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Integrating Research and Education

Ted C. Schroeder

***Abstract:** University faculty have numerous responsibilities, but development of our own and our students' human capital is our primary job. To effectively develop human capital of others requires investing heavily in our own capital. This includes being actively involved in discovering knowledge. In addition, as agricultural economists, our clientele demand relevant research output which requires regularly informing them about our research. Conducting research, publishing and communicating findings to interested parties better equips us to provide a quality teaching program. This article presents an accumulation of evidence supporting this view and provides insights about how these activities might be integrated.*

***Key Words and Phrases:** Education, Teaching, Research, Scholars.*

University teaching scholars have numerous responsibilities, but one of the most important is to acquire knowledge. Essential to being able to teach anything is to know something to teach. Once knowledge is acquired, it should be conveyed. Recent public sentiment holds that university teaching has been neglected, as indicated in Winston:

It appears to be a consensus in the mid-1990s that the quality of undergraduate teaching in the U.S. is in decline.... And there is near consensus, if not always explicit, that the root of the cause is moral failure of American Professors; they simply have too much power and they pay too much attention to their research and consulting and graduate students and too little attention to their undergraduates and lectures and advising and caring (p. 9).

Numerous others have noted similar concerns that have arisen regarding faculty attention to, and reward systems for, undergraduate teaching (e.g., Cage; Massy, Wilger and Colbeck; Mooney). It is healthy to question our priorities and be cognizant of our critics. However, whether Winston and others are correct or not, the sentiment that research is receiving excessive attention is dangerous because an effective education program relies critically on knowledgeable teachers and knowledge is gained through research. Therefore, research and discovery activities

must not be encumbered under the guise that this will somehow improve education quality. Research and teaching are not necessarily antagonistic activities. The two can be complimentary and synergistic.¹ This article presents evidence of the synergistic nature between research and agricultural economics and agribusiness teaching. In addition, a framework is provided for how teaching and research might be accomplished together.

Survey

To discern information about teacher and researcher activities, opinions, goals and perspectives, a mail survey was conducted of award-winning teachers and researchers from the American Agricultural Economics Association (AAEA), Western Agricultural Economics Association (WAEA), and Southern Agricultural Economics Association (SAEA). The AAEA and WAEA awardees surveyed included winners from the years 1980-1994 and the SAEA winners for 1987-1994². A total of eighty-nine surveys were mailed in June, 1995; forty-one of forty-six teaching awardees and twenty-four of forty-three research winners responded for an overall response rate of 73 percent.

The survey included questions about the relative preferences of the awardees in teaching and research activities; academic appointments; teaching, research, extension, service and administrative responsibilities; workloads; and goals. Survey results are used to highlight the crucial link between teaching and research and they also illustrate some of the differences among these two groups.

Responsibilities

Two important responsibilities university scholars have are to: 1) acquire knowledge and 2) convey knowledge. Acquiring knowledge is the process used to build intellectual capital. Capital depreciates and, therefore, intellectual capital needs continual reinvestment. Lovell estimates the half-life of an economics Ph.D. to be seven years. Therefore, it is not sufficient for a scholar to simply have a degree since learning is a life-long process. Once acquired, knowledge is more valuable if it is conveyed to students and the public. In this way knowledge is multiplied to serve a broad interest.

Acquiring Knowledge. Knowledge can be acquired through numerous means. Borrowing from Boyer, two primary stages of knowledge acquisition include *discovery* and *integration*. Knowledge originates with discovery, which is accomplished through scientific inquiry. Understanding the scientific process reduces the likelihood of logical fallacies and provides a basis from which to judge

them. As knowledge is discovered, its value is enhanced if it is placed in its broadest context and integrated directly in areas in which it is most likely to have an impact. The concepts of discovery and integration are addressed directly in the ensuing discussion.

Discovery. Discovery results from conducting research, as well as from other activities. The act of doing research is important and research products are subjected to peer review and published to accomplish the ultimate research mission. Publishing research is integral because 1) the process builds human capital of both writers and readers and 2) it is part of the duties of publicly sponsored academics. Paul and Rubin argue that research is not only desirable but necessary for guaranteeing ongoing quality instruction. A productive researcher is more likely to teach important material because the teacher is current on the state of knowledge in an area as a result of the research process. The researcher is more able to distinguish between fruitful and sterile ideas than those who are not publishing. Because teachers generally teach a broader range of topics than they research, an important value of a productive research program is that it is evidence of human capital development by the scholar.

