



Center for the Integration of Research, Teaching and Learning

CIRTL for the Nation: The Growth Plan

*Enhancing excellence in undergraduate STEM education
through development of the future national faculty*



www.cirtl.net

CIRTL for the Nation: A Growth Plan

Preface	i
A. CIRTL: The Big Picture.....	1
B. Expanded CIRTL Network Operations: Overview of Business Plan	2
C. Expanded CIRTL Network Operations: Membership Categories.....	3
D. Expanded CIRTL Network Operations: Membership Expectations.....	4
Expectations for Core Institutional Members	4
Expectations for Individual Members.....	5
Expectations for Affiliate Members	5
Expectations for Managing Institutional Members.....	5
Process to Apply to be a Member of the CIRTL Network.....	5
E. Expanded CIRTL Network Operations: Organizational and Administrative Structure	6
Goals	6
Organizational Structure.....	6
F. Expanded CIRTL Network Operations: Business Plan - Details	9
Underlying Ideas.....	9
Sample Budgets	10

Preface

Nearly 80% of STEM Ph.D.'s in the United States are awarded at only 100 doctoral research universities.¹ This small number of universities populates the STEM faculties of several thousand undergraduate institutions in the United States. In fact, 80% of full-time STEM faculty received their Ph.D.'s at Carnegie Research Extensive universities.² Thus graduate education is a powerful lever by which to improve STEM undergraduate learning across the nation.

On this strategic foundation, the *Center for the Integration of Research, Teaching and Learning* (CIRTL) began in January 2003 as an NSF Center for Learning and Teaching focusing on better preparing future faculty in teaching and learning. The initial CIRTL partners were Michigan State University, the Pennsylvania State University and the University of Wisconsin – Madison. The first goal was to discover whether the core ideas of CIRTL could move STEM graduate programs at major research universities toward preparing future faculty who are *both* superb researchers and excellent teachers.

After significant successes of the CIRTL learning communities at these universities, in 2006 the CIRTL partnership expanded to form an NSF-funded prototype *CIRTL Network*, comprising the University of Colorado at Boulder, Howard University, Michigan State University, Texas A&M University, Vanderbilt University and the University of Wisconsin – Madison. This intentionally diverse set of research universities was selected so as to test how the ideas of CIRTL would take root and grow in diverse campus cultures, and to explore if a cross-Network learning community would allow future faculty at every institution to benefit from the diversity of the Network universities.

Both the local and the cross-Network learning communities of the prototype CIRTL Network have thrived, and currently serve more than 1000 STEM future faculty each year. Now, to truly have the national impact on STEM undergraduate education envisioned at it's beginning, CIRTL must include a large number of those 100 research universities. Thus in 2011 we seek to expand the CIRTL Network to 25 universities. This expansion builds on the lessons of the prototype Network, and at the same time represents the next sea change in the progression of CIRTL. The operational model of the CIRTL Network will need to change from a "family business" to a major national enterprise, while maintaining fidelity to the core ideas that have been successful.

This document, *CIRTL for the Nation: A Growth Plan*, is a draft plan for the operation of the expanded CIRTL Network. It is not intended to be a recruiting document (but see Table P1). The presumption is that if you are reading this, you are already interested in CIRTL and want to understand the current vision for the operations of the expanded CIRTL Network, including the resources and expectations associated with membership.

This is not a final plan. Rather, it is the beginning of learning how to grow to national scale in order to prepare a future faculty that will improve STEM undergraduate education throughout the United States. We hope you join us on this journey.

¹ National Science Foundation, Division of Science Resources Statistics. 2009. *Doctorate Recipients from U.S. Universities: Summary Report 2007–08*. Special Report NSF 10-309. Arlington, VA. Available at <http://www.nsf.gov/statistics/nsf10309/>.

² Forrest Cataldi, E., Fahimi, M., and Bradburn, E.M. (2005). *2004 National Study of Postsecondary Faculty (NSOPF:04) Report on Faculty and Instructional Staff in Fall 2003* (NCES 2005–172). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved [3/3/11] from <http://nces.ed.gov/pubsearch>.

