وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ

…….. dan di atas tiap-tiap orang yang berpengetahuan itu ada lagi Yang Maha Mengetahui (Al-Qur'an, Yusuf, 76)

Tren Riset Pendidikan Fisika

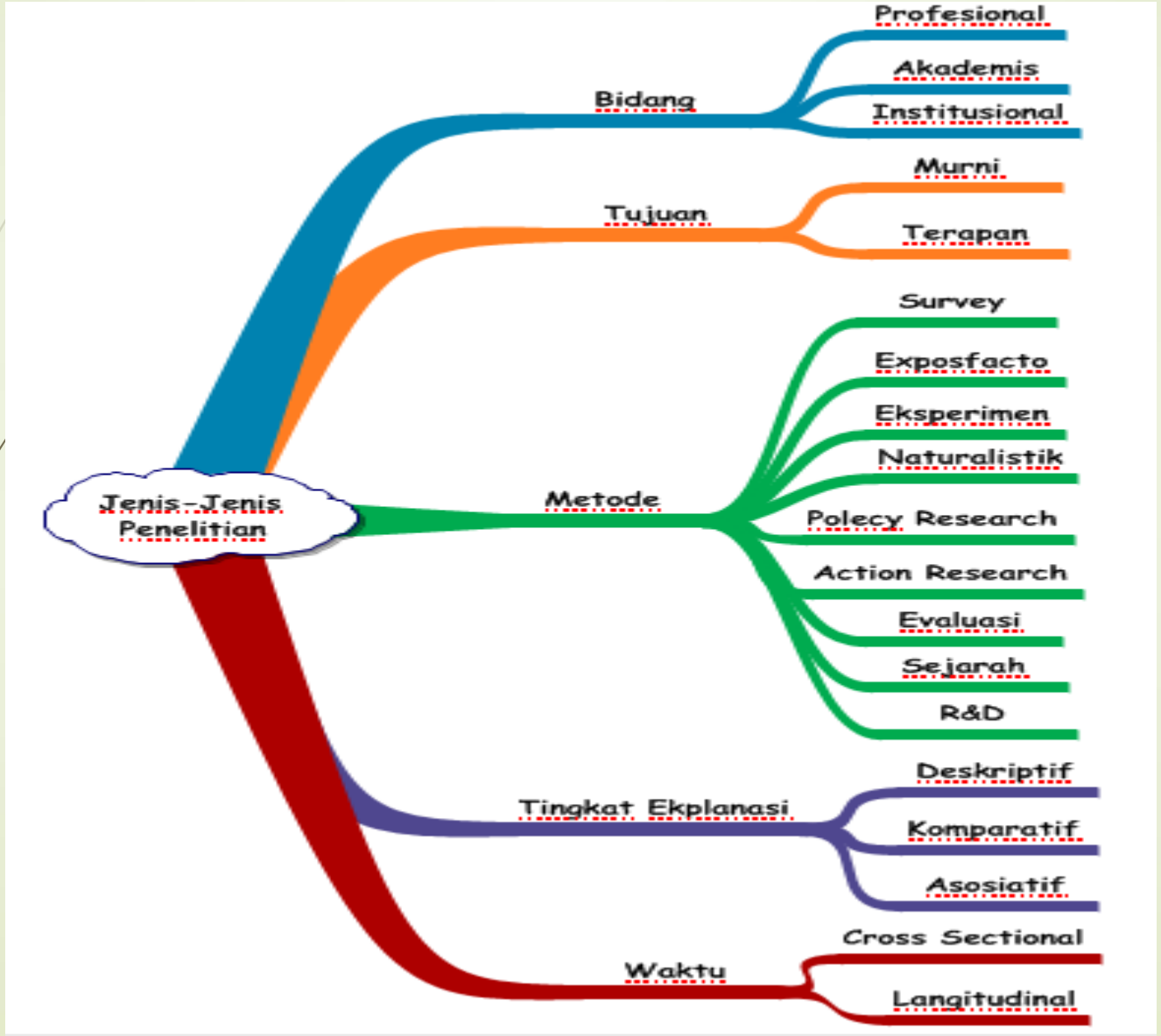
Ishafit
Progtam Studi Pendidikan Fisika
UNIVERSITAS AHMAD DAHLAN
2016
http://ishafit.pfis.uad.ac.id

Riset Pendidikan (Education Research)?

