
BeeSpace Education Research

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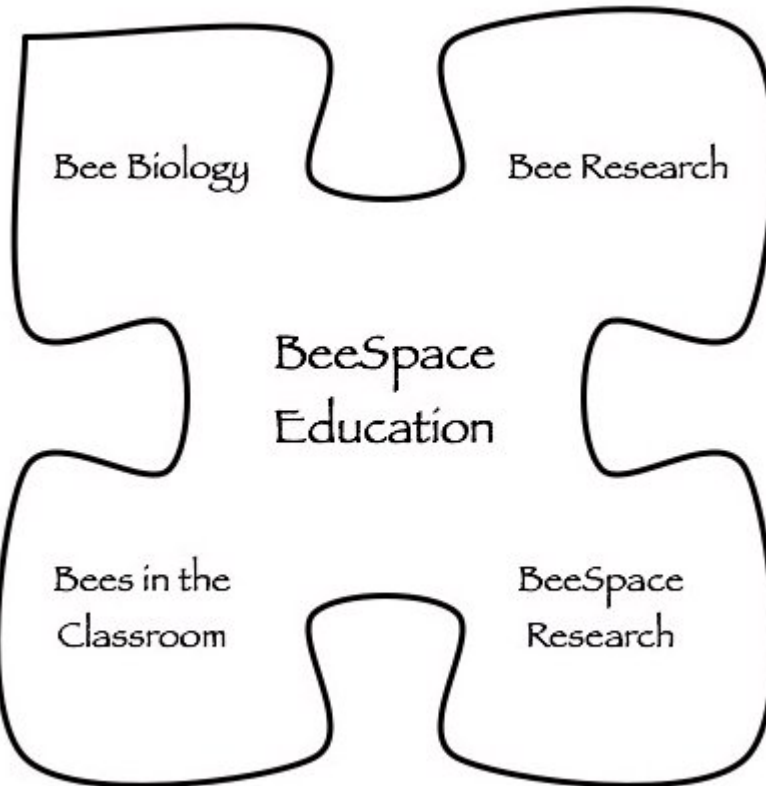
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Unpacking the Puzzle



Integrative Learning

- "connecting skills and knowledge from multiple sources and experiences; applying skills and practices in various settings; utilizing diverse and even contradictory points of view; and, understanding issues and positions contextually." Huber, Hutchings, & Gale, Integrative Learning for Liberal Education (2005)
- "Relate the school to life, and all studies are of necessity correlated." John Dewey, The School and Society (1900)
- No "gap in kind (as distinct from degree) between the child's experience and the various forms of subject-matter." Dewey, The Child and Curriculum (1902)



Education Resources

■ Bee Biology

- ❑ Booklet by high school biology teacher (D. Stone)
- ❑ Video of talk by G. Robinson, with question set
- ❑ Video footage of bee behaviors

■ Bee Research

- ❑ Video tour of Bee Lab
- ❑ Links to Honey Bee Genome materials

■ BeeSpace Research (molecular basis of social behaviors)

- ❑ Video: caring for the BeeSpace bees (K. Pruiett)
- ❑ 'Anatomy of a BeeSpace Experiment' (D. Stone)
- ❑ Videos: researchers at work (M. Sarma, A. Boardmann, S. Liang, R. Velarde)

■ Bees In the Classroom

- ❑ 'Bioinformatics for Beginners' freshman seminar (S. Fahrbach)
- ❑ Middle school visits with bee researchers (G. Robinson, N. Ismail)
- ❑ Video: teacher education activities with bees (S. Fahrbach)

■ Software Support

- ❑ Training for researchers using BeeSpace software – in-house, lab visits, online help



'Bioinformatics for Beginners' @WFU



- First-year seminar taught by S. Fahrbach in Fall 2006
- Classes 1x/wk. for 150 minutes
 - Students introduced to bioinformatics via “nature vs. nurture” issue and BeeSpace Navigator
 - Students build skills and display mastery by developing new BeeSpace educational materials for younger students
- Special features
 - Session with science librarian to create online resource page
 - Field trip to research apiary
 - Videoconference with Bruce Schatz
 - Access to online BeeSpace educational resources
 - Use of NCBI tools and resources
 - Presentation of final projects to BeeSpace PI's via teleconference



B4B@WFU Student Projects

- Projects were required to conform to the North Carolina Standard Course of Study.
- Projects required a “deliverable” for use in the classroom and an accompanying teacher’s manual.
- Materials are ready for use Summer 2007, and will be broadly accessible via the BeeSpace website.
- Students created: a board game (BeeLand), a Jeopardy game, a web site, several PowerPoint presentations, and rules for a game to be played outdoors.



Nature or Nurture	Non-Human Examples	Honey Bee Experiment	Environmental Influences	Genes
\$100	\$100	\$100	\$100	\$100
\$200	\$200	\$200	\$200	\$200
\$300	\$300	\$300	\$300	\$300
\$400	\$400	\$400	\$400	\$400
\$500	\$500	\$500	\$500	\$500



Successes/Challenges of B4B@WFU

- Introduced to bioinformatics concepts, challenges of effective search, modern formulations of nature/nurture in human behavior
- Embraced learning-by-teaching, worked effectively in groups to complete projects
- Interacted directly with researchers
- Proved *resistant* to idea of gene x environment interactions
- Sometimes distracted by minor technical glitches (delays getting BLAST results, printer failures, videoconferencing problems)
- Busy student schedules and low proportion of intended science majors precluded student transition to active participation in outreach



Next Steps

- BeeSpace summer education meeting June 14 – visitors welcome
- Additional education resources coming to project website
- Summer intensive for small group of early high schoolers coming in early August, to explore and model BeeSpace research through learner-led inquiry – planning 20 hours of instruction for 6-8 students
- Assessing outcomes and challenges of connecting middle school-age through undergraduate learners with leading-edge research
- First-Year Seminar at Wake Forest to be offered again in Fall 2007 and Fall 2008 – BeeSpace volunteers are needed for videoconferences in Fall 2007