Table P1. Benefits of institutional participation in the CIRTl Network.

Enhancing Local Future Faculty Preparation Programs

Resources and programming from successful learning communities of CIRTl Network
Tested evaluation instruments and national baseline data
Be part of a funding application to NSF to establish or advance CIRTl-related programs

Diverse Cross-Network Opportunities for Future Faculty Preparation in Teaching and Learning

Short programs offered through the CIRTl Café (internet portal) including CIRTlCasts, CIRTl Coffee Hours, and online communities

Online graduate courses

- Teaching-as-Research in the College Classroom
- Diversity in the College Classroom
- Effective Use of Technology in Teaching and Learning
- Training to be a Research Mentor
- Teaching and Learning Science: Changing Student Misconceptions
- Building a Community of Computational Thinkers
- Teaching Through Inquiry-based Learning: Integrating Research, Teaching and Learning in the Classroom

Cross-network seminar for teaching-as-research interns

Future Faculty Exchange Program (between network universities)

CIRTl Network Alumni Connections that support mentoring of CIRTl participants and career support for CIRTl alumni

Marketing to employing institutions

National Presence in Graduate Education and Post-Doctoral Professional Development

Recognition as leader of national movement to prepare future national STEM faculty

Local enhancements through leveraged participation in an NSF Center

- Collaborative teaching and learning projects and funding proposals
- Launch pad for future centers (e.g., STEP)
- Broader impact (NSF)
- Post-doctoral professional development requirement (NIH, NSF)

Enhanced graduate student and post-doc recruiting and placement

A. CIRTl: The Big Picture

The mission of the *Center for the Integration of Research, Teaching and Learning* (CIRTl) is:

To develop a national faculty in science, technology, engineering, and mathematics (STEM) committed to implementing and advancing effective teaching practices for diverse student audiences as part of their professional careers.

The strategic leverage point of CIRTl is graduate education. 80% of U.S. Ph.D.'s are granted at only 100 doctoral universities. Many of these graduates disperse among the faculties of several thousand institutions of higher education, and they become the engine of STEM undergraduate education in the United States.

Three core ideas form the foundation of all that CIRTl does: **Teaching-as-Research**, **Learning Community**, and **Learning-through-Diversity**. When doing teaching-as-research, STEM faculty engage in their teaching as they engage in their research - consider prior work, hypothesize, implement, collect data, analyze, and improve. This work is fostered in interdisciplinary learning communities that bring together those doing teaching-as-research. These learning communities promote understanding of learning-through-diversity, the idea that learning of all students is enhanced as teachers draw on their diversity. (www.cirtl.net/pillars)

The *CIRTl Network* connects universities building on the CIRTl ideas to prepare the national STEM faculty. **Shared ideas** among Network universities allow each institution to more rapidly advance opportunities and effectively use resources. **Shared learning** of Network graduate students better prepares them for the diverse teaching and research settings that they will encounter in their careers. And **shared action** better positions Network universities for funding and national impact.

Each university in the CIRTl Network develops, implements, and evaluates a local learning community and associated programs for future faculty³ on its campus. These learning communities all share the CIRTl core ideas, but each is uniquely innovative in ways that reflect the wide variety of campus cultures, missions, students and circumstances. (www.cirtl.net/coreinstitutionalmembers)

Each university also contributes to a cross-Network learning community. These programs allow the future faculty on every campus to draw on the rich diversity of the Network universities. Much of this cross-Network learning community happens online, and we envision steadily expanding connectivity of CIRTl Network future faculty to the entire landscape of undergraduate institutions. (www.cirtl.net/cafe)

In 2011 we will expand the CIRTl Network from 6 to 25 universities. We are seeking new partners committed to preparing future faculty who are *both* superb researchers and excellent teachers. We also seek partners whose graduates will play a significant role in the future national STEM faculty. Finally, the strengths of new partner universities should complement and expand the strengths of the current Network.

