RIDING THE MOMENTUM: INTERDISCIPLINARY RESEARCH CENTERS TO INTERDISCIPLINARY GRADUATE PROGRAMS

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A natural, positive outcome in this age of interdisciplinary research is the emergence of interdisciplinary research centers. At the University of Kansas, we have a long history of interdisciplinary research centers dating back to the 1920's. We have capitalized on this strength to achieve an unprecedented growth in research over the last several years. In the fall of 2003, in a conversation with our chancellor Robert Hemenway and me, Elias Zerhouni, the director of the National Institutes of Health, stated in so many words that universities should not be adding money to academic units. Instead, Zerhouni said, they should be investing in interdisciplinary research centers. This relates to Steve Warren's comments regarding the NIH's view of the success of centers.[1]

> At KU, our major centers report to the Office of the Vice Provost for Research. The range of subject matter for these centers includes such diverse themes as drug discovery and delivery, energy, information technology, the humanities, education, environmental science and engineering, bioinformatics, and life sciences. In our established structure, funding for these centers flows through the Vice Provost's office budget, and an Associate Vice Provost for Research oversees the administration.

For a center to be strong, it must have certain characteristics. In fact, we use specific attributes to measure the qualifications for a center to become known as a designated center, one of the major centers on our campus.[2] These attributes include:

1. having national or international prestige
2. fitting the special character of the campus
3. being truly interdisciplinary
4. providing administrative services to researchers
5. being inclusive, not exclusive (A good example of this is the Life Span Institute, which has 12 major centers, including the Merrill Advanced Studies Center.)
6. having a large volume of externally funded research, as measured by their discipline (We are careful to not put the same funding expectation on a center that is doing major NIH work in drug discovery and drug delivery that we put on a center for the humanities, for example.)

7. providing a significant return on investment (At KU, we do in fact measure return on investment by our centers – gauged in terms of dollars and other metrics – and we have closed centers because of low returns.)
8. being flexible (In fact, most centers are going to have a natural progression if they are done right: they are born, they thrive, and they die. Sometimes academic units seem to have eternal life. Centers can get there as well if we are not careful.)

The creation of a research center really has to begin with a natural interest from the faculty. It has to be bottom-up to be successful. Top-down directed centers often do not work. Faculty-inspired centers come about by thinking big: they are often event-driven. They can develop from state programs, new funding sources that are set up, major grants, or winning a program project. Oftentimes, a "hero factor" is there, where a single individual is responsible for the development of the center. Centers should embody leadership in the sense of how they help the faculty.

At their best, research centers provide crucial support for interdisciplinary teams. They have facilities, administrative support, and seed funding opportunities. They are nimble and flexible. Another important function that happens in strong centers is the mentoring of junior faculty.