Ladd indicates that formal writing is itself discovery of new knowledge: "Many of my intuitions come to me when I am writing. It frequently happens that I don't know what I think until I write it" (p. 6). As any author knows, writing papers well is difficult because it involves learning. Even publishing in less formidable journals is indicative the researcher is current on ideas present in premiere journals since to publish the former requires knowledge of the latter. Number and quality of publications, therefore, are conditions (although far from sufficient) of a quality education program.

Table 1 shows to no surprise, that most award-winning teachers publish, although, not as much, on average, as award-winning researchers. Teaching awardees publish, on average, 1.11 refereed journal articles per year compared to 2.56 articles per year published by research awardees. These teaching awardees also publish a host of other materials ranging from books to extension publications. The survey results indicate that effective teachers invest in discovery of their own knowledge.

Integration. Integration refers to interpreting the broad meaning and implications of research results. This includes expanding research to broad levels of cognition and relating findings across disciplines or other affected programs. Integration does not refer to a mechanism of research dissemination, rather, it is a dimension of research breadth. Integration forces the scholar to question the relevance of the research and increase its depth. An example may help clarify this idea. Why is it important to determine the willingness of consumers to pay for irradiated food products? Once willingness to pay is determined, what are the implications for production scientists, food scientists and marketing researchers?

Table 1.

Publications per Year of Award Winning Teachers and Researchers, Last Ten Years (or Career if Less than Ten Years)

Publication	Award	Mean	Significance		
			Level ^a	Min.	Max.
Refereed Journal Articles	Teaching	1.11		0.00	4.00
	Research	2.56	0.001	0.00	6.29
Other Journal Articles	Teaching	0.48		0.00	4.00
	Research	0.33	0.393	0.00	1.20
Books Authored	Teaching	0.13		0.00	3.00
	Research	0.08	0.610	0.00	0.30
Books Edited	Teaching	0.08		0.00	2.00
	Research	0.03	0.509	0.00	0.20
Book Chapters	Teaching	0.19		0.00	1.20
	Research	0.72	0.001	0.00	3.00
Extension Publications	Teaching	1.58		0.00	10.00
	Research	0.74	0.114	0.00	3.10
Other Publications	Teaching	1.51		0.00	6.00
	Research	1.96	0.414	0.00	10.50

^a Significance test of equality of means between teaching and research awardees. Number of observations are Teachers=41 and Researchers=24.

Integrating research enriches the researcher's own knowledge about the issue by expanding its context.

How is research integrated? What is the procedure? What is the forum? How is it recognized nationally, locally and professionally? These questions could encompass an article in themselves, and deserve at least a brief account here. University administrators often promote interdisciplinary work. Evidence of interdisciplinary work is an important part of many institutions' promotion and tenure decisions. Interdisciplinary research (which means more than a token production scientist or economist as an author) is one way to help ensure research is integrated. Professional publications across disciplines provide evidence of integration. For example, agricultural economists occasionally publish in animal

science, food science or agronomy journals. Research integration can be an arduous task. If it is valued, encouragement to increase this activity may be necessary.

Conveying Knowledge. Once information is discovered and knowledge is acquired through conducting, publishing and integrating research, the responsibility of the scholar is to convey the knowledge. Again borrowing from Boyer, knowledge can be conveyed by *application* and *teaching*. In the context used here, conveying means going beyond academic journal articles. Publishing in academic journals is essential, but application and teaching are necessary to complete research.

Application. Beattie and Watts argue, "Research results that are not committed to paper, or otherwise conveyed to students (again, broadly defined), is research undone; and society has assuredly been 'ripped off' if such happens often" (p. 98). Research published in academic journals is intended to be conveyed to other scholars (who are also students). In this regard, a journal article represents a finished product but it is not the completion of applied research projects. If it is treated as such, we have failed to serve our clientele as a problem-solving profession and we will be subjected to public criticism for not fully serving the public interest.