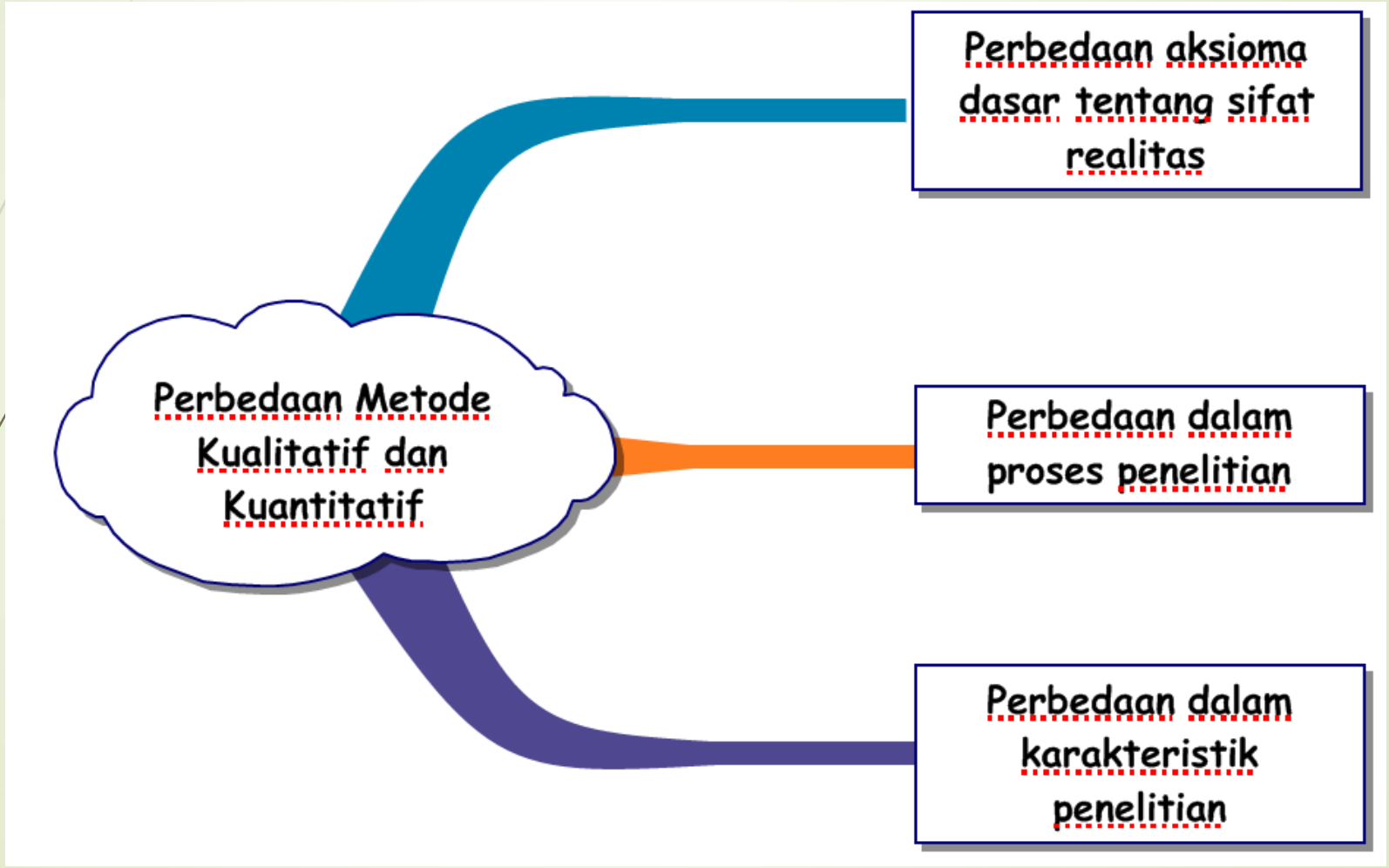
- Penelitian pendidikan adalah bidang kajian ilmiah yang meneliti proses pendidikan dan pembelajaran meliputi atribut manusia, interaksi, organisasi, dan lembaga-lembaga yang membentuk hasil pendidikan.
- Penelitian pendidikan mencakup spektrum metode yang luas dan ketat sesuai dengan pertanyaan riset yang diajukan dan juga mendorong pengembangan alat-alat dan metode baru.

The American Educational Research Association (AERA)

