

Table 1D. Milestones

	Goal 1 Taxonomies of Bioengineering Knowledge	Goal 2 Bioengineering Curricula Design	Goal 3 Formulate and Test Learning Science Theories for Bioengineering	Goal 4 Develop Learning Technologies for Bioengineering Instruction	Goal 5 Develop Assessment and Evaluation Methods and Apply to Instruction and Center Performance	Goal 6 Disseminate Research Findings to Educational Community
Year 4: 2002-2003	Established collaboration with CDIO critical skills group at MIT		Developed basic concepts for "adaptive expertise"	Made CAPE a practical tool for alpha testing of its ability to design and support instruction ● Redesigned VaNTH web site as a initial portal for bioengineering educators.	Performed first preliminary meta analysis of VaNTH-wide studies. Results show significant overall effectiveness of HPL based instruction. Developed assessment tracking system ● Developed web-based survey instruments ●	Published 7 journal articles, 1 textbook and numerous proceedings.
Year 5 2003-2004	Expand physiology taxonomy and develop database method for its storage and retrieval. ● Develop taxonomy in bioinstrumentation	Develop curriculum and critical skills database systems ●	Develop definitions and methods of assessment for adaptive expertise for bioengineers ●	Bring CAPE to enhanced usability by instructors ● Integrate SOCASK and CAPE	Refine assessment methods for experimental studies and extend to new modules. Develop Center and systems evaluations. Develop methods to assess student responses to CAPE instruction ● ● Develop assessment tracking and management software. ●	Expand journal article presentations
<p>KEY= ● Learning Science ● Assessment and Evaluation ● Learning Technology ● Bioengineering Domains ● Education Program ● Industrial/Practitioner Partner Program</p>						

Table 1D. Milestones

	Goal 1 Taxonomies of Bioengineering Knowledge	Goal 2 Bioengineering Curricula Design	Goal 3 Formulate and Test Learning Science Theories for Bioengineering	Goal 4 Develop Learning Technologies for Bioengineering Instruction	Goal 5 Develop Assessment and Evaluation Methods and Apply to Instruction and Center Performance	Goal 6 Disseminate Research Findings to Educational Community
Year 6 2004-2005	Expand taxonomy coverage to key areas	Integrate curricula and critical skills into a web resource, Have AIMBE Academic Council act as a review body. ●	Add methods for the development of adaptive expertise into the HPL general framework. Expand selected modules to incorporate these features. ●	Improve the functionality and CAPE within eLCMS and eLMS, Add modules and granules to repository and exemparry database. Register materials with digital libraries.	Complete AE for CAPE based materials. Analyze studies of newly developed modules.	Continue publishing and presenting at key professional meetings. ●●●
Year 7 2005-2006	Assemble taxonomy, curricula and critical skills material into a searchable database available to the bioengineering community. ●	(same as goal 1)	Begin seeking additional center funds to continue research on adaptive expertise im engineeirng and related subjctcs.	License CAPE, INDIE and related technologies for commercial dissemination.	Begin overall center evaluation.	Provide workshops to potential proposers for open competitin for VaNTH style modules. ●
Year 8 2006-2007	Identify or create organization to coordinate continuous review and updating of taxonomies, curricula, and skills database.	(see goal 1)	Create organization to pursue LS research in bioengineering and related fields	Develop learning technology as a field, participate in new research and development organization for bioengineering education.	Complete evaluatin of VaNTH and its impact.	Create final report
KEY= ● Learning Science ● Assessment and Evaluation ● Learning Technology ● Bioengineering Domains ● Education Program ● Industrial/Practitioner Partner Program						

Table 1D. Milestones

	Goal 7 Develop and Disseminate Instructional Materials in Bioengineering Domains for Precollege, Undergraduate, Graduate and Postgraduate Learners	Goal 8 Disseminate Methods for Production of Instructional Materials	Goal 9 Engage Industry and Practitioner Groups in Educational Development of Bioengineering
Years			
Year 1: 1999-2000	Began work on the applications of HPL and Legacy cycle to BioE domain material. ●		Identified IPP leadership and initial industrial partners. Enlisted two partners.
Year 2: 2000-2001	Continued work on undergraduate and graduate modules in active domains ● ● Proposed and received funding for RET and PER programs to support significant precollege outreach, recruited collaborating precollege teachers and schools ●	Workshops at MIT, NWU, VU, UTA, Duke on HPL methods Modular Design white paper developed.	Recruited additional industrial partners, added Olin College and University of Washington as academic outreach partners. Internship program developed as IPP involvement effort.
Year 3: 2001-2002	Addition of new modules, refinement of existing modules, increased controlled studies. ● ● Modules tested in Nashville and Chicago schools (middle and high school) ●	Workshops at U. Washington, Vanderbilt School of Engineering ● ● Workshops at Austin, San Antonio for precollege teachers	Revised industrial participation plan, industrial partners grow to 10, U. Memphis added as outreach academic partner. Datex-Ohmeda and Micronova participate substantially in design domain. nTara participates in biomechanics module development. ● ●
	KEY= ● Learning Science ● Assessment and Evaluation ● Learning Technology ● Bioengineering Domains ● Education Program ● Industrial/Practitioner Partner Program		

