

Business Plan

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Data Discovery for Learners of All Ages

Science Approach is dedicated to promoting data discovery for learners of all ages. In support of this mission, Science Approach develops educational materials that engage students and faculty in guided scientific discovery with visualization and related computational technologies.

Clarity of Problem/Opportunity Addressed

As endorsed by the National Research Council, educational institutions and science faculty are striving to introduce spatial and computational thinking to K-12 and college students. Unfortunately, the technologies and research formats needed to introduce such skills can be prohibitively expensive and difficult to implement in classroom settings. Science Approach's e-laboratories (e-labs) offer students the opportunity to develop spatial and computational thinking using the same tools employed by practicing scientists, but in a format that is affordable and easy to implement. Nothing more than an Internet browser is required to use Science Approach's e-labs.

Instructional Format and Technologies

Science Approach's inquiry-based format provides apprenticeship experiences with imaging and computational technologies, data collection procedures, and statistical analysis strategies usually only gained "on the job" in internships or professional work in research labs. To support this approach, sophisticated online tools have been implemented within Science Approach's Moodle-based learning management system (LMS). Analysis technologies implemented so far include ImageJ-A, a scientific image analysis tool; and Rpad, a statistical analysis and graphing interface. Funding is being sought for additional visualization and analysis tool development.

Business Model

To fund development of its educational products, Science Approach receives Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) grants from federal agencies such as the National Institutes of Health (NIH) and the National Science Foundation (NSF).¹ Science Approach uses the funding to develop e-labs in collaboration with scientists, programmers, and science writing consultants. As required by the SBIR and STTR grants, the e-labs are prepared for commercialization.

¹ Since 2003, Science Approach has received \$2,550,000 in SBIR and STTR grants from the NIH. Applications are pending for an additional \$1,550,000 in SBIR funding from the NIH and NSF.

Addressable Market/Size of Market

Science Approach's e-labs respond to a rapid increase in use of e-learning in K-12 and college education. The target market for Science Approach's e-labs includes middle school, high school, and undergraduate life science (e.g., anatomy and physiology, biology, biotechnology, neuroscience, and genetics) courses. The number of undergraduate degrees in biology awarded annually—78,000 in 2010—provides a low estimate of the market size. Several hundred thousand middle school, high school, and undergraduate students could potentially acquire subscription codes to access the labs each year.

Targeted Demographic

Science Approach plans to publish, market, and fulfill low-cost subscription orders for its e-labs. The labs will also be licensed to publishers and commercial e-learning providers. Thus, five customers for the labs are envisioned:

1. Middle school, high school and college faculty teaching life science courses.
2. Middle school, high school and college students taking life science courses.
3. The purchasing departments of middle schools, high schools, and their local districts.
4. College book stores who may sell subscriptions for the labs to students.
5. Publishers and e-learning providers who might license the labs.

Financial Targets

Currently, Science Approach is supported primarily by grants. However, the company commercialized its first product in 2010 and began receiving royalty income in 2011. Additional licensing income is anticipated in 2011 and the following years as more of the company's e-learning products are published and licensed.² Science Approach's goals for generating revenue from its SBIR-funded projects are to (1) pay salaries of key staff and consultants; (2) cover overhead expenses for sustaining the organization; (3) build a base of savings to help sustain the company during economic downturns; (4) provide reasonable health care and retirement benefits for key staff; and (5) upgrade and maintain the technological infrastructure of the company. To achieve these goals, Science Approach plans to become 50-60% self-sustaining within five years. An annual income of \$250,000–\$300,000 will be required to achieve that target.

² Science Approach plans to publish and market ten e-labs in 2011 and 2012.

Go-To-Market Strategy

The potential for Science Approach to market its products has been strengthened by its graduation from the NIH Commercialization Assistance Program (NIH-CAP) in May 2011. The NIH-CAP is a specialized technical assistance program for SBIR Phase II awardees that helps them transition their SBIR-developed technologies into the marketplace. While in the NIH-CAP program, Science Approach developed a plan to identify and recruit strategic partners to license e-labs created for its *NeuroVisions* project. Science Approach also identified its competitive landscape, primary competition, value proposition, and critical milestones for success.