The CIRTl Network and its core ideas align well with other STEM reform efforts taking place throughout the country. (www.cirtl.net/CIRTlOutcomes) As we expand the CIRTl Network, we expect many interested doctoral universities to have programs that share common elements with CIRTl, although these programs may use other language such as scientific teaching, scholarly teaching, the scholarship of teaching and learning and the like. We look forward to joining with and learning from such diverse future faculty preparation initiatives. We also anticipate that each new partner in the CIRTl Network will find resonance in the core ideas of CIRTl, and will be able to use these ideas to adapt and enhance future faculty preparation in ways uniquely their own.

³ By future faculty" we mean graduate students and post-doctoral researchers. While CIRTl learning communities have always been welcoming to post-doctoral researchers, more recently CIRTl has begun to expand its focus to include programming specifically for post-doctoral researchers.

B. Expanded CIRTl Network Operations: Overview of Business Plan

Detailed models of the business plan for the expanded CIRTl Network are presented in Section E. Here we give an overview to provide context for the operational details of the Growth Plan about to be presented.

Our business model will first seek funding from the National Science Foundation and private foundations to jump-start the transformation of STEM graduate education at the new partner universities. We envision four years of such funding, with a major initial investment in each partner for development work followed by a ramp-down toward institutionalization. After four years, ongoing operations of each CIRTl learning community will be supported by the home institution, as is happening in the current prototype Network. Thus the business plan lays the groundwork for the Network to become a self-sustaining entity by mid-decade, likely still developing funding for new initiatives but not requiring external funding for standard operations.

Based on the prototype CIRTl Network, we anticipate seeking \$300,000 in direct funds over 4 years for each partner institution. To be clear, currently there are no commitments by any funding source.

One possible funding profile for direct funds is:

Academic Year 1 - 2012-2013	\$110,000
Academic Year 2 - 2013-2014	\$ 82,500
Academic Year 3 - 2014-2015	\$ 70,000
Academic Year 4 - 2015-2016	\$ 37,500
Academic Year 5 - 2016-2017	--
Total	\$300,000

In addition to local institutionalization, the cross-Network learning community will require ongoing support and coordination. The business plan develops this funding from institutional dues and in-kind contributions of Network members (such as providing instructors for cross-Network courses or program leadership). Over the first five years of the partnership the dues profile will ramp up from \$3000/yr to that for nominal operations, which here we estimate as \$15,000/yr per institution.

Academic Year 1 - 2012-2013	\$ 3,000
Academic Year 2 - 2013-2014	\$ 5,000
Academic Year 3 - 2014-2015	\$ 7,500
Academic Year 4 - 2015-2016	\$10,000
Academic Year 5 - 2016-2017	\$15,000

Finally, the business plan includes modest revenues from individual participants not at a partner institution.

C. Expanded CIRTl Network Operations: Membership Categories

The CIRTl Network will have 4 categories of membership:

Core Institutional Members are doctoral universities that are significant contributors to the STEM undergraduate faculty of the United States. They are also committed to building a local CIRTl learning community and offering programs based on the CIRTl ideas that advance teaching and learning practices for future faculty. Core Institutional Members will establish a formal, contractual partnership with the CIRTl Network. Through this partnership, Core Institutional Members are eligible for developmental funding from the Network.

Individual Members are STEM graduate students, post-docs or other future and current faculty not located at the Core Institutional Members who wish to access professional development opportunities and other resources as well as to be members of the cross-Network learning community.

Affiliate Members are individuals at institutions beyond the Core Institutional Members who wish to contribute to achieving the CIRTl Network mission. For example, Affiliate Network Members might be faculty, staff or administrators at other doctoral institutions, or at primarily undergraduate institutions (PUIs). Affiliate Network Members may also be outside academia. Finally, Affiliate Network Members might be entire institutions who wish to contribute to improving STEM education through future faculty preparation.

Managing Institutional Members are Core Institutional Members that, in addition to the responsibilities of Core Institutional Members, take on management responsibilities for the Network. While every Core Institutional Member will be expected to contribute to the leadership and operation of the Network, Managing Network Members will receive additional funding to take on primary responsibility for key facets of Network operations and leadership.

