1524963, DUE-1525062, DUE-1525525.

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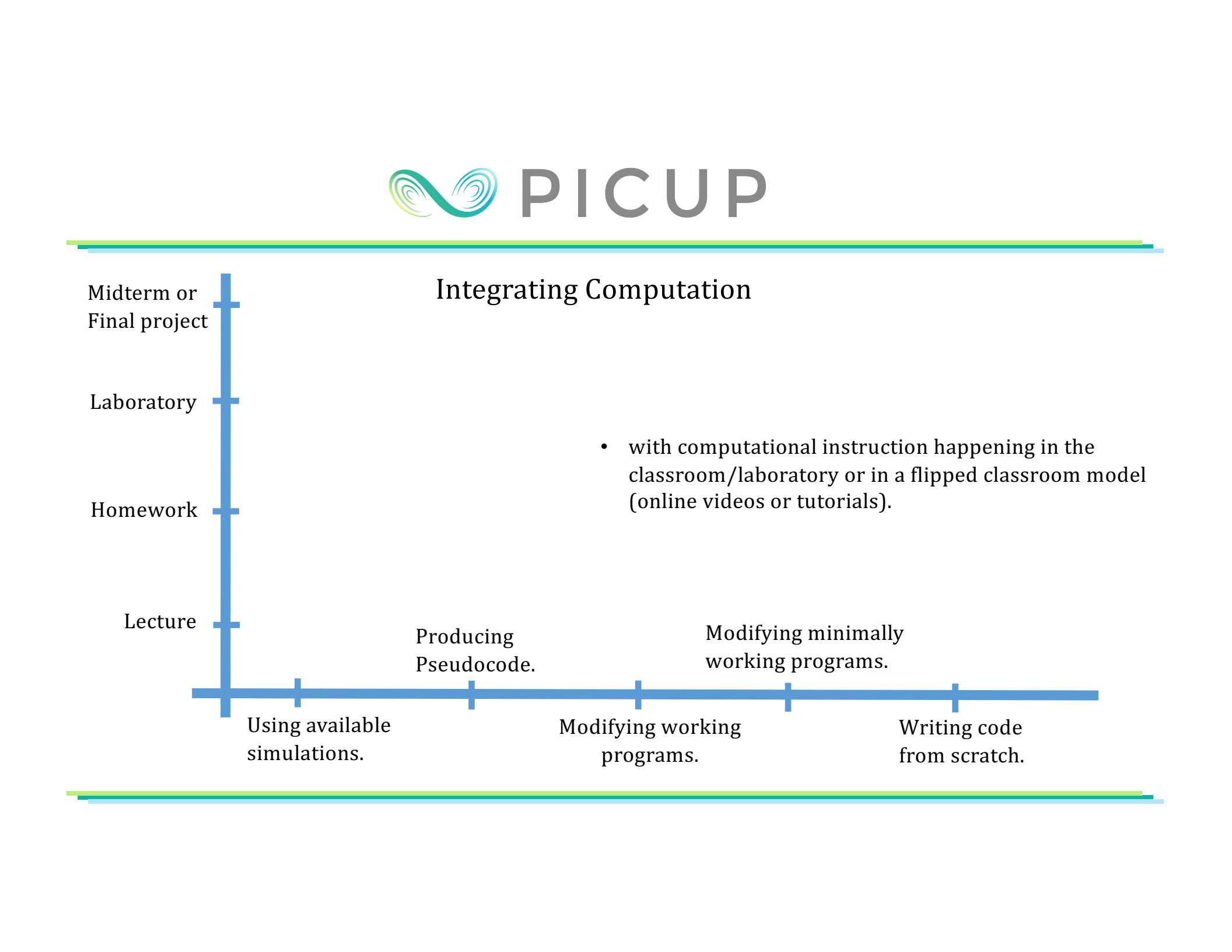
Hands-on Activity
Falling Ball with Drag

https://trinket.io/glowscript/8fffadc105


PICUP
Integrating Computation
Midterm or Final project
Laboratory
Homework
Lecture
• with computational instruction happening in the classroom/laboratory or in a flipped classroom model (online videos or tutorials).
Using available simulations.
Producing Pseudocode.
Modifying working programs.
Modifying minimally working programs.
Writing code from scratch.