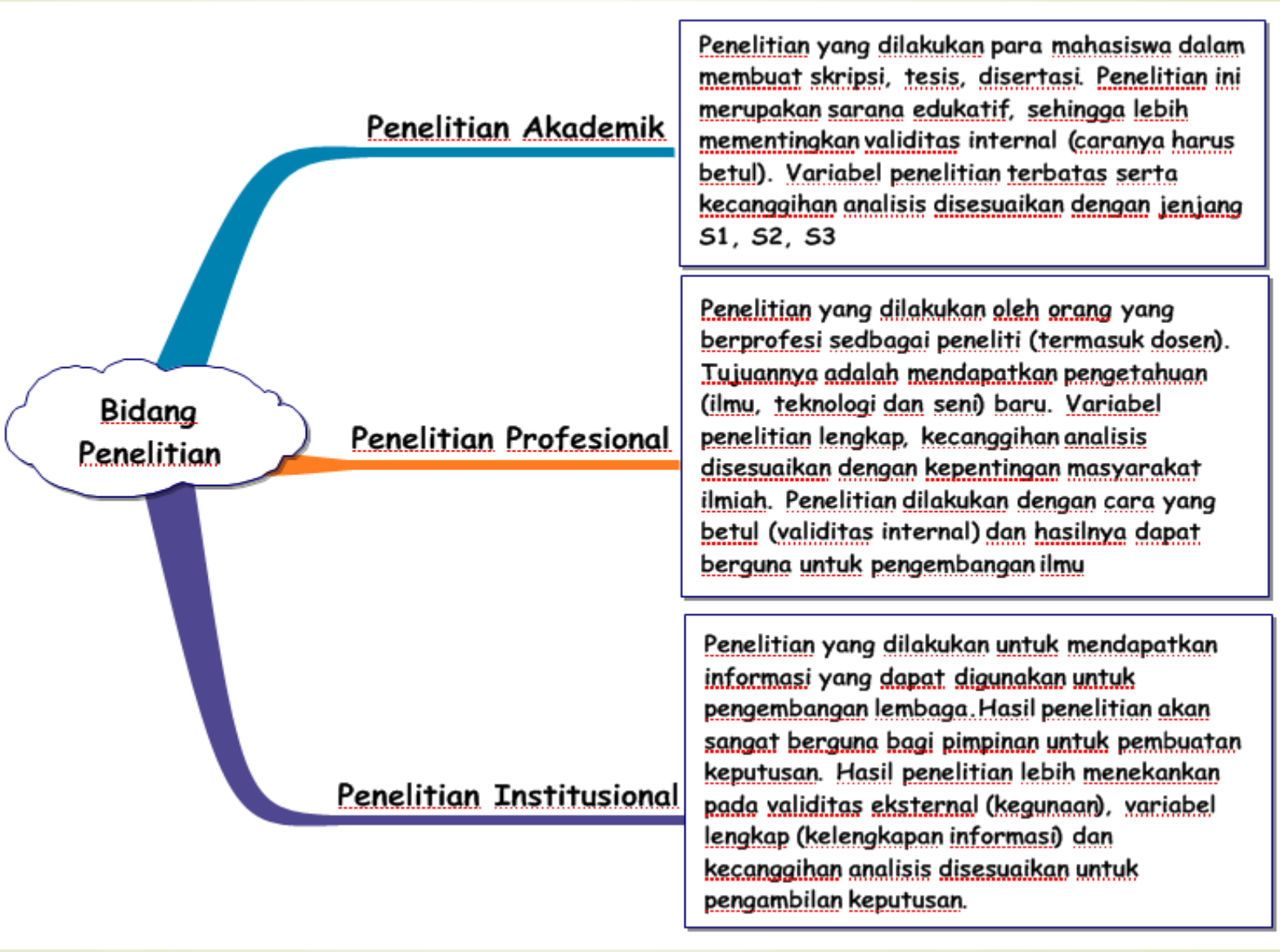
Riset Pendidikan



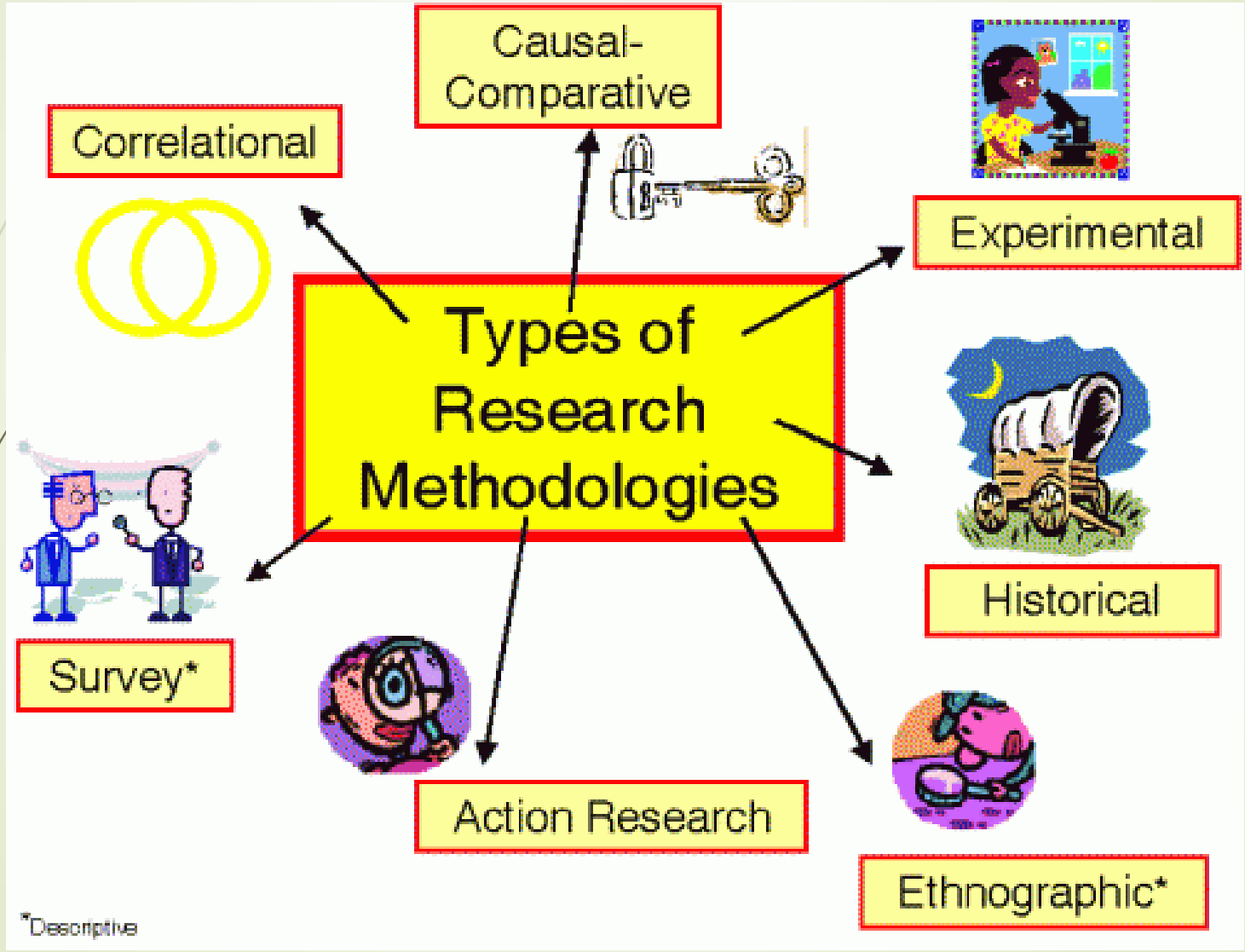
Riset Pendidikan



Riset Pendidikan



Riset Pendidikan



Education Research Approach

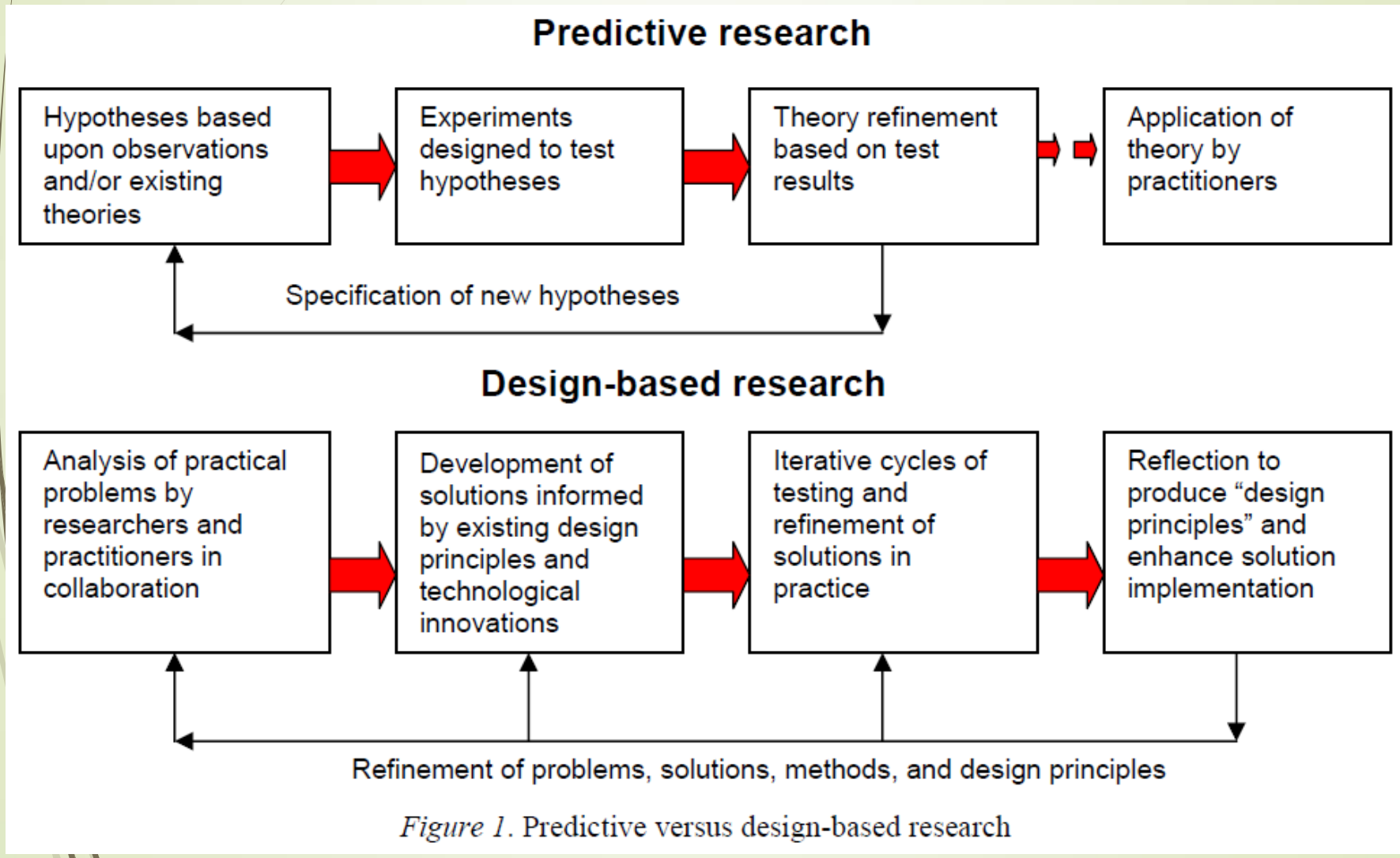


Figure 1. Predictive versus design-based research

Discipline-based education research

- **Discipline-based education research** (**DBER**) is an interdisciplinary research enterprise that "investigates learning and teaching in a discipline [normally from the STEM fields] from a perspective that reflects the discipline's priorities, worldview, knowledge, and practices

- Educational research
- Astronomy education research (AER)
- Biology education research (BER)
- Chemistry education research (CER)
- Computer science education research (CSER), also computing education research
- Engineering education research (EER)
- Geoscience education research (GER)
- Mathematics education research (MER)
- Physics education research (PER)
- Science education#Research

Physics Education Research (PER)

- Physics Education Research (PER) is a field of research focused on understanding how students think about physics and how to teach physics more effectively.
