

Inquiry-guided Learning at NC State University

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Begun in 1997 NC State University's Inquiry-guided Learning (IGL) Initiative bridges the research and teaching missions of the University. It is a complex, multi-pronged faculty development initiative that has engaged approximately 200 faculty and more than sixty academic and administrative units on campus and affected more than 6,000 students. The initiative comprises a growing First Year Inquiry Program that reaches approximately one third of incoming freshmen, a First Year Seminar Program in the College of Humanities and Social Sciences, selected courses throughout the undergraduate program, both general education and the major, and nine lead departments in seven of the university's ten colleges that have transformed a sequence of courses in the major. We are also developing closer connections between the University's Honors Program and the new Office of Undergraduate Research. In all four facets of the initiative, participating faculty facilitate learning through students' active investigation of complex questions and problems and, in the process, promote four broad student learning outcomes: critical thinking, developing habits of independent inquiry, responsibility for one's own learning, and intellectual growth and development. A shared commitment to these outcomes has furthered the integration of the IGL Initiative with three other key initiatives on campus—writing and speaking across the curriculum, undergraduate academic program review, and assessment. The initiative is also intertwined with broader, ongoing conversations concerning general education and the undergraduate education curriculum. The initiative is remarkable, particularly in a large research university, because it is so widespread and multi-faceted, yet coordinated and faculty-driven from the start. We are currently working on a book on the IGL Initiative scheduled for publication in fall 2004 by Stylus Publishing. Edited by Virginia Lee, Faculty Center for Teaching and Learning, the book will include the contributions of over thirty faculty and staff at NC State.

The following three symposiums have helped showcase successive achievements in inquiry-guided learning, disseminate inquiry-guided learning more broadly on the campus, and advance the current conversation about and understanding of inquiry-guided learning on this campus:

March 19, 2001 Campus-wide Symposium on Inquiry-Guided Instruction at NC State University, Talley Center

The final event of the Office of the Provost-funded Hewlett Continuation Project, the symposium showcased the classroom practices of faculty utilizing inquiry-guided learning and disseminated these practices to the wider university community. More than seventy people attended, including faculty, staff, and graduate students from NC State as well as representatives from Duke University and the Kenan Institute.

The symposium began with a keynote address by Sheila Tobias, author and science education consultant. Following the address thirty-seven faculty, staff and graduate/undergraduate students presented twelve breakout sessions organized around four themes: classroom teaching practices and IGL, technology and IGL, assessing the effects of IGL on students and faculty, and other undergraduate reform efforts and IGL. Proceedings are available at http://www.ncsu.edu/fctl/Initiatives/IGL_Symposium/.

January 22, 2002 Institute on Inquiry-guided Learning, Convocation Center, College of Textiles

Funded through a small planning grant from FIPSE, the invitational Institute on Inquiry-Guided Learning showcased best practice examples of inquiry-guided learning at four levels of the University: individual course, sequence of courses in the major, departmental program, and the span of general education to completion of the major. More than fifty people who had been involved in one or more IGL programs or projects on campus attended as well as Stuart Cooper and James Anderson.

Between faculty presentations, participants met in small groups to develop specific ways in which they could advance their own practice of IGL and to identify the opportunities for and obstacles to more widespread dissemination of IGL in their departments. Among other important outcomes from this Institute, we have developed a model of departmental readiness for undergraduate education reform using the Department of Microbiology as a case study. We have presented the model at two national conferences and are currently working on an article for publication.

January 8, 2004 Third Symposium on Inquiry-guided Learning: Institutionalizing Inquiry-guided Learning at NC State, Convocation Center, College of Textiles

Funded with remaining funds from the Initiative's second grant from the Hewlett Foundation, the Symposium will highlight current examples of the institutionalization of inquiry-guided learning at the University including the First Year Inquiry Program, CHASS First Year Seminar Program, the Honors Program, the Office of Undergraduate Research and selected departmental majors. It will also assist us in charting a course for further institutionalization of inquiry-guided learning. We anticipate an attendance of 70-100 participants including NC State faculty, staff, and administrators, and representatives from Duke and UNC-Chapel Hill and the Kenan Institute's Kenan Fellows Program. Alan Guskin and Mary Marcy, Co-Directors of the Project for the Future of Higher Education, who have developed a model for institutionalizing educational reform in times of scarce resources will assist us with the planning of this event, consult with us, and present the keynote address.

Next steps include the following:

1. Establishment of an Inquiry-guided Learning Academy, a vehicle for faculty and departmental teams unfamiliar with inquiry-guided learning to work intensively with experienced faculty and staff on the introduction of IGL into their classes and programs;
2. Establishment of an Institute for Research on Inquiry-guided Learning with funded graduate students and Faculty Fellows to enhance the scholarship of teaching and learning in this area and deepen the practice of IGL on the campus;
3. IGL for Students, a comprehensive orientation to the demands and expectations of inquiry-guided learning at NC State, recognizing that inquiry-guided learning represents a new way of learning for many students;
4. The integration of the University's Undergraduate Research Program with the IGL Initiative; and
5. IGL at NC State On-line, representing the aggressive development of a university-wide website to provide a portal for the various IGL initiatives on campus, to describe current campus efforts at all levels of the university, and to articulate a vision for the transformation of undergraduate education through IGL at NC State.

