Helping Develop America's Technological Workforce

Data Activities Portfolio:

A Research Based Approach for Infusing 21st Century Physics into the High School Classroom

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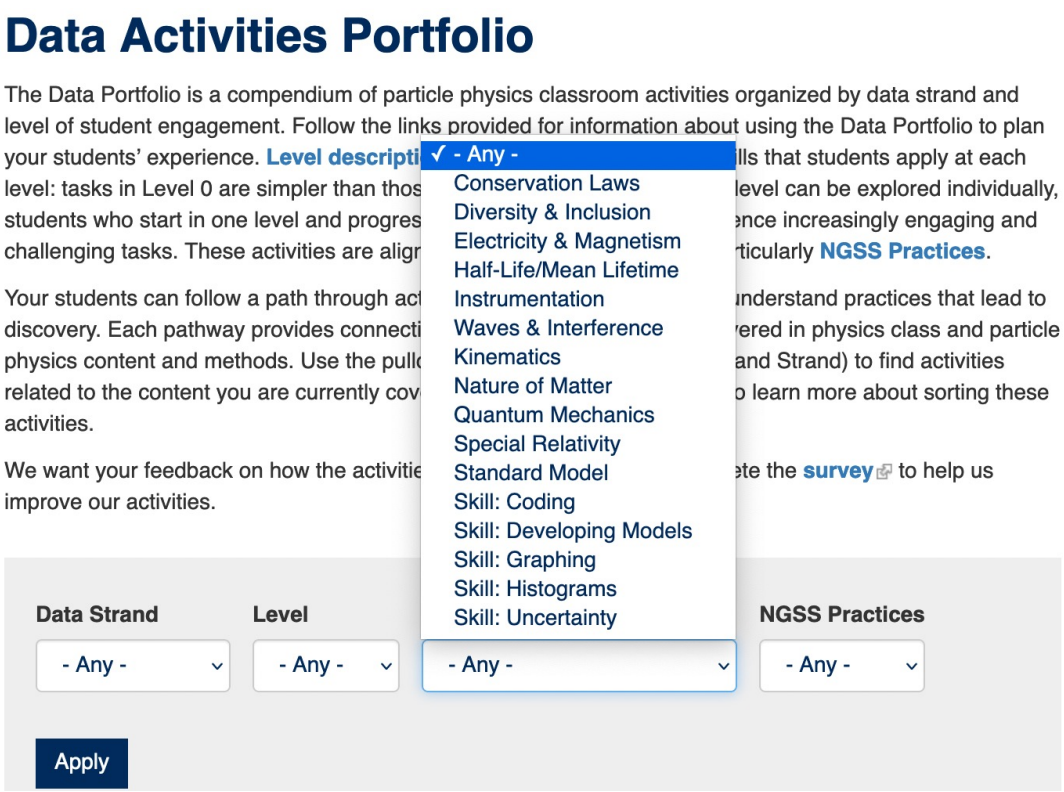
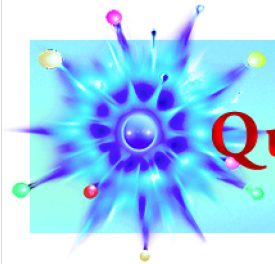
Data Activities Portfolio

Activities Incorporating 21st Century Physics

- https://quarknet.org/data-portfolio





Engaging Teachers

Making 21st Century Physics Approachable

- Connect to traditional content topics
- Clearly address standards
- Overcome fear of complexity

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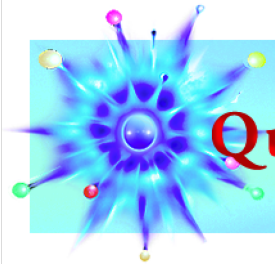
Connection to Standards

Standards across the United States

- Next Generation Science Standards (NGSS)
- Common Core
- Advanced Placement (AP)
- International Baccalaureate (IB)
- Example of Standards in Particle Transformation Teacher Pages