D. Expanded CIRTl Network Operations: Membership Expectations

Expectations for Core Institutional Members

a. Institutional Commitments

Core Institutional Members endorse the CIRTl Network's mission and core ideas; express a commitment to develop or expand local initiatives to address the preparation of future faculty; and commit to meeting the programmatic commitments below.

A Core Institutional Member should have one STEM senior faculty member, the *Institutional CIRTl Leader*, committed to leading the institution's involvement in the CIRTl Network. The Institutional CIRTl Leader should receive some relief from other obligations (e.g., 25% FTE) during the intensive development of at least the first two years, either via the institution's funding from the Network or local resources.

A diverse leadership is necessary for success. We recommend several *Co-Leaders*, including someone responsible for management of day-to-day activities. Successful leadership teams in the prototype network have included multiple STEM faculty; colleagues in centers focused on faculty development, teaching excellence, or teaching assistants' professional development; and senior graduate students. (<http://www.cirtl.net/coreinstitutionalmembers>)

Core Institutional Members contribute funds and in-kind instructional and leadership resources to the Network in support of cross-Network activities and Network management, as described in Section F.

Core Institutional Members have ways of communicating with all of their STEM graduate students and for broadly marketing local and cross-Network programs to future and current faculty and staff.

A senior-level administrator should commit the institution to fulfilling the obligations of Core Institutional Members.

b. Programmatic Commitments

Core Institutional Members commit to develop a local CIRTl learning community that fosters formal and informal interactions among their future faculty.

The programmatic components of the local learning community will include (but are not limited to) courses, seminars, workshops and other activities. These could be newly created, build on current institutional offerings, or draw on existing programs throughout the Network. Through involvement in the local learning community, future faculty will develop skills aligned with the CIRTl learning outcomes. (www.cirtl.net/CIRTlOutcomes)

Each of the local programs and those programs offered by the Core Institutional Member as cross-Network opportunities should incorporate, at least in part, the core CIRTl ideas and associated concepts. In particular, local programs should provide numerous and explicit opportunities for future faculty to do Teaching-as-Research.

Core Institutional Members commit to integrating cross-Network offerings into their local CIRTl learning community, and to contributing programming and opportunities for future faculty throughout the cross-Network CIRTl learning community.

c. Evaluation Commitments

Core Institutional Members commit to submitting an annual evaluation report for all local CIRTl-funded programs using a Network-provided online template. Evaluation reports will be reviewed by a standing

committee in order to assess progress toward achieving local goals at each member institution, as well as to examine progress toward achieving overarching Network goals. The committee will prepare a summary report for the Executive Committee of the Institutional Network Leaders, the CIRTl Network Director, and the Board of Directors.

In the spirit of Teaching-as-Research, Core Institutional Members implement additional evaluations locally, for which the Network will provide a resource base of assessment instruments and examples.

Expectations for Individual Members

Individual Members will be expected to register at the CIRTl website and become members of the online learning community. Individual Members will be eligible to participate in available cross-Network opportunities, some of which will be offered on a fee-for-service basis (e.g., online seminars, courses, and professional development opportunities, in-person CIRTl conferences). Priority of Individual Members will follow participants from Core Institutional Members.

Expectations for Affiliate Members

As both employers of doctoral program graduates and as STEM education innovators, Affiliate Members can bring significant expertise to the Network. The primary expectation is to contribute meaningfully to the preparation of the CIRTl Network future faculty in ways consistent with the CIRTl Network mission and core ideas. Affiliate Members might teach cross-Network courses, lead new programs, or host Network Exchange Students; participate in specific Network initiatives; or serve on the Board of Directors or as members of the Operation Group teams (Section E).

Affiliate Members may be eligible for limited financial support from the Network, depending on the project and the nature of member's contribution to that effort.

Expectations for Managing Institutional Members

The prototype CIRTl Network (2006-2011) had all management centralized at one institution (University of Wisconsin – Madison). This model is not optimal in terms of creating a robust and flexible on-going management structure, and is susceptible to single-point failure. Optimally, management responsibility and associated funding will be divided and distributed among a few Core Institutional Members that wish to be Managing Institutional Members.