If a researcher communicates research only to an academic journal through a published article, although better than not publishing at all, the researcher has fallen short of conveying the knowledge. That is, applied research, the primary type agricultural economists do, increases in value when it is communicated to clientele. Beneficiaries of research are not just academic peers. Informed policies are dependent upon well-founded research. The relevance of our programs will continue to be under scrutiny. This is healthy as it keeps us accountable to our employers. State and federal budget cuts have forced researchers to obtain more external funds. Often external funding agencies require results be communicated to broader audiences and in different forms than journal articles.

By communicating research results through trade magazines, extension publications, extension and other public presentations, radio programs, legislative testimony, etc. several benefits accrue to both research and teaching programs. First, our understanding of issues is enhanced by placing information in lay terms. This is also quite challenging because these audiences are rarely pure "lay" audiences. They generally represent successful industry or policy professionals who challenge research relevance, assumptions, procedures and results and demand precise interpretations to extend results. These groups are issues oriented and serve as a source for identifying future research needs. Initiating research projects with these challenges in mind helps keep a research program relevant, reduces likelihood of making unrealistic assumptions, and encourages careful data analyses and results interpretation.

Teaching programs are enhanced considerably through application of research. What more pristine activity does a scholar do than discover knowledge? Turner (1993) suggests, "A university faculty that loses their passion for the pursuit of knowledge will deteriorate into no more than a technical training school. Furthermore, it is the noblest goal of a university faculty to instill this passion into our students (undergraduate, graduate, and adult)" (p. 25).

Another way in which research and teaching are compliments is indirect. Purcell argues that young faculty should be encouraged to experience agricultural institutions and work with policy makers and trade associations as these faculty develop their research programs. This will increase relevance, appropriateness, credibility, accountability and magnitude of contribution of research to applied problems. One concern with this paradigm is that industry interaction could make it more difficult for the researcher to remain nonpartisan and objective. Scholars are often invited to participate in industry meetings and conferences, conduct consulting projects, or address legislative bodies as policy positions are discussed and formulated. These invitations are generally a direct result of the scholar having an active research program that has had applications of results. Without this step of applying results, industry is not adequately informed about research being conducted. According to Patton and Marver, "...academics who engage in paid consulting tend to be more active in the academy than their colleagues who do not consult..." (p. 175). Of course, this activity can detract from teaching or research programs if done in excess.

Opportunities to be directly involved in industry issues and policy making provide insights for classroom teaching from real-world examples of economic phenomenon. This also provides experiences to draw from in helping students formulate and solve applied problems. Students demand relevance, applicability and realism in teaching programs. As teachers, we must strive to supply these attributes. This linkage between research and industry is invaluable for teaching applied agricultural economics and agribusiness problem solving.

An example of research-extension-teaching synergy is the Oklahoma State University Beef Packer-Cattle Feeder simulation (Koontz et al.). This simulation was designed to be a tool to conduct experimental economic tests. Faculty in teaching, research and extension jointly developed a simulator of cattle feeder-beef packer markets. The simulator has been used in teaching, public extension and private industry consulting to teach price discovery. The program has also been used in research as an experimental tool to provide insight into price impacts of particular market events. Development of this teaching tool required recognition of the teaching and extension need and in-depth knowledge of the industry, including research-based market relationships to ensure realism.

The surveyed award-winning teachers generally agreed teaching and research were synergistic activities. Ninety percent of the teaching awardee survey

respondents *agreed* or *strongly agreed* that teaching graduate classes and research were synergistic. Less, but still a significant amount—42 percent—felt the same about teaching undergraduates, and 68 percent indicated extension was synergistic with teaching. Our challenge as scholars is to make our research and extension activities associated with a relevant and applied research program linked with our teaching program (graduate and undergraduate), making these synergistic. If left to compete with each other, they will. Turner (1995) recommends that every undergraduate student be required to do a senior research paper. This is appealing for several reasons. Not only does this contribute to the student's in-depth understanding of the scientific research process, it also contributes to the synergy between teaching and research. At Kansas State University, several undergraduate honors student projects have resulted in scholarly, professional and popular publications. This is one example of how teaching activity directly contributes to a research program.