- Researchers in PER typically have (or are working towards) PhDs in physics or education. PER is different from traditional education research because researchers in this field are experts in the subject of physics, and can therefore look at student learning in ways that are particular to physics content.
- Over the last few decades, researchers in PER have made enormous advances in understanding how students learn physics most effectively and in developing teaching methods that apply this understanding to achieve improved student learning.

Physics Education Research (PER)

- Penelitian Pendidikan Fisika adalah bidang penelitian difokuskan pada pemahaman bagaimana siswa berpikir tentang fisika dan cara mengajar fisika lebih efektif.
- Para peneliti di PER biasanya memiliki (atau sedang studi) PhD dalam fisika atau pendidikan. PER berbeda dari penelitian pendidikan tradisional karena peneliti di bidang ini adalah pakar dalam subjek fisika, dan karena itu dapat melihat siswa belajar dengan cara-cara yang khusus untuk konten fisika.
- Selama beberapa dekade terakhir, para peneliti di PER telah membuat kemajuan besar dalam memahami bagaimana siswa belajar fisika yang paling efektif dan dalam mengembangkan metode pembelajaran yang menerapkan pemahaman ini untuk mencapai peningkatan belajar siswa.

Topik Penelitian Pendidikan Fisika

I. CONCEPTUAL UNDERSTANDING

Research questions

1. Identifying common misconceptions
    1) What learning difficulties do students possess that are conceptual in nature?
    2) What are the most common misconceptions that interfere with the learning of scientific concepts?
2. Describing the architecture of conceptual structure
    1) What is the nature of scientific concepts in memory?
    2) What changes when conceptual change takes place?
3. Developing and evaluating instructional strategies to address students' misconceptions
    1) What instructional interventions are most effective for helping students overcome stubborn misconceptions?

Topik Penelitian Pendidikan Fisika

II. PROBLEM SOLVING

Research questions

1. Expert-novice research
    1) What approaches do students use to solve physics problems?
    2) How are the problem-solving procedures used by inexperienced problem solvers similar to and different from those used by experienced solvers?
    3) How do experts and novices judge whether problems would be solved similarly?
2. Representations
    1) What representations do students construct during problem solving?
    2) How are representations used by students?
    3) What is the relationship between facility with representations and problem-solving performance?