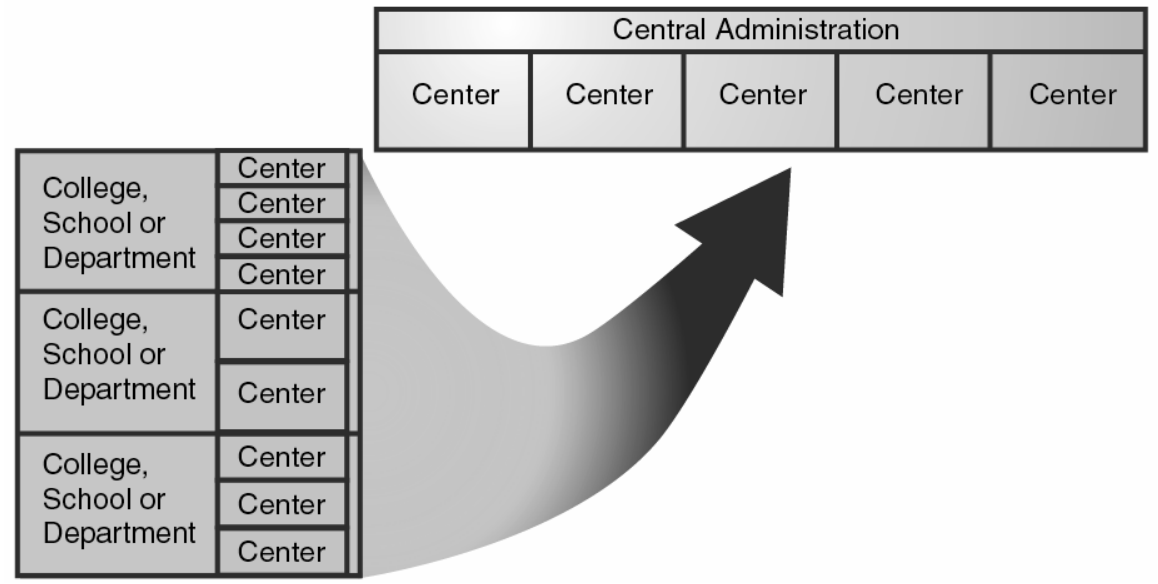


Figure 1. Organizing Successful Research Centers

At KU, we believe it is important that the interdisciplinary centers not report to colleges or departments, but rather to central administration. We have to bridge the college/departmental boundaries. Right now, that is done through the Office of the Vice Provost for Research. This creates in effect a matrix with the centers running along one axis and the colleges and departments running

along the other. This is shown in Figure 1. The faculty members appear as elements on the matrix. Faculty are, of course, members of their own department, but they can also be members of a center. They may or may not be paid by that center. They can have a split appointment or they can be a member of a center strictly as a volunteer. Successful situations in both instances have occurred at KU.

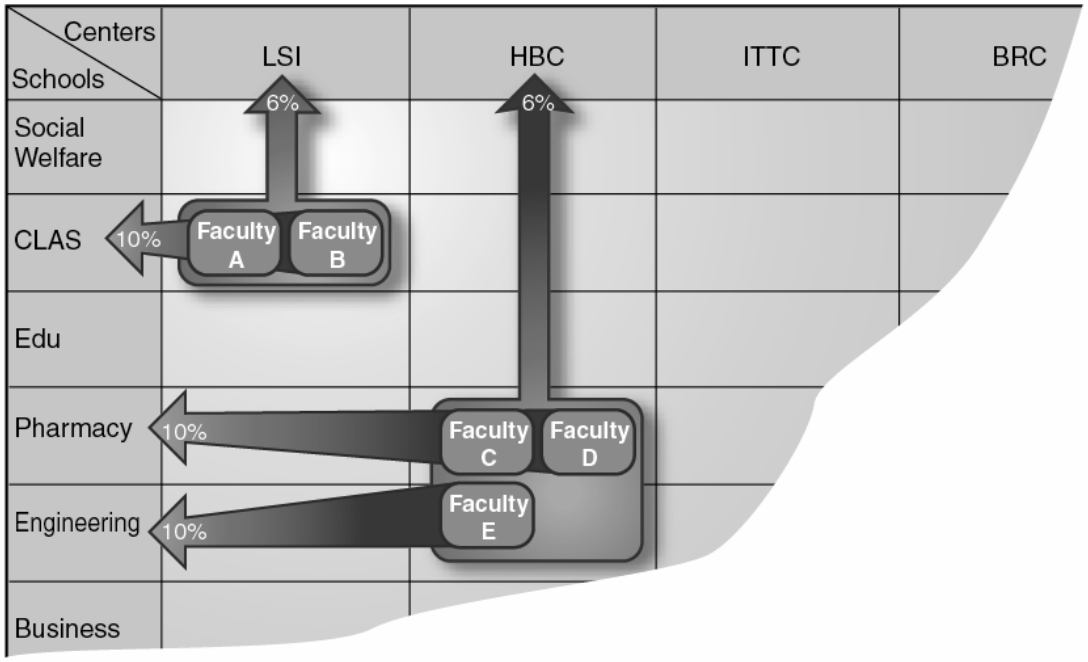


Figure 2. Distribution of Credit and Return-of-Overhead to Academic and Research Units[3]