For further information about NC State's IGL Initiative, please see the following:

http://www.ncsu.edu/fctl/Initiatives/Inquiry-Guided_Learning/ for an online description of the program.

Lee, V. S. & Schechter, E. (2000) Assessing teaching and learning. **Emphasis, 10** (1). Available at http://www.ncsu.edu/fctl/Services/Emphasis_Teaching_And_Learning/

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Lee, V. S. (2002). Coordinating campus initiatives through a focus on student learning outcomes. In Austin Doherty et al. (Eds.) **Student Learning: A Central Focus for Institutions of Higher Education**. Milwaukee, WI: Alverno College, 89-92.

Odom, J. & Greene, D. (2003). The first year inquiry program: A faculty led teaching and learning initiative at NC State. **Emphasis, 12** (4). Available at http://www.ncsu.edu/fctl/Services/Emphasis_Teaching_And_Learning/

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Table 2.1 Inquiry-guided Learning at NCSU

<i>Dates</i>	<i>Program title</i>	<i>Participating units</i>	<i>Focus</i>	<i>Program features</i>
Before 1997	Independent Faculty Initiatives CUS Report CUE Position Statement Richard Paul Workshop	Individual Faculty Faculty Senate CUE Div. of Undergraduate Affairs	Early exploration	
1997–1999	Hewlett I (\$150,000—funded by Hewlett Foundation)	Individual Faculty, Staff and Graduate Students (50) Div. of Undergraduate Affairs	Exploration of inquiry-guided learning with classroom experimentation in general education courses	Self-directed faculty groups Retreats/workshops with external facilitators Assessment study
1999–2002	First Year Inquiry Courses (2001/2002—\$271,000 funded by Div. of Undergraduate Affairs)	Sections: 1999/2000—10; 2000/2001—28; 2001/2002—46 Div. of Undergraduate Affairs	Small seminars for first-year students taught with inquiry-guided learning	Small (i.e., 22 students) classes Faculty development Program assessment
2000–2001	Hewlett Continuation (\$59,500—funded by NCSU Office of the Provost)	Individual Faculty, Staff and Graduate Students (40) Hewlett Steering Committee	Integration of inquiry-guided learning in individual courses	Outcomes-based course development process Common understanding of inquiry-guided instruction

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Table 2.1 (Continued)

<i>Dates</i>	<i>Program title</i>	<i>Participating units</i>	<i>Focus</i>	<i>Program features</i>
2000–2001 (continued)		Faculty Center for Teaching and Learning		Resource handbook Retreats/workshops with external/internal facilitators Small working groups Embedded classroom/program assessment Campus-wide dissemination
2000–2002	Hewlett Campus Challenge (\$150,000—funded by Hewlett Foundation)	Departmental Teams (10) Faculty Center for Teaching and Learning Campus Writing and Speaking Program Div. of Undergraduate Affairs University Planning and Analysis	Institutionalization of inquiry-guided learning in the departmental major with multiunit collaboration	Outcomes-based curricular-level outcomes and course/curriculum planning Orchestration of campus initiatives Resource handbook Retreats/workshops with external/internal facilitators Embedded classroom/program assessment Departmental dissemination Campus-wide dissemination

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(Continued)

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<i>Dates</i>	<i>Program title</i>	<i>Participating units</i>	<i>Focus</i>	<i>Program features</i>
2001–2002	FIPSE Planning Grant (\$30,000)	Div. of Undergraduate Affairs College of Humanities and Social Sciences Faculty Center for Teaching and Learning	Assessment of impact of IGL initiatives on faculty and student perceptions of teaching and learning and effects on student learning	Construction of an assessment model
2002	Teaching with IGL Seminar	Faculty Center for Teaching and Learning	Integration of IGL into courses in department teams of two	See Hewlett Continuation above
	Other Reform Efforts	Office of the Provost Faculty Center for Teaching and Learning Campus Writing and Speaking Program		Service learning, curriculum diversity, writing/speaking across the curriculum

Table 1.1 Current Understanding of Inquiry-guided Learning

<i>Stages of inquiry</i>	<i>Critical thinking</i>	<i>Kolb's learning cycle</i>	<i>Teaching strategies</i>	<i>Continuum of support</i>	<i>Selected methods of assessment</i>
Content	Knowledge Comprehension		Various (see below)	✓ Various (see below)	Quizzes, exams Outlines Concept maps Briefing (paper) (Mini-) Papers, reports Oral presentations (Annotated) Bibliography
Develop question Design/frame experiment/ study Select raw data [Define/represent problem] ↓	Synthesis	Active Experimentation ↓	Laboratories Direct observation Primary text reading Simulations/games Field work Problems Case studies Service learning Problem-based learning Project (e.g., design) Performance Internships	✓ Question/problem provided ✓ Readings selected ✓ Parameters provided ✓ Site selected ✓ Guiding questions provided ✓ Prompts provided ✓ Heuristic provided ✓ Modeling ✓ Coaching	Research proposal Study design/plan Problem statement Develop question/hypothesis Chart, diagram, flowchart