Topik Penelitian Pendidikan Fisika

II. PROBLEM SOLVING

Research questions

3. **Mathematics in physics**
   1) How are the mathematical skills used in physics courses different from the mathematical skills taught in math courses?
   2) How do students interpret and use symbols during quantitative problem solving?
4. **Evaluating the effectiveness of instructional strategies for teaching problem solving**
   1) How do students interact with online computer tutor systems?
   2) What features of Web-based homework systems successfully enhance students' problem solving skills?

Topik Penelitian Pendidikan Fisika

III. CURRICULUM AND INSTRUCTION IN PHYSICS

1. Lecture-based methods
    1) Interactive lecture demonstrations (ILDs).
    2) Prelecture assignments. : Just-in-Time teaching (JiTT),
2. Recitation or discussion methods
    1) Tutorials in Introductory Physics developed at the University of Washington
    2) Activity-Based Tutorials and Open-Source Tutorials at the University of Maryland
    3) Cooperative Group Problem Solving at the University of Minnesota
3. Laboratory methods
    1. Real Time Physics
    2. Investigative Science Learning Environments
    3. Computer based Problem-Solving Labs
    4. Scientific Community Labs

Topik Penelitian Pendidikan Fisika

III. CURRICULUM AND INSTRUCTION IN PHYSICS

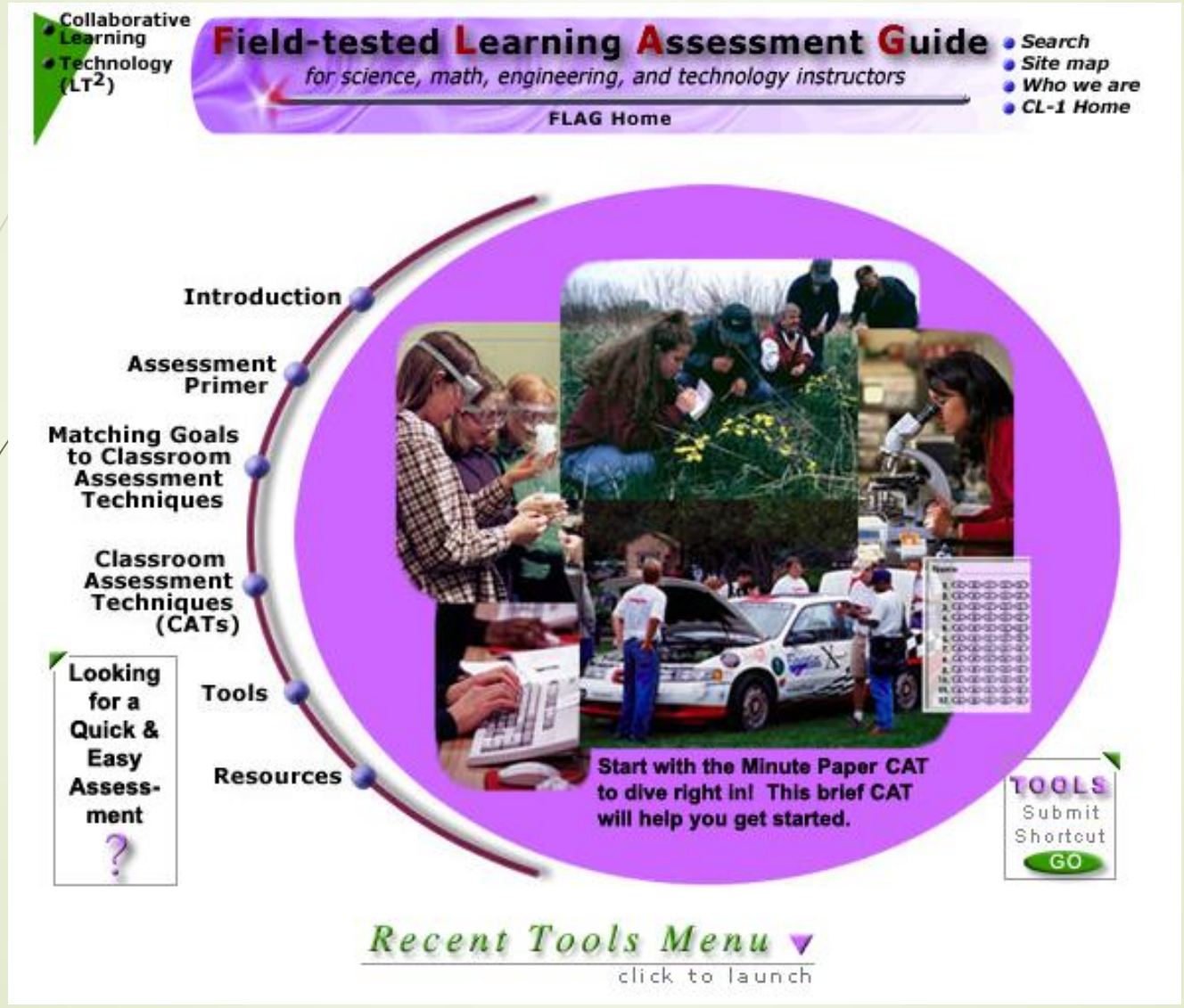
4. Structural changes to classroom environment
    1) Physics by Inquiry
    2) Workshop Physics
    3) Studio Physics
    4) Student-Centered Active Learning Environment for Undergraduate Programs (SCALE-UP)
    5) Technology-Enabled Active Learning (TEAL)
5. General instructional strategies and materials