A Managing Institutional Member would have an annual contractual relationship with the CIRTl Network. The contract would specify specific responsibilities, deliverables, and an associated budget. These would be approved by the Executive Committee of the Institutional CIRTl Leaders and the chair of the Board of Directors.

The contractual responsibility for management success must lie with an identified individual of the Managing Institutional Member.

Possible management responsibilities might include: Online Community and Technology; Cross-Network Programs; Evaluation.

Process to Apply to be a Member of the CIRTl Network

Doctoral universities will be invited to apply to become Core Institutional Members of the expanded CIRTl Network in Spring 2011.

Processes for other memberships will be developed after the Core Institutional Members are in place. Until then, applications for other memberships will be considered on an *ad hoc* basis.

E. Expanded CIRTl Network Operations: Organizational and Administrative Structure

Goals

- a. The organizational structure must insure achievement of the CIRTl mission, foster CIRTl learning outcomes for future faculty, and reflect the CIRTl core ideas. In particular:
 - i. The organizational structure should distribute responsibility, engaging members of the Network in interdependent, functional roles (e.g., engaged programmatic and administrative roles);
 - ii. The organizational structure should promote ongoing evaluation of outcomes throughout the organization;
 - iii. The organizational structure should value and make use of the diversity of all Network Members.
- b. We seek a highly interactive, collegial management structure, while maintaining clear lines of authority and responsibility necessary to ensure high quality in administration and programs for future faculty; accountability to the Network members and funders; and fidelity to strategic directions.
- c. The structure should be expandable to on order of 100 doctoral universities.
- d. The organizational structure must be consistent with a business model that ultimately can operate independent of external funding, while at the same time able to obtain external funding.

Organizational Structure

Figure 1 presents the proposed organizational structure. Brief descriptions of the management roles are provided in the following Table 1.

Core Member Institutions will have primary leadership and oversight responsibility for the CIRTl Network, with support and coordination by a central unit ("CIRTl Central"). Contributions to leadership and oversight from other Network members will be welcomed.