Teaching. The remaining scholarship discussed by Boyer, already much alluded to here, is teaching. The most effective teachers continually augment their own human capital. Broder and Dorfman analyzed 198 end-of-semester student evaluations of teaching. The three most important characteristics affecting teacher evaluations were: 1) instructor's enthusiasm for teaching, 2) instructor's knowledge of the subject matter, and 3) instructor's ability to tie information together. Feldman reported a meta-analysis of eighteen studies on the importance students place on instructional dimensions. The top five ranked attributes were: 1) teacher's sensitivity to, and concern with, class level and progress, 2) teacher's preparation: organization of the course, 3) teacher's knowledge of the subject matter, 4) teacher's stimulation of interest in the course and its subject matter, and 5) teacher's enthusiasm for subject or teaching. In the survey of award winners, the teacher's knowledge of material was the most frequently mentioned attribute of a good teacher followed by the teacher's desire or enthusiasm (Table 2).

Not surprisingly, a teacher's enthusiasm and other personal characteristics are important. However, the teacher's knowledge, is also integral to quality teaching. If a teacher is discovering new information, he or she will be better equipped to provide students with this information. Eble summarizes this: "Potentially great teachers become great teachers by the same route: through mind and spirit and body; acquiring skills, and practicing in respectful competition with great teachers living and dead" (p. 17).

Several have questioned whether teaching is given adequate notoriety among the activities faculty perform. Massy, Wilger and Colbeck discuss results of personal surveys in which a former department chair relayed that "...faculty in his department who had won major teaching awards were below the 50th percentile on the

Table 2.

Survey Respondents' Listed Important Attributes of an Effective Teacher^a

Teacher Attribute	Respondents Listing Attribute (%)
1. Knowledge of Subject Matter	56
2. Desire or Enthusiasm	45
3. Rapport or Personable with Students	42
4. Communication Skills	42
5. Ability to Motivate or Show Relevance	34
6. Organized and Prepared	29
7. Innovative Teaching Approaches	13
8. Committed to Students and Teaching	13
9. Other	27

^a Survey question read: *Please list the three most important attributes of an effective University teacher.*

department salary scale” (p. 14). They also noted a general sentiment that teaching has received superficial assessments. In the survey conducted here, agricultural economics teaching awardees did not generally agree with this sentiment. As shown in Table 3, although only 24 percent felt teaching was adequately valued by the profession, 68 percent felt quality teaching was rewarded by their department, and 61 percent indicated they were “sufficiently rewarded financially” for quality teaching. However, more than two-thirds felt incentives to be a good teacher were strong enough and few felt pressures to be a good teacher were too strong.

Although in-depth debate regarding these issues is beyond the scope of this discussion, these results provide solace that the state of teaching rewards in agricultural economics are not as poor as those perceived in other disciplines. If teaching is perceived as not being adequately valued by the profession, teachers need to take a more active role in making it so. Kohls summarized this effectively more than thirty years ago:

As a group teachers and extension workers have not been productive in contributing to literature. If the assertion that those who teach are equally capable of scholarly activities is to be accepted, results must be forthcoming.... And most important, teachers must insist that their activities be evaluated. They must ask that administrators sit in on their classes, attend their meetings, and question their students (p. 348).

Table 3.

Survey Respondents' that Agreed or Strongly Agreed with Selected Statements

Survey Statement	Respondent Category	
	Teaching Awardees (%)	Research Awardees (%)
Teaching is personally rewarding to me	95*	83*
Quality teaching is sufficiently rewarded by my department	68	46
Quality teaching is appropriately valued by the profession	24	17
I am sufficiently rewarded financially for quality teaching	61*	25*
Quality teaching is rewarded sufficiently compared to research	27	25
Incentives to be a good teacher are strong enough	68	54
Pressures to be a good teacher are too strong	2*	13*
To earn tenure a colleague needs to be a good teacher	39	54

*Indicates distributions of responses were statistically different between teaching and research awardees at the 0.05 level.

Has sufficient progress been made along these lines over the last thirty years? Either way, disgruntlement over teaching not being adequately rewarded is simply not productive.