Topik Penelitian Pendidikan Fisika

IV. ASSESSMENT

1. Development and validation of concept inventories
2. Comparing scores across multiple measures
3. Comparing scores across multiple populations (culture and gender)
4. Course exams and homework
5. Rubrics for process assessment

ASSESSMENT



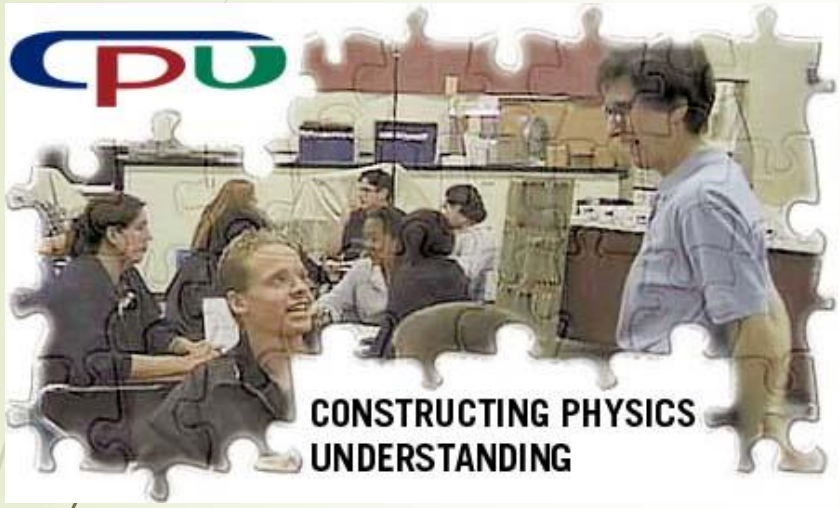
http://www.flaguide.org/index.php

ASSESSMENT

ASTRONOMY & PHYSICS	
Attitude Survey	Survey of Attitudes Toward Astronomy, Pre-Test Survey of Attitudes Toward Astronomy, Post-Test Views on Science-Technology-Society (VOSTS) Views About Sciences Survey (VASS) Maryland Physics Expectation (MPEX) Survey Epistemological Beliefs Assessment for Physical Science (EBAPS) Instrument TextRev: A Survey Tool for Learning how Students Use and Value Textbooks Views about Writing Survey (VAWS)
Concept Mapping	Solar System fill-in Solar System fill-in (answer key) Stars fill-in Stars fill-in (answer key) Galaxies fill-in Galaxies fill-in (answer key)
Concept Tests	Project Galileo: Your gateway to innovations in science education Paul Green's ConcepTest Website for Introductory Astronomy
Conceptual Diagnostic Tests	Introductory Astronomy Survey The Mechanics Baseline Test (MBT) Force Concept Inventory (FCI) Instrument Views of Nature of Science Questionnaire (VNOS)
Mathematical Thinking	University of Maryland (Estimation) Problems for Physics
Multiple Choice Tests	Astronomy Multiple Choice Test

http://www.flaguide.org/index.php

Curriculum Development



Physics Education Research Group (PERG)

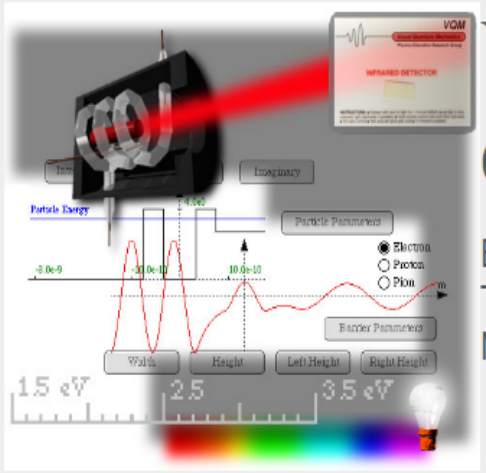
https://web.phys.ksu.edu/vqm/

SUPER

Kansas State University Physics Education Research

Home | Events | Awards | Graduate Study | Contact Us

- Research
- Instructional Materials
- For Teachers
- Publications
- Presentations
- Graduate Education
- Links
- Directories
- About Us