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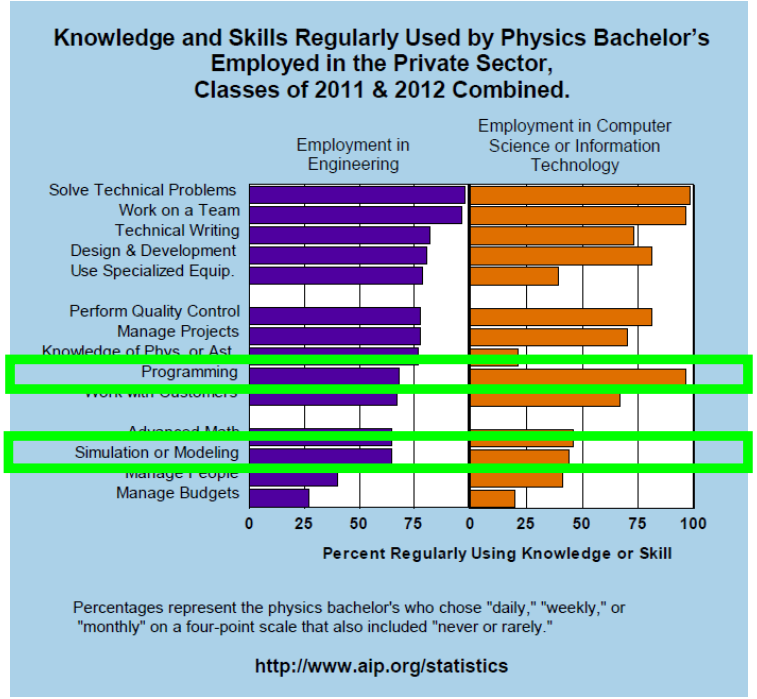
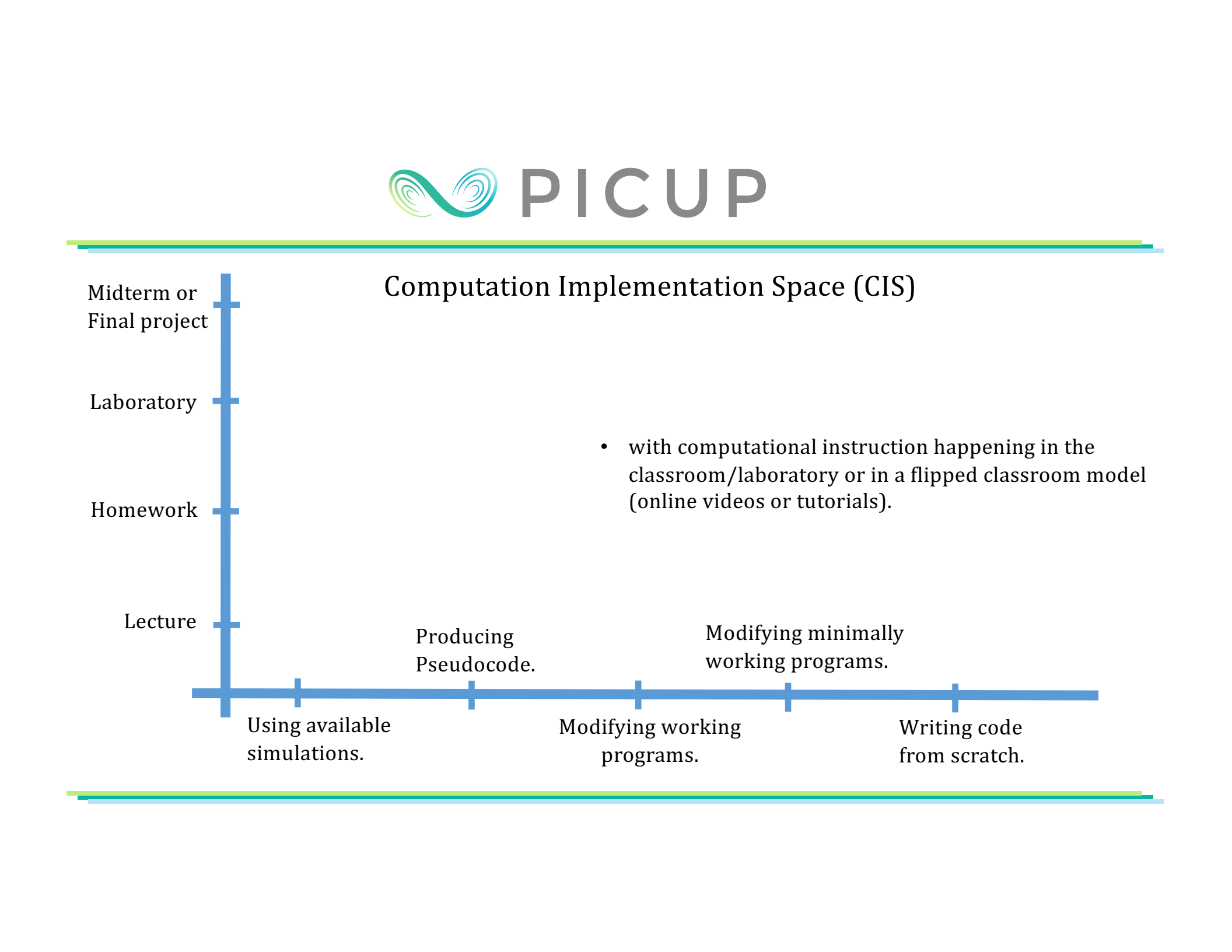
Benefits:

- Students develop skills that are necessary in private sector jobs and in graduate school[1].
- Computational homework and projects that are more closely connected to how professional physicists engage with their own work, excite students, and might help retain physics majors by providing enjoyable experiences[2].
- Enhance content coverage with little or no loss.
- Enhance conceptual understanding by allowing students to play around in "parameter space" and to visualize system behavior.



1. AIP Statistical Research Center, "Report on Physics Bachelors," Focus On, June 2015.
2. Caballero, M.D. & Pollock, S.J. Am. J. Phys. **82** (3), March 2014.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Possible issues:

Dancy and Henderson[3] have listed the most salient barriers to changes in Physics instruction. Below we offer suggestions for overcoming these barriers in the context of integrating computation into an undergraduate Physics course.

#1 Expectations of content coverage.

#2 Lack of instructor time.

#3 Departmental norms.

#4 Student resistance.

#5 Class size and room layout.

3. Dancy, M. & Henderson, C. *Barriers and Promises in STEM Reform*, Commissioned Paper for National Academies of Science Workshop on Linking Evidence and Promising Practices in STEM Undergraduate Education, Washington, DC, Oct 13-14, 2008.

Post-workshop support:

Local: Rob Balogh-Robinson
Robert.Robinson@marist.edu

Virtual: PICUP
gopicup@googlegroups.com
gopicup.slack.com

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