Teaching Competitors

University scholars have many responsibilities including classroom teaching, grading, consulting students, advising undergraduates, serving on committees, conducting research, advising graduate students, writing grants, presenting extension meetings, professional service, administrative duties, etc. that are necessary tasks. How is this accomplished while maintaining a scholarly focus? First, this myriad of activities suggests that faculty must work a lot of hours. Much as an unmotivated student does not learn the material, an unmotivated scholar quickly

becomes stale, nonproductive, and ineffective at scholarly activity. In fact, award-winning teachers worked an average of 55.8 hours per week during their heavy teaching load and 52.3 hours during their light teaching load (Table 4). In addition, some worked as many as 96 hours per week and almost 10 percent worked 70 hours or more per week (Figure 1). These workloads are consistent with recent studies of faculty in general across disciplines. For example, the National Center for Education Statistics found that faculty in public institutions worked an average of 52 to 57 hours per week (Miller).

The average distributions of workloads by award-winning teachers illustrate the different types of activities on which these faculty spend their time (Figure 2). During periods of heavy workloads, these faculty spend 57 percent of their time in class, preparing lectures, grading, consulting students and advising. They spend 23 percent of their time working with graduate students and conducting research, and 6 percent conducting extension work. During periods with light teaching loads, these teachers spend considerably less time in direct teaching roles (18%) and much more time conducting research and working with graduate students (54%). Teaching requires time allocation when classes are in session during heavy teaching semesters. However, even during heavy teaching loads, these teachers conducted numerous other activities in significant proportions. These faculty continued to build their human capital through conducting research and extending results.

Pressures to conduct numerous scholarly activities are often high. The key to continual renewal of human capital is not to let activities that are of lesser value consume our time and efforts. As budgets shrink and course sizes continue to increase, it is easy to let teaching consume all of our time. Guskin provides an insightful paradigm to continue to enhance student learning in this environment.

Conclusion

In 1954, physicist Robert Oppenheimer, in an address at the 200th anniversary of Columbia University, spoke of the scholar:

The specialization of science is an inevitable accompaniment of progress; yet it is full of dangers, and it is cruelly wasteful, since so much that is beautiful and enlightening is cut off from most of the world. Thus it is proper to the role of the scientist that he not merely find the truth and communicate it to his fellows, but that he teach, that he try to bring the most honest and most intelligible account of new knowledge to all who will try to learn (Boyer, p. 24).

Table 4.
Weekly Self-Reported Workload of Award Winning Teachers and Researchers

Time Period	Mean	Standard Deviation	Min.	Max.
----- hours per week -----				
<u>Teaching Awardees:</u>				
Heavy Teaching Load	55.8	10.1	40.0	96.0
Light Teaching Load	52.3	11.1	36.0	89.5
<u>Research Awardees:</u>				
Heavy Teaching Load	53.7	11.4	40.0	86.0
Light Teaching Load	52.4	13.7	35.0	90.0

Figure 1.
Distribution of Hours Worked Per Week During Heavy Teaching Loads, Teaching Awardees