Research

Effective Teacher Professional Development

June 2017

Linda Darling-Hammond, Maria E. Hyler,

and Madelyn Gardner,

with assistance from Danny Espinoza

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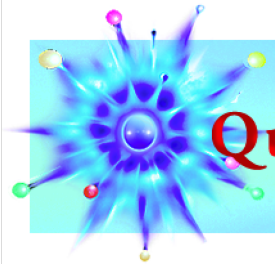
1 Content Focus

Activities include:

- Particle physics
- Data analysis
- Skill-building



2 Active Learning

Guided Inquiry

- Research questions guide thinking
- Teacher hat vs. student hat
- Claim – Evidence – Reasoning

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3 Collaboration

Emphasis on Group Work

- Break task into small chunks.
- Share results across groups.
- Analyze whole class data.
- Use histograms frequently.

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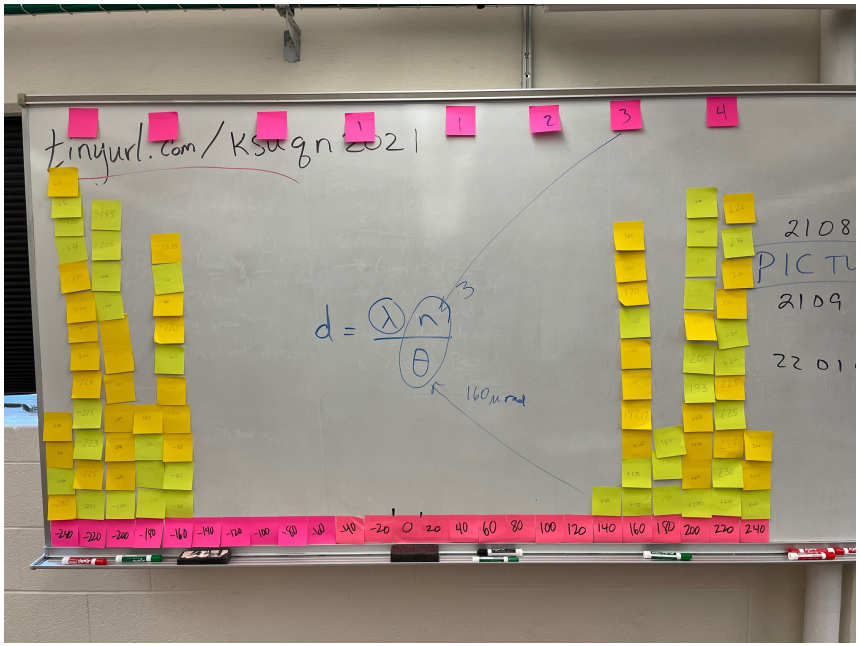
4 Use of Models & Modeling

Role of Models in Physics Research

- Models change over time.
- Evidence drives model development.
- Models take many forms.
  - Mathematical
  - Physical
  - Qualitative
  - Graphical



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Importance of Workshops

- Train teachers on using the activities.
  - Teacher hat – student hat
- Ask teachers to develop implementation plans.
- Encourage student use.
- Use vocabulary from traditional physics curriculum.

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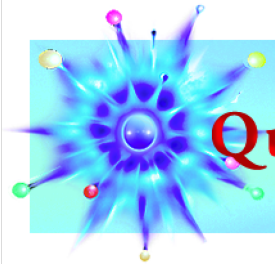
6 Feedback & Reflection

Meaningful Discussion on Teachers' Needs

- Reflect on the claims that are supported by the evidence found in data analysis.
- Teachers tune activity for their setting.
- Advice from experienced teachers



7 Sustained Duration

Meaningful Impact in the Classroom

- Develop long-term relationships with teachers.
- Ask teachers what they need.
- Work collaboratively to support their situation.

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Evidence of Effectiveness

Effectiveness

- Half of the QuarkNet teachers surveyed report using DAP activities.
- Anecdotal reports of use of skills and strategies.
- Sustained virtual contact during Covid.

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Conclusion

Impacting Curriculum

- Provide access to vetted activities available on public web site.
- Reach out to existing programs & organizations to develop relationships.
  - Science teacher organization
  - State, local physics teacher groups
- Share data to support additional activity development.