When the old departmental model is "pulled apart" to create the matrix, as shown in Figure 1, credit and money problems arise. What we have done at KU about competition for money or credit in centers is to initiate a double-counting system. It is actually a triple-counting system to be precise. Credit and return of overhead money flows, first of all, back to the dean based on the faculty members' appointments. Although there is a default algorithm for assigning the credit, the investigators decide how the distribution will be handled. It has to total 100%, no more. Consider the example shown in Figure 2. Here is a grant that is shared by three faculty members, two in the School of Pharmacy, and another in the School of Engineering. The grant is being administered by and through the Higuchi Biosciences Center (one of our research centers). The credit for the grant flows back to the School of Pharmacy and the School of Engineering in proportion to the expenditures on the grant. Those deans receive 10% of the overhead generated on the grant based on the expenditures. Meanwhile, the Higuchi Biosciences Center gets a separate pot of money, 6% in this case, based on the grant itself, not on what the faculty do, but the grant. The point here is, first of all, that these two pots of money are non-competitive – the deans cannot get part of the 6%; the centers cannot get part of the 10%.

One exception, however, occurs if the center happens to be paying part of the salary of the faculty members. If this is the case, the center gets that share. So the 10% share really flows to whoever is paying the salary of the researchers.

When we keep track of expenditures, we also triple-count in the sense that we can add all of this up by academic unit or we can count by faculty member. Either adds up to a total for the university. We can also compute totals by research center; that is, we add up all the grants and allocate them to the research centers. We have a separate list that adds up to the same total for the research centers. The School of Pharmacy is able to say "this is how much research we did," based on what their faculty do, regardless of where they do it. And a research center can say "this is how much research our center is doing," based on the grants that go through that center. An "other" category covers non-center research or non-faculty research. This is shown in Figure 3.

University of Kansas

Sponsored Project Activity by Academic Unit: FY 2003

	AWARDS		EXPENDITURES				
	No.(1)	TOTAL	No.(1)	Federal Science & Engineering Research	Direct	Facilities & Administrative	TOTAL
ALLIED HEALTH	19	2,218,755	34	892,073	1,533,807	268,104	1,801,911
ARCHITECTURE AND URBAN DESIGN	3	28,262	4	4,683	20,582	6,482	27,064
BUSINESS	8	901,642	10	152,683	538,252	58,333	596,585
LIBERAL ARTS AND SCIENCES	271	38,925,380	573	26,219,753	29,034,001	6,682,720	35,716,721
Administration	0	0	4	0	82,219	0	82,219
NSF EPSCoR	0	0	23	159,970	482,416	20,931	503,347
Humanities				12,145	1,843,369	126,083	
African & African A							
TOTAL (3)	1,274	178,269,222	2,282	90,875,892	136,594,122	28,021,013	$164,615,135

University of Kansas Research

Sponsored Project Activity by Research Unit: FY 2003

	AWARDS		EXPENDITURES				
	No. (1)	TOTAL	No. (1)	Federal Science & Engineering Research	Direct	Facilities & Administrative	TOTAL
LAWRENCE CAMPUS DESIGNATED CTRS.	286	52,005,920	436	27,295,750	38,040,812	7,495,491	45,536,303
Biodiversity Research Center	12	4,096,361	30	2,632,782	2,036,544	645,039	2,681,583
Center for Research on Learning	25	6,281,813	45	1,279,024	5,402,378	632,035	6,034,413
Higuchi Biosciences Center	110	13,190,085	117	9,272,366	8,945,343	2,357,205	11,302,548
Information & Telecomm. Technology Ctr.	26	5,913,261	76	4,191,357	4,592,392	1,073,026	5,665,418
Hall Center for the Humanities	19	1,729,102	27	36,298	1,989,295	135,572	2,124,867
Grant Development Office	*10*	*440,288*	*18*	*36,298*	*424,126*	*24,290*	*448,416*
African Studies Resource Center	*1*	*221,925*	*1*	*0*	*206,527*	*16,522*	*223,049*
Center for East Asian Studies	*2*	*202,833*	*2*	*0*	*257,022*	*12,906*	*269,928*
Ctr. for Russian & East European Studies	*1*	*251,000*	*2*	*0*	*504,999*	*18,996*	*523,995*
Center of Latin American Studies				*0*	*596,621*		
	744	88,764,599					
TOTAL (3)	1,274	178,269,222	2,282	90,875,892	136,594,122	28,021,013	$164,615,135

Figure 3. Academic Unit and Research Center Allocations[4]

This system has worked quite well for us. Sometimes difficulties occur when deans and center directors make special deals on the side. We in the research office try to not get involved in the special deals, although sometimes they are hard to avoid. Frankly, if everybody were to stick to the basic model, there would be very few disagreements.