Marketing of the labs will occur through strategic partnerships and through social networking channels. Science Approach maintains a Web site that is linked with its Facebook page and connected to LinkedIn and Twitter feeds. Science Approach will actively recruit registered members from its newsletter list, Facebook friends, LinkedIn connections, and Twitter followers. Social networking strategies learned through the NIH-CAP program will be employed to draw interest in Science Approach's products and activities.

Science Approach plans to sell four-month subscriptions to its labs. Single-student subscriptions will be sold at low cost (~\$5). Revenues will be generated in two ways: (1) direct sales to customers and (2) licensing.

Direct Sales to Customers

The Science Approach Web site includes a registration and login system that connects the Joomla!-based content management system (CMS) to the Moodle-based LMS. The open source AEC subscription system manages all registrations on the Science Approach site. Students who are directed by their instructor to purchase a subscription for an e-lab will navigate to the Science Approach Web site, register, and use the subscription system to make the purchase. The system, which is integrated with Paypal, will permit a student to purchase a subscription with a credit card or direct transfer from a bank account. The funds will be deposited into Science Approach's Paypal account and the student given immediate access to the lab.

Additionally, coupon codes will be sold directly to schools and book stores for use in the system. The institution or book store will submit a purchase order to Science Approach to buy a specified number of license codes. Science Approach will then generate the codes and send them to the purchaser. The institution will then either distribute the codes to the instructor and students (as in the case of a purchase for a classroom) or sell the codes to the students (i.e., through the campus bookstore).

Science Approach

Science Approach is developing a plastic card that bookstores can use to sell the codes. Once a student has a coupon code to subscribe to a lab, the code will be entered as part of the purchase process and the student granted immediate access to the lab.

Licensing

Science Approach is actively pursuing strategic partners who will license and market its labs.

Management Team

Science Approach has four founding partners. Two of the founding partners (Steven Moore, Ph.D., and Kristine Rees) are full-time directors of the company; one partner (Jenny Brady) is a part-time staff member; and the other partner (Robert Kolvoord, Ph.D.) is an instructional technology advisor. Dr. Moore has an undergraduate degree in biology, a masters in business administration, and a Ph.D. in natural resource management and sociology. Ms. Rees has an undergraduate degree in public administration and nearly three decades of experience managing non-profit and for-profit entities. Ms. Brady is a former high school science teacher and has undergraduate and graduate degrees in general biology and secondary education. Dr. Kolvoord has a Ph.D. in theoretical and applied physics and is professor of integrated science and technology at James Madison University. The company currently has one part-time staff member, Mary Moore. She has a graduate degree in geography and an undergraduate degree in environmental conservation and management. Ms. Moore serves as an instructional materials developer and editor for Science Approach. On a project-by-project basis, Science Approach contracts with scientists, academic institutions, programmers, pedagogical experts, evaluators, graphic designers, animators, science writers, and science content consultants.

History

For nearly 20 years, the Center for Image Processing in Education (CIPE) (the non-profit organization from which Science Approach was created) and Science Approach have been innovators in the use of computer-based visualization tools in K-16 education. CIPE was founded in 1992 as an offshoot of the Image Processing for Teaching (IPT) project in the Lunar and Planetary Laboratory of the University of Arizona. With federal and private funding, CIPE developed and disseminated 15 sets of instructional materials: *IPT Sourcebook*; *Discovering Image Processing*; *Hands-on Image Processing (HIP) Biology 1 and 2*; *HIP Physics*; *Anatomy and Physiology Technologist*; *Discovering GIS*; *Why Did the Sheep Cross the Road?*; *Camp IPX*; *HIP Mathematics*; *Visualizing Addiction*; *Guiding Light*; *Biotechnologist*; *Mapping an Ocean Sanctuary*; and *Exploring Data with GIS to Experience Sanctuaries*. Sales of these products and related professional development workshops provided approximately 40% of CIPE's operating budget until it was closed in 2007 so that its directors could

Science Approach

focus on management of Science Approach. Total sales for CIPE exceeded \$2.2 million during the ten-year period before it ceased operations. Its products were carried by respected resellers such as Fisher Science Education, Pearson Publishing, Ward's Scientific Enterprise, Sargent-Welch, Tangent Scientific Supply, and Parco Scientific.