CIRTL Network – Management Structure

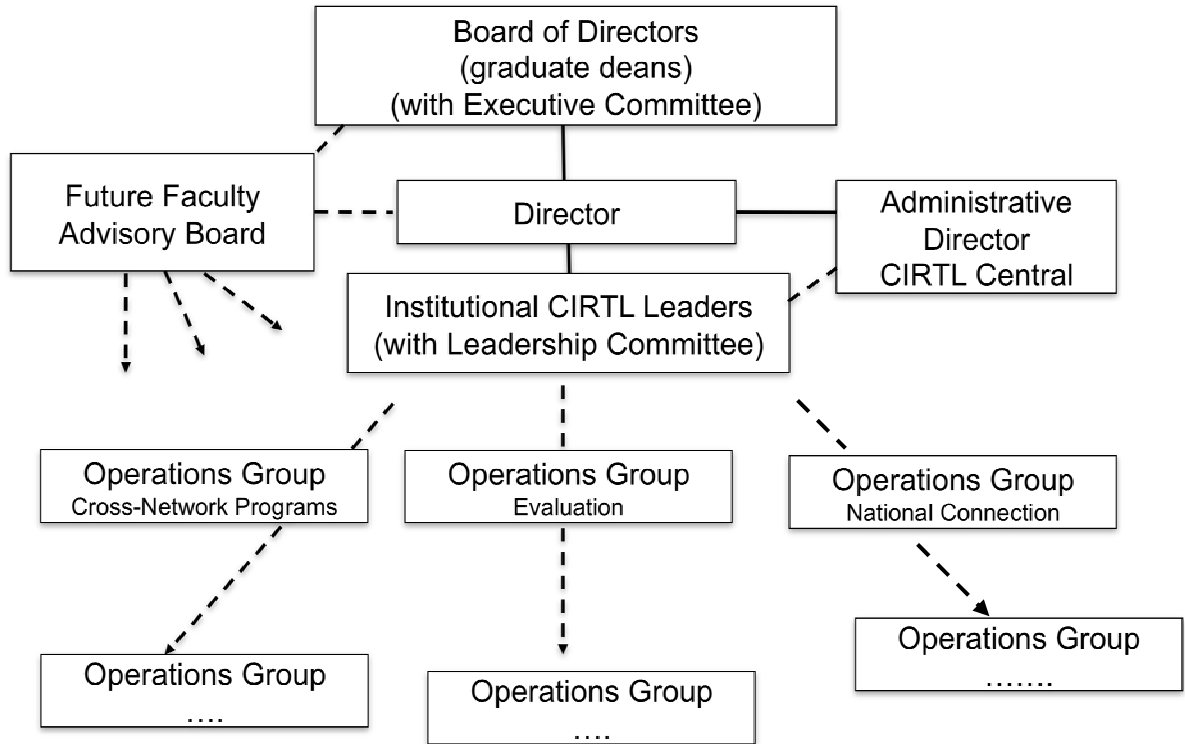


Figure 1

Table 1. CIRTl Network – Management Structure

Board of Directors The Board of Directors promotes awareness and engagement of those university administrators who ultimately must fund the Network, both in cash or in-kind. The Board of Directors will meet twice a year. Nominally the graduate dean (or equivalent) would be the Board member. The Board may also invite additional members as they consider necessary and appropriate.

Executive Committee of the Board of Directors: The Board Chair and Executive Committee act as the point of contact for the Director, as necessary.

Director: The Director has responsibility and authority for all Network activities, supervises CIRTl Central staff, and reports to the Board of Directors. The Director would likely be the PI of external funding grants that support the entire Network. (2011: R. Mathieu)

Institutional CIRTl Leaders: As a whole the Institutional CIRTl Leaders are the governing body of the CIRTl Network. A Leadership Committee drawn from the Institutional CIRTl Leaders, along with the Director, and the Administrative Director, will act as the day-to-day leadership team of the CIRTl Network. (2011: A. Austin, R. Campa, T. Harris, B. Herbert, W. Patterson)

Administrative Director/ CIRTl Central: The Administrative Director will manage the day-to-day Network operations and supervise CIRTl Central staff. (2011: K. Barnicle)

Operations Groups: Much of the *de facto* operational leadership will rest with the community through Operations Groups formed to develop and operate specific aspects of the Network. Group members may include Institutional CIRTl Leaders, Co-Leaders and other team members from Core Institutional Members; Affiliate Members; and participating future faculty. At the discretion of the Operations Group chair, groups may range in size from two to several people. Potential Operations Groups include:

- Cross-Network Programs
- Evaluation
- Online Community & Technology
- National Connection
- Disciplinary groups

Depending on the magnitude of the responsibility, an Operations Group may be run by a Managing Network Member with an independent funding stream. Other Operations Groups may operate more as Working Groups. *Ad hoc* Operations Groups might have new developmental responsibilities, perhaps funded by a Seed Grant.

Future Faculty Board: The future faculty board is a graduate student advisory council that advises the Director and Board of Directors, and formally brings the voice of future faculty to the Network.

F. Expanded CIRTl Network Operations: Business Plan - Details

Funds paid to the Network by Core Institutional Members will be administered through the CIRTl Network's administrative home, currently the University of Wisconsin-Madison.

The CIRTl Network business plan intends to, first, obtain and provide substantial initial funds to transform graduate education at the 25 CIRTl Network partners, and second, transition the Network to a self-sustaining entity by mid-decade. Currently the business plan includes only Core Institutional Members, but it has the flexibility to incorporate revenue from Individual Members and externally funded special initiatives (e.g., with Affiliate Members).

Underlying Ideas

- a. Membership in the Network as a Core Institutional Member carries with it responsibilities for:
 - i. developing and institutionalizing a local CIRTl learning community.
 - ii. providing funds and in-kind contributions to support the cross-Network learning community.
- b. Developing or advancing sustainable local CIRTl learning communities is a long-term national investment in the preparation of the nation's STEM faculty. Thus local and associated CIRTl central costs during the initial development phase (4 years) are appropriately supported in part by Federal and other external funding sources.
- c. Institutions will be expected to provide their required in-kind contribution to the cross-Network learning community within 1 year of joining the Network (roughly the time to develop an in-kind contribution).
- d. Ongoing local and cross-Network activities must become sustainable independent of external funding. The business plan builds toward such "institutionalization" after four years.