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Observe Record [Explore, generate strategies] ↓		Concrete Experience ↓	See above [Role play]	✓ Questions provided ✓ Worksheet provided ✓ Guidelines provided	Log Lab/field notes Observation lists Idea lists Tables, charts Alternative drafts/solutions
Organize Analyze [Analyze alternative strategies] ↓	Analysis	Reflective Observation ↓	Logs/journals Other writing assignments Discussion Brainstorming [Debate/panel]	✓ Questions provided ✓ Format provided ✓ Articulation	Charts, tables, diagrams, flowcharts (Mini-) Papers Memo Taxonomy/set of categories Journal
Interpret Evaluate [Select strategy] ↓	Synthesis Evaluation	Abstract Conceptualization ↓	Lecture Readings Films/videotapes Concept maps Demonstrations	✓ Outlines ✓ Note-taking guidelines ✓ Concept maps ✓ Guiding questions	Briefing paper Abstract (Mini-) Paper Statement of assumptions Performance (e.g., clinical, artistic) Reflective journal Case analysis Diagnosis Regulation, law, rule Plan (e.g., nursing, construction)

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Table 2 Diagnosing Readiness for Educational Reform in the Academic Department

Factor	Diagnostic Questions	Selected Strategies to Address Weaknesses
Departmental vision	<ul style="list-style-type: none"> Does the dept have a shared vision of undergraduate education? If so, what is it? 	<ul style="list-style-type: none"> Initiate a sustained planning process with appropriate resources (e.g., time, facilitator)
Pressure for change	<ul style="list-style-type: none"> Has the dept developed curricular-level outcomes for its academic programs? What are they? Are they clear? Accepted and valued? Is there some recognized and accepted pressure for change, whether external or within the dept? What is it? Is the pressure for change related to the dept vision? 	<ul style="list-style-type: none"> Develop curricular-level outcomes with a skilled facilitator Use external pressure for change as catalyst for dept change Link dept planning/vision with pressure for change
Disciplinary characteristics	<ul style="list-style-type: none"> To what academic discipline does the dept belong? Is there essential agreement on the important content, theory, methods and values in the discipline? Is the dept primarily organized for teaching or research? 	<ul style="list-style-type: none"> Initiate explicit conversation about the discipline w/in dept, e.g., content, theory, methods, values Identify areas of agreement/disagreement about discipline Introduce dept to literature on disciplinary differences and implications for teaching
Academic values	<ul style="list-style-type: none"> How collegial is the dept? What is the relative strength of autonomy, academic freedom, specialization and collegiality? What aspects of the dept encourage and impede collegiality? 	<ul style="list-style-type: none"> Use planning process/shared dept vision to promote collegiality Stress common dept goals and communicate their importance often
Protected sub-unit/culture	<ul style="list-style-type: none"> Is there a small, cohesive and protected group w/in the dept already practicing or supportive of the change? Is there a faculty member practicing/supportive of the change who teaches a-course at a key point in the curriculum? 	<ul style="list-style-type: none"> Support interests of individuals/subgroups w/in dept consistent w/change Use these individuals/groups as internal change agents, providing forums to share their experience w/dept
Support of undergraduate education	<ul style="list-style-type: none"> How critical is undergraduate education to the mission of the dept? Historically has there been support of undergraduate education in the dept? Are there faculty specifically assigned to teach undergraduate courses? What is their rank? 	<ul style="list-style-type: none"> Sustain past support of undergraduate education Assign interested tenured/senior faculty responsibility for undergraduate education Consider designating faculty positions for undergraduate education
Department leadership	<ul style="list-style-type: none"> Is the dept chair supportive of/knowledgeable about undergraduate education? 	<ul style="list-style-type: none"> Initiate professional development for dept chairs on organizing dept for teaching/learning
Reward structure	<ul style="list-style-type: none"> If applicable, is the college of which the dept is a part supportive of it? Is there financial support for undergraduate education in the dept? Are there university/departmental awards for undergraduate teaching? How seriously is teaching recognized in tenure and promotion decisions in the dept? College? University? 	<ul style="list-style-type: none"> Use focus on teaching/learning to promote collegiality Align reward structure w/dept vision Support effort/achievement in teaching/learning with resources and visible rewards (e.g., recognition, monetary) Create awards to recognize teaching in dept/university
External support	<ul style="list-style-type: none"> Is the dept's disciplinary organization supportive of teaching? Are the requirements of professional and regional accrediting bodies consistent with the proposed change? Is the proposed change consistent with broader trends in higher education? 	<ul style="list-style-type: none"> Support faculty attendance at meetings of disciplinary org Use requirements of professional/regional accrediting bodies to leverage desired change in dept

From Lee, V.S., Hyman, M.R., & Luginbuhl, G. (in press). The concept of readiness in the academic department: A case study of undergraduate education reform. **Innovative Higher Education**.