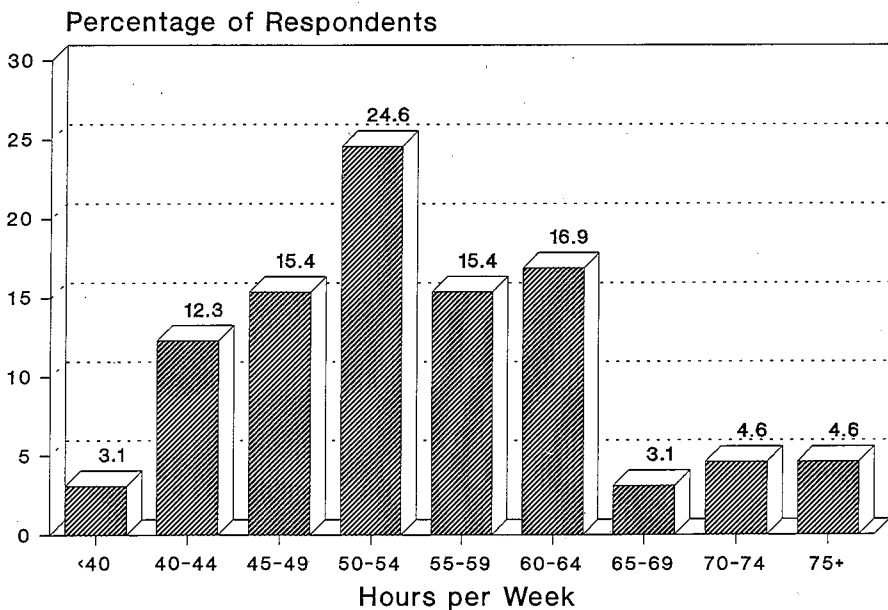
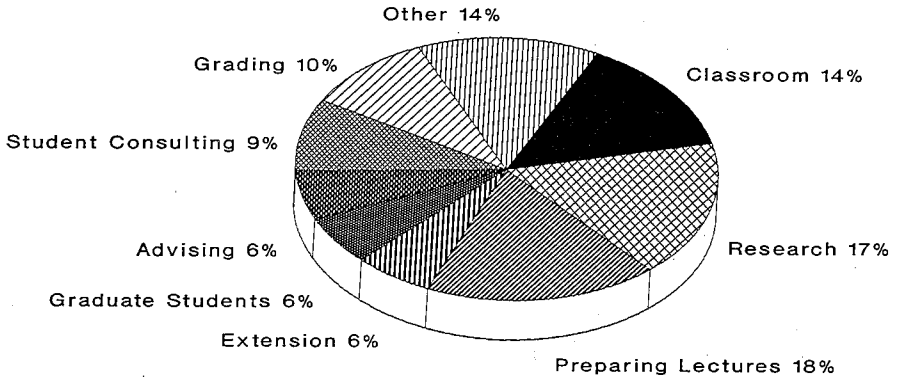
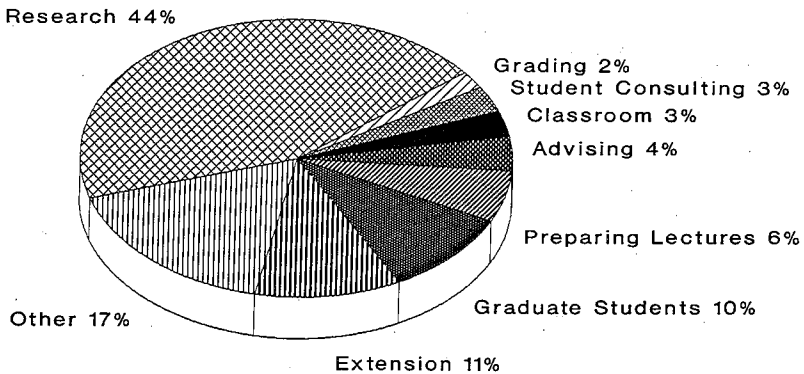


Figure 2.
Time Allocations of Award Winning Teachers

Heavy Teaching Load



Light Teaching Load



continually active in discovering knowledge. As Beattie and Watts state:

we in the colleges of agriculture must abandon the atypical and nonsense view that research, scholarly, and creative activity is expected and deemed socially responsible behavior only for those with a formal research, i.e., experiment station, appointment. Nothing could be more foreign from the concept of a university professor (p. 97).

In addition, getting relevant research results to the public is our job. They demand it and they hold us accountable for the money they invest in us. As agricultural economists, our applied research is often of significant interest to industry, commodity associations and policy makers. Our responsibility is to get this information to these sources. We also must use our knowledge to teach students. Our problem-solving-oriented curricula is complimented with our knowledge and information gained from conducting research, reporting results and interacting with industry. These activities do not need to unduly compete with each other but, rather, they can be compatible and synergistic.

Notes

The author is Professor of Agricultural Economics, Kansas State University, Manhattan, Kansas 66506-4011. Helpful comments of Andrew Barkley and three journal reviewers are gratefully acknowledged.

1. At some universities faculty have full-time teaching positions with little time to devote to research. This significant constraint increases need for these educators to devote time to reviewing current literature. Although not a substitute for conducting research, this at least keeps these teachers informed about evolving scientific knowledge. The different perspectives of the faculty suggest a difference in the type of education a student is likely to get at a research-based university relative to universities without active research programs.
2. The AAEE winners included teaching awardees (with ten or less years and with more than ten years experience), and research winners (authors of the research discovery and outstanding article awards). The other associations give one award for each research and teaching (the WAEA has added a second journal article award for their journal recently). Only those winners who were from domestic universities and gainfully employed in the profession were surveyed.

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