This then is the center structure that we have developed at KU. It has worked very well for us; we have been among the fastest growing institutions in the country in terms of research volume. Irwin Feller singled out KU in a talk he gave at the AAAS conference earlier this year in Seattle.[5] Feller studied interdisciplinary research at universities and concluded that there were five universities in the country that "get it" when it comes to doing interdisciplinary research. They are the University of California at Santa Barbara, UCLA, MIT, and then two universities represented at the Merrill conference – KU is one of them; Michigan, the other.

Next we consider how graduate education relates to research centers. We know that in the traditional administrative model, there is a one-on-one relationship between departments and degrees (Figure 4). And in fact we saw this in spades at KU. At the School of Engineering a few years ago, we were attempting to merge the Department of Mechanical Engineering and the Department of Aerospace Engineering, but only administratively. This action was not going to have any impact at all on the degrees offered. But some alumni fought this because they could not get it out of their heads that there was not the usual one-to-one relationship between department and degrees. They saw a degree program disappearing. There have been, of course, a lot of administrative mergers. Today there is certainly a model for developing interdisciplinary degrees where multiple disciplines come together, form an alliance, and organize the degree program. An example is the biomedical engineering degree that was discussed earlier.[6]

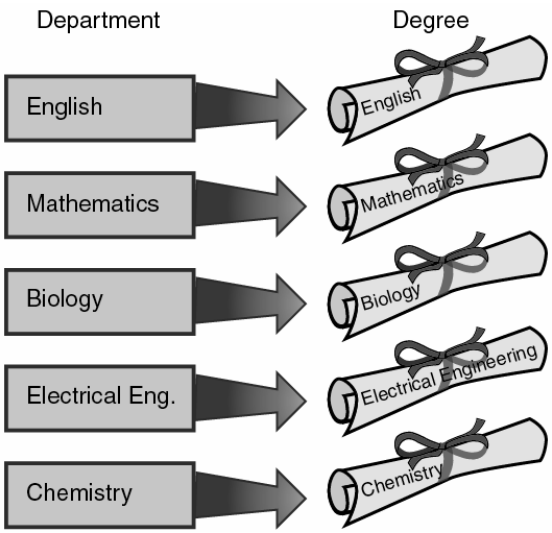


Figure 4. Traditional Administrative Model

There is an interesting case study we might consider. I was department chair for Electrical and Computer Engineering at the time computer science merged into engineering. If one looks at the historical development of computer science at KU, it came from an interdisciplinary group, an alliance of electrical engineering, mathematics, and business faculty members who were interested in computing in the 1960's. Out of that alliance grew a new department and a new degree program, starting with the graduate degree and then, ultimately, the undergraduate degree in computer science (Figure 5). These faculty were not research-intensive faculty members but were simply interested in computing. There was no research momentum that came with the computer science degree or the computer science department when it was formed. As a result, at the time of the merger in 1993, there was a paltry $100,000 a year going on in research in computer science at KU.