Visual Quantum Mechanics

Educational Research & Development for Teaching Quantum Physics to Non-science and Science Students

Visual Quantum Mechanics - The Original

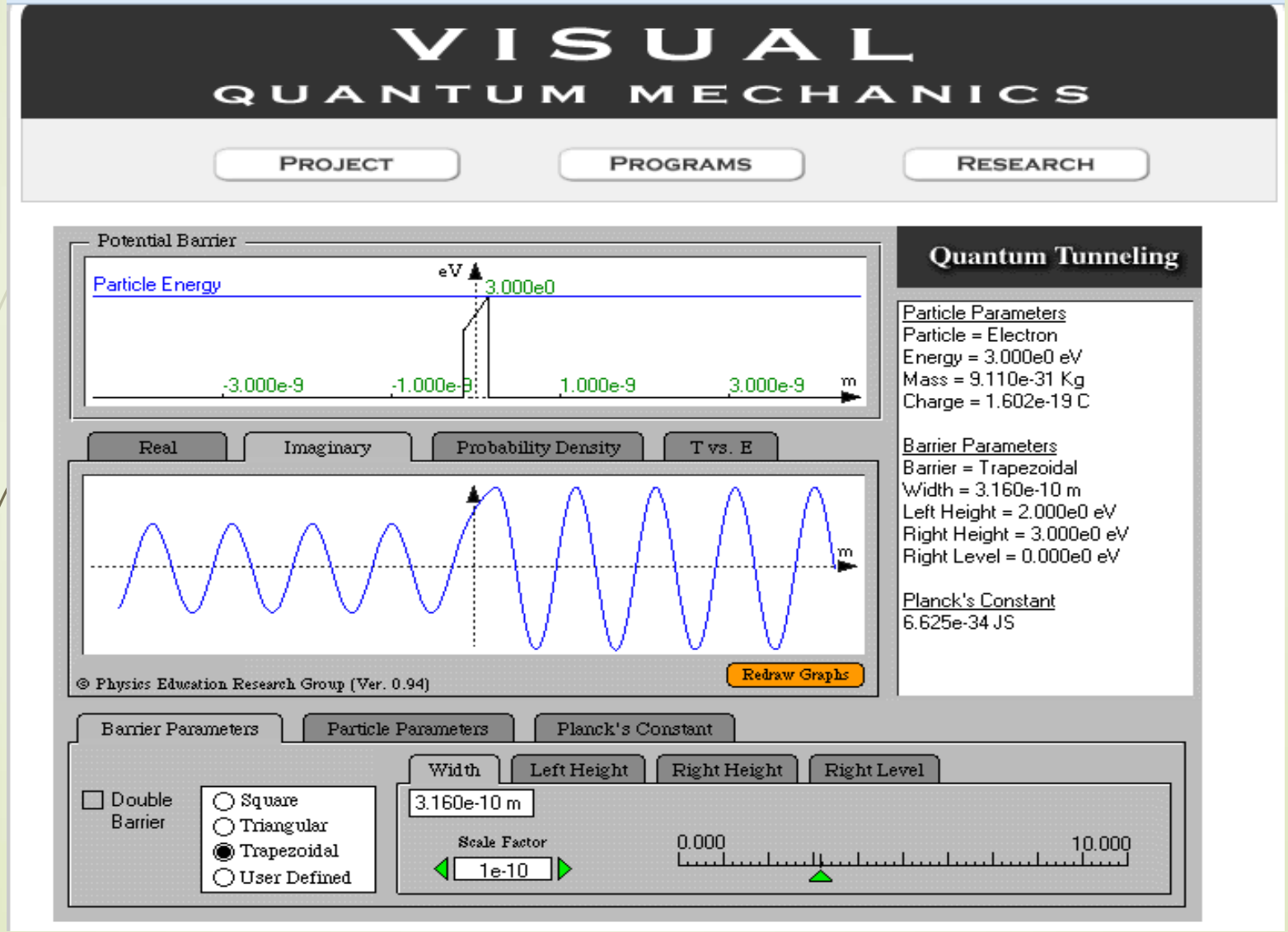
VQM - The Next Generation

Advanced Visual Quantum Mechanics Software

Modern Miracle Medical Machines

Publications

Physics Education Research Group (PERG)



PER Journals and Conferences

- Physical Review Special Topics: Physics Education Research
  http://prst-per.aps.org/
- American Journal of Physics
  http://scitation.aip.org/ajp/
- *The Physics Teacher*
  http://scitation.aip.org/content/aapt/journal/tp
- JRST
  http://www3.interscience.wiley.com/cgi-bin/jtoc/31817/
- *Physics Education*
  http://iopscience.iop.org/journal/0031-9120

International Conference on Physics Education

International Conference on Physics Education