Local - University support for their local programs might include faculty and staff salary support, reduced teaching loads so faculty can teach CIRTl courses, office space and information technology. For the purposes of this business plan, these resources are not accounted for in the CIRTl Network budget.

Cross-Network - The business plan presumes that these activities will become supported primarily with funds and in-kind contributions from Core Institutional Members.
- e. Individual Members will provide fees-for-services as appropriate.

Sample Budgets

The budgets in the following tables are meant to be illustrative, and are based on the experiences of the prototype CIRTLL Network.

Table 2. Sample annual subcontract budgets for 25 Core Institutional Members, with funding provided by the NSF or other funding agencies. Each Core Institutional Member would receive such funding to develop new or enhance local CIRTLL learning communities and programs for STEM future faculty. As proposed, funding would ramp down over the course of 4 years and be institutionalized thereafter.

Table 2. Sample 4-yr Subcontract Budget for Development of Local Learning Communities

Sample subcontract budget for Core Institutional Members.	2012-13	2013-14	2014-15	2015-16	2016-17	5 year total per institution
a. Leadership and staffing (salary & fringe)						
i. % FTE faculty	30,000	20,000	20,000	10,000	0	
ii. % FTE academic staff	37,500	37,500	37,500	25,000	0	
b. Development of local marketing (services, supplies, events, printing)	5,000	2500	0	0	0	
c. Development of local infrastructure	5,000	0	0	0	0	
d. Development of local curriculum						
i. % FTE faculty level	30,000	20,000	10,000	0	0	
Travel (CIRTLL Meetings)	2,500	2,500	2,500	2,500	0	
Total Direct	110,000	82,500	70,000	37,500		300,000
Indirects @ 52% (varies by institution)	57,200	42,900	36,400	19,500		156,000
Total Subcontract Budget	167,200	125,400	106,400	57,000		456,000

Table 3. Sample budget for the support of the activities of the cross-Network learning community and management of the CIRTl Network.

It is anticipated that by 2013 some of the activities represented in this table would be conducted at several Managing Network Members. In that case, funds that appear in this table would be redirected to the Managing Network Member for the specific management task. For example, if a Managing Network Member institution took on the role of managing the CIRTl portal, the funds for the portal staff and technology would go to that institution through a subcontract.

Table 3. Sample Annual Expenses for Cross-Network Learning Community and CIRTl Central

Cross-Network learning community		
a. 25 activities x 0.2 FTE faculty – contributed from member Institutions		in-kind
b. Web, web/teleconferencing & tech support staff	1 FTE	70,000
c. Cross-Network learning community coordinator	.5 FTE	50,000
CIRTl Central (salary & fringe)		
a. Director	.2 FTE	30,000
b. Administrative director	1 FTE	120,000
c. Portal support	1 FTE	70,000
d. Administrative support	.8 FTE	35,000
Total		375,000

Table 4. Sample Network revenue contributed by the Core Institutional Members over 5 years. In this plan, institutional dues ramp up to an estimated normal operations level in 2017.

Table 4: CIRTl Network Revenue

Sample dues and in-kind contributions from Core Institutional Members	2013	2014	2015	2016	2017	5 year Total
Core Institutional Members Annual Dues	3,000	5,000	7,500	10,000	15,000	40,500
Total Revenue from 25 Core Institutional Members	75,000	125,000	187,500	250,000	375,000	1,012,500
In-kind contribution to develop and/or facilitate cross-Network activities	.2 FTE* faculty level	.2 FTE faculty level	.2 FTE faculty level	.2 FTE faculty level	.2 FTE faculty level	1 FTE faculty level
*Note: The in-kind contribution would begin 1 year after an institution joins the Network.						