Science Approach was incorporated as a limited liability corporation (LLC) in 2003 by Dr. Moore (CIPE's Executive Director at the time); Ms. Rees (CIPE's Business Manager); Ms. Brady (a CIPE staff member); and Dr. Kolvoord (the chair of CIPE's Board of Trustees). Since its founding, Science Approach has been funded with grants from the National Institute of Mental Health (NIMH), National Institute of Environmental Health Sciences (NIEHS), National Library of Medicine (NLM), National Institute of Child Health and Human Development (NICHD), and National Science Foundation (NSF). Science Approach has completed three Phase I SBIR projects (*NeuroVisions: Teaching Neuroscience with Neuroimaging Data* [NIMH 1R43MH070250-1], *Powers of Inquiry: Using Image Analysis to Explore Environmental Health Science* (NIEHS [1R43ES012551-01], and *NIH Biotechnologist: Authentic Exploration of Biotechnology in Health Science* [NLM 1R43LM009474-01]); one Phase I STTR project (*Volumetric Imaging for Science Instruction of an Open Nature* (VISION) [NICHD 1R41HD049973-01]); and one Phase II SBIR project: (*Powers of Inquiry* [5R44ES012551-03]). The company is currently completing a Phase II SBIR project (*NeuroVisions: Teaching Neuroscience with Neuroimaging Data* [NIMH 2R44MH070250-02]); a Phase II STTR project (*VISION* [NICHD 2R42HD049973-02]); and an Innovative Technology Experiences for Students and Teachers (ITEST) grant from the NSF (*CoastLines* [NSF 0737706]).

Product Pipeline

Science Approach plans to release the following e-labs in 2011-2012.

Title	Level
Exploring Neuron Form and Function: Using 3D Imaging of the Second Brain to Predict Neuronal Shape	High School
Stomata Revealed: Investigating How Guard Cells Maintain Homeostasis	High School
Surgery Practice: Digitally Defining, Diagnosing, and Excising Brain Tumors	High School
How Alcohol Alters the Brain: Exploring Hippocampal Volume Reduction in Teenagers Who Drink	High School
Mapping the Yeast Cytoskeleton: Reconstructing and Analyzing the Movement of Spindles and Centromeres During Mitosis	High School

Title	Level
Your Brain Without Sleep: Analyzing How Sleep Deprivation Impacts Brain Function	Lower Undergraduate / High School
Teen Brains on Alcohol and Other Drugs: Using fMRI to Assess Cognitive Damage and Predict Future Substance Use	Lower Undergraduate / High School
New Neurons for You: Verifying and Investigating Adult Neurogenesis with Imaging	Lower Undergraduate / High School
Seeing GABAA Receptors at Work: Quantifying Radioligand Binding and Its Modulation by Endogenous Signaling Molecules	Advanced Undergraduate
Form and Function of Individual Neurons: Using Confocal Images and Modeling to Learn About Structure/Function Relationships in Nerve Cells	Advanced Undergraduate

Future Projects

Science Approach currently has three SBIR applications in review.

Title, Funder, and Submission Date	Purpose
<i>Neuroscience Visualization e-Laboratory Builder (NVeLB)</i> . Submitted to the National Science Foundation in June 2011.	If funded, the <i>NVeLB</i> project will make neuroimaging and statistical analysis tools integrated within an e-learning framework available for easy deployment as learning objects (e-laboratories) in the existing learning management systems (LMSs) of academic institutions and commercial e-learning development companies.
<i>VoxelDiscovery 5-8: Engaging the Middle Grades in Visualization of the Nervous System</i> . Submitted to the National Institute of Mental Health in April 2011.	If funded, the project will develop and test four prototype e-laboratories (e-labs) and corresponding tablet applications (apps) for middle school science education. The goal of the e-labs and apps is to empower middle school students to use modern neuroimaging research to explore questions relevant to young adolescents' lives and health, such as: (1) Are all people wired the same way?; (2) How is my brain changing as I grow up and why do I think the way I do?; (3) Is exercise good for my brain too?; and (4) Are alcohol and other drugs really that bad for my brain?

Science Approach

Title, Funder, and Submission Date	Purpose
<i>NIH Biotechnologist: Authentic Explorations of Biotechnology, Genetics, and Genomics in Health Science</i> . Submitted to the National Library of Medicine in August 2011.	If funded, the project will develop ten hybrid (online and e-book-based) laboratories that use bioinformatics to teach basic concepts in biotechnology, genetics, and genomics to high school and lower undergraduate students. The project goal is to provide resources that faculty can use to build computational thinking skills in beginning life science students.