Table 1D. Milestones

	Goal 7 Develop and Disseminate Instructional Materials in Bioengineering Domains for Precollege, Undergraduate, Graduate and Postgraduate Learners	Goal 8 Disseminate Methods for Production of Instructional Materials	Goal 9 Engage Industry and Practitioner Groups in Educational Development of Bioengineering
Year 4: 2002-2003	<p>Replicated and extended modules in active domains. Expanded experimental tests of instruction.</p> <p>Acquired new funding from the Whitaker Foundation to expand module development in biotechnology and bioMEMS.</p> <p>Converted biomechanics course to CAPE assisted instruction. ●</p> <p>Partnership established with Oregon Graduate Institute for development of optics modules. Partner Fisk university establishes courses in biomedical computing and informatics. Designs first courses with HPL framework ●</p>	<p>Design Workshop at 2002 BMES meeting, Workshop on module design at MIT. Workshop at 2002 ASEE Summer School for Chemical Engineering faculty. ●</p>	<p>Industrial partners engaged in senior design course.</p> <p>Industrial partners held joint instructional design conferences with VaNTH investigators. ●</p> <p>N-Tara developed preliminary business plan for new company to market VaNTH materials.</p>
Year 5 2003-2004	<p>Extend module production to new domains.</p> <p>Develop and test HPL-based materials at minority serving institutions Fisk and Memphis ●</p> <p>Bring development of mature modules to an end. Make materials available to beta testers outside VaNTH.</p> <p>Deliver workshop on high school bioengineering modules to Nashville teachers.</p>	<p>Develop workshop format and web-based support of workshops.</p> <p>Give workshops at BMES meeting, U. Memphis ●</p>	<p>Continue business plan development and identify venture capital for start up e-learning company (Jerry Brock).</p> <p>Incorporate partners into module development and design instruction.</p>
	<p>KEY= ● Learning Science ● Assessment and Evaluation ● Learning Technology ● Bioengineering Domains ● Education Program ● Industrial/Practitioner Partner Program</p>		

Table 1D. Milestones

	Goal 7 Develop and Disseminate Instructional Materials in Bioengineering Domains for Precollege, Undergraduate, Graduate and Postgraduate Learners	Goal 8 Disseminate Methods for Production of Instructional Materials	Goal 9 Engage Industry and Practitioner Groups in Educational Development of Bioengineering
Year 6 2004-2005	<p>Engage beta test sites in evaluation of graduated modules and courses. ●</p> <p>Compare results from minority-serving institutions to those for other VaNTH testbeds to determine demographic based differences in response and effectiveness of HPL modules if any exists. ●</p>	<p>Bring workshop methods to fully functional forms. Offer at national meetings and to requesting university programs.</p> <p>Bring precollege module and course methods to outreach-workshop level, Seek school and district in-service training venues.</p>	<p>Send graduated modules and course for commercial finishing in preparation for commercial distribution.</p> <p>Continue to engage industry in the review of VaNTH modules and courses.</p> <p>Complete funding and establishment of start-up eLearning company.</p>
Year 7 2005-2006	<p>Conduct an open competition for the development of bioengineering modules and courses developed according to HPL framework and VaNTH technology and AE principles. (Note: This effort requires additional funds from NSF)</p>	<p>Continue precollege workshops and in-service education.</p>	<p>Create an industrial review panel for bioengineering education.</p> <p>Continue dissemination through start-up company or other commercial distribution organizationa.</p>
Year 8 2006-2007	<p>Use new organization to continue funding of module development and assembly of completed and tested materials in repository. ●</p>	<p>Continue workshops and publications.</p>	<p>Act as a resource for commercial eLearning partners. ●</p>
	<p>KEY= ● Learning Science ● Assessment and Evaluation ● Learning Technology ● Bioengineering Domains ● Education Program ● Industrial/Practitioner Partner Program</p>		