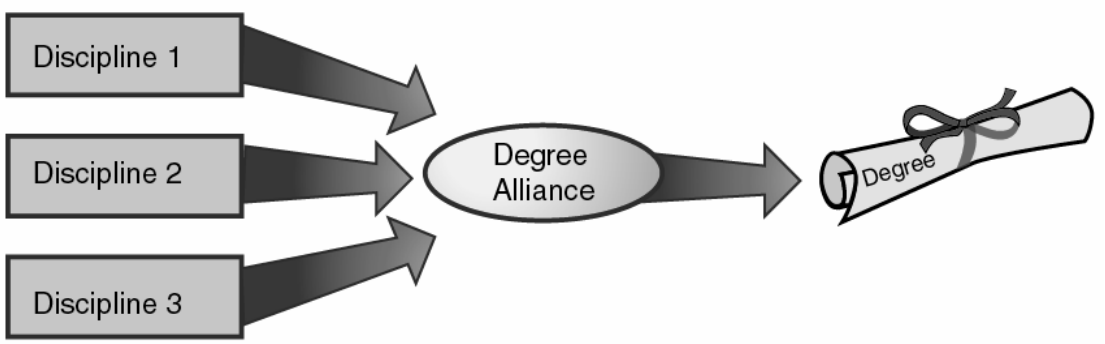
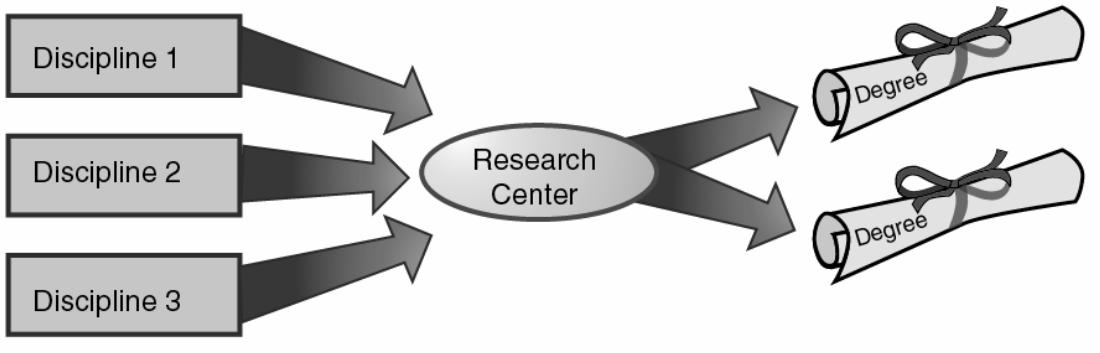


Figure 5. Degree Alliance Model for Interdisciplinary Degree Development

What I propose is that research centers afford us a tremendous opportunity for the development of interdisciplinary degrees based on the research momentum coming from these degree programs (Figure 6). Even though we do have models for interdisciplinary degrees in centers, they ultimately are administered by a college or school. We could create the situation where the graduate school really is the responsible authority for graduate degree programs, which in fact, it is on paper. Degree programs could either be in academic units or they can be in the centers. The key is that the faculty are the glue that holds this all together (Figure 7).



