Embracing

Introducing Students to Better Research

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Houston, we have a problem…

- How do you teach research?
  - Here’s what didn’t work:
    - Essays
    - Science Fair Projects
    - Science Olympiad Projects
    - Library Websites
    - Educational Websites
    - ‘Fun’ Outreach
    - Instructional Classes
We did notice a couple things:

- Students go to Google first
- Students perked up for Google
  - Comfort ≠ Skill
- Abstract Project
  - October 2008 Issue of Science Teacher
Google Scholar Results:

Leukaemia stem cells and the evolution of cancer-stem-cell research
BJP Huntly, DG Gilliland - Nature Reviews Cancer, 2005 - nature.com

... Timeline: Leukaemia stem cells and the evolution of cancer-stem-cell research. Brian JP Huntly 1 & D. Gary Gilliland 2 About the authors. Top of page Abstract. ...

Cited by 215 - Related articles - All 4 versions
Georgia Performance Standards – Habits of the Mind

- SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
- SCSh6. Students will communicate scientific investigations and information clearly.
- SCSh7. Students will analyze how scientific knowledge is developed.
- SCSh8. Students will understand important features of the process of scientific inquiry
- SCSh9. Students will enhance reading in all curriculum areas by:
  - a. Reading in All Curriculum Areas
  - b. Discussing books
  - c. Building vocabulary knowledge
  - d. Establishing context
Abstract Project – Student Edition

- Research Diary
  - Start-up Assignment
- Annotated Bibliography
  - NOT a research paper
Student Example - Nanotechnology

- Google: 1,560,000 results
  - #1 was Wikipedia: Nanotechnology

- Google Scholar: 19,700 results since 2006
  - #1: Zinc, copper, and magnesium and risks for all-cause cancer and cardiovascular mortality
    - From Epidemiology
  - Chose to change topic: magnetic nanoparticles
  - #2: Drug-loaded magnetic nanoparticles in cancer therapy
    - From Journal of Physics – Condensed Matter
Student Example - Nanotechnology

- Official Question: How effective and/or reliable is the use of magnetized nanoparticles in cancer therapy?
- Reflection #2 (halfway through):
  - “Although my question fits all the information my articles supply, I feel that I, as an individual, am looking for how realistic the use of magnetized nanoparticles is. I believe that reliability of this idea isn’t a question that needs to be asked at this point in time. In my opinion, it is more important to find out the feasibility of this idea.”

- Changed Question: How effective and/or feasible is the use of magnetized nanoparticles in cancer therapy?
Other Examples – NOT Freshmen

- Why do shark attacks on humans occur?
  - Fisheries Research
  - Tourism Management

- What are the effects of global warming on mammals?
  - Conservation Biology
  - Oecologia
More examples – still not freshmen

● What are the advantages of playing sports at a younger age?
  – Journal of Bone and Mineral Research
  – Journal of the American College of Sports Medicine

● What is the relationship between genetics and nicotine addiction?
  – Biomedical Pharmacology
  – Cancer Epidemiology Biomarkers & Prevention
Abstract Project – Student Edition

- How do you teach research?
  - Here’s how it worked:
    - Actually follow a research process
    - Analyze, criticize, select and reject
    - Vocabulary (Google it!)
    - Reflection and introspection
Abstract Project – Student Edition

- How do you teach research?
  - Here’s why it worked:
    - It’s cool.
    - It’s in their comfort zone.
    - It’s critical thinking.
    - It’s their choice.
      - And they can change their mind!
    - They take charge.
    - They carry it over.
What’s next for us?

- Pre-test and Post-test
- Research in different grades/disciplines
  - LHS Freshman Honors Biology – Poster Project
  - LHS Honors Chemistry – Annotated Bibliography
  - LHS Senior Forensics – Research Paper

- UWG uses a more sophisticated version
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