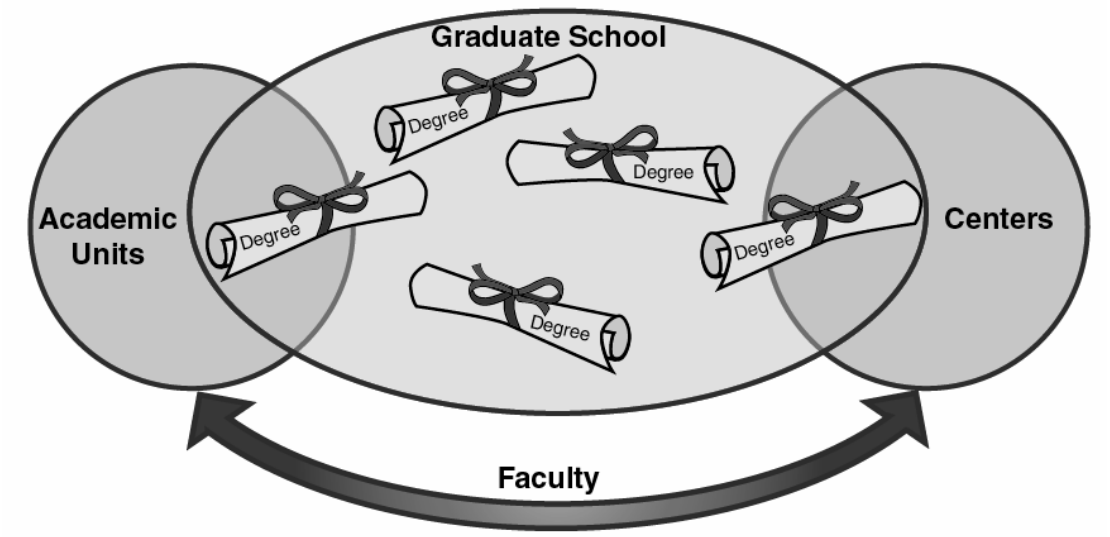


Figure 6. Research Center Model for Interdisciplinary Degree Development

Figure 7. The Big Picture

There could be a similar process for credit for these degrees, student credit hours, degrees produced, etc. We could double-count them just as we do research dollars. In a center-driven model, if a faculty member is a part of an interdisciplinary degree program in a center and has a master's or PhD student in the center, then the home department could still get credit for that degree in their degree total because of the faculty member's affiliation with the department. The research center could also count the degree, saying that some number of degrees was awarded in various interdisciplinary areas. This is shown in Figure 8.

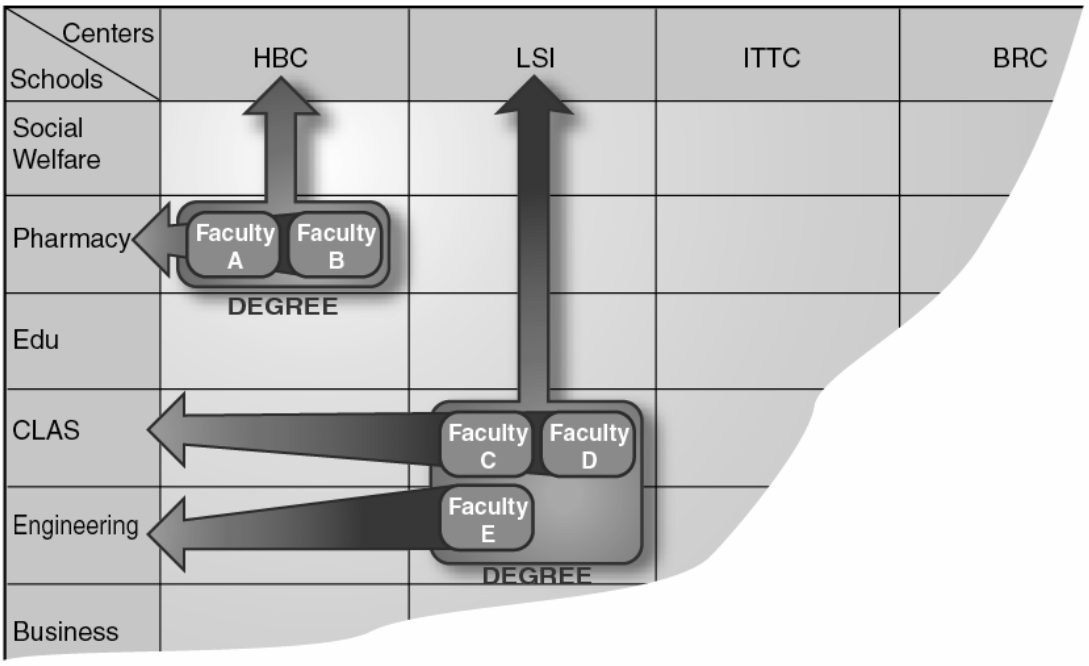


Figure 8. Credit for Degrees Awarded

A number of advantages accrue with this model. It makes more new degree programs available. Out of the research strengths, there is more flexibility for the creation of graduate programs through either traditional academic departments, through centers, or through coalitions. To force ourselves to be in a department or school equals a degree box. Building a degree program on a research strength creates a natural fit for such prestigious programs such as an Integrated Graduate Education Research Training (IGERT) program from the National Science Foundation, for example.

Although it is different from the way most universities have been doing it, there are significant advantages to this approach. The center-based system requires that the graduate school be reasonably strong. Then, if they are the only school overseeing the graduate program, they can do their job. It could lead to degrees that might come and go, but this is okay. Another thing that could happen is that an interdisciplinary degree could ultimately grow into a disciplinary degree. The degree could stabilize and simply become a stand-alone degree or part of a college at that point. The key is to make it flexible. In doing this, we must avoid diverting the center from its core research mission and thereby weakening it. The centers, for example, should not take on curricular matters; course creation should be left to departments. Cross-listing of courses is a useful tool. Again, faculty involvement is the key

Several models of this approach are already in operation around the country. One would be what I call the center-college model. In this situation,

there are interdisciplinary degrees that are administered by research centers, but they still report through a single school or college. An example is the Child Language Doctoral Program[7] at KU that Merrill Center Director Mabel Rice directs. The Life Span Institute administers the degree, but it still goes through the College of Liberal Arts and Sciences. It is an interdisciplinary degree program, but it is ultimately part of a college. There is also the alliance model that I mentioned earlier. An example is the development of computer science at KU. Next is an interdisciplinary graduate program that is administered by a council of deans wherein multiple schools administer the program. An example of this is the toxicology program at Texas A&M[8] that involves faculty and graduate students from 17 departments and colleges and three research laboratories. The final model is where there is an interdisciplinary graduate degree program, but the research center alone administers the degree with graduate school oversight. This is the model proposed in this paper. An example is Operations Research Center (ORC) at MIT.[9] ORC is the only interdepartmental center at MIT that both admits its own students and offers masters and doctoral programs.

In summary, the key to advancing graduate education is to ride the research momentum. When there is a successful interdisciplinary research center, the university needs to allow that center to develop graduate programs based on its research. The center can administer the degree programs, but the academic departments should develop curricula and administer instructional issues. The graduate school could oversee these degrees just like they do any graduate degree. It is possible to do double-counting so that both the academic unit and the research center gain credit.

The traditional academic units and the research centers are both important. This is not a situation where it is one or the other. The faculty can provide the linkages between the centers and the academic units. They may or may not have appointments in the centers. Successful centers work with joint appointments between the center and academic units. They also work with 100% appointments in the academic units, with the faculty voluntarily working in the center. But it is important again, just as with research credit, that this credit be shared, because we want the deans and department chairs to encourage faculty to work in interdisciplinary centers and to be innovative in terms of developing new graduate degree programs. When this happens, the students, the faculty, and the public are all winners.

End Notes

[1] Warren, S.F. (2004) *Setting Priorities for Behavioral Research at the Institute for Life Span Studies*. In Mabel L. Rice (Ed.), *Riding the Momentum of Research: Leadership Challenges in Public Research Universities*. (MASC Report No. 108). Lawrence, KS: University of Kansas Merrill Advanced Studies Center.

[2] Roberts, J.A. (2004) Building a Better University Through Research Centers. AAAS Annual Meeting, Seattle, WA.

[3] Roberts, J.A. and Barnhill, R.E. (2001) Engineering Togetherness (An Incentive System for Interdisciplinary Research), *Proceedings of the 2001 IEEE/ASEE Frontiers in Education Conference*, pp. F2G-23 to F2G-27, Reno, NV, Oct 10-13, 2001.

[4] *Sponsored Research at the University of Kansas - Fiscal Year 2003* (2004) University of Kansas, Office of the Vice Provost for Research. Lawrence, KS.

[5] Feller, I. (2004) *Whither Interdisciplinarity (In an Era of Strategic Planning)?* AAAS Annual Meeting. Seattle, WA.

[6] Coleman, M.S. (2004) The Research Mission of Public Universities. In Mabel L. Rice (Ed.), *Riding the Momentum of Research: Leadership Challenges in Public Research Universities*. (MASC Report No. 108). Lawrence, KS: University of Kansas Merrill Advanced Studies Center.

[7] Child Language Doctoral Program, www.clp.ku.edu.

[8] Texas A & M Toxicology program, toxicology.tamu.edu.

[9] Operations Research Center, web.mit.edu/orc/www/.