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Research in a Teaching Institution

by William G. Van Meter, PhD*

Preface
The writing of this article is the result of a talk presented by the author to SIRE (Students Interested in Research and Education). It became quite clear that many students of the profession were unaware of just what was required in order to have a research program in an educational institution. It is intended that this article will offer some insight into the task of faculty committed to teaching and research in a College of Veterinary Medicine.

Introduction
In the recent past, for the present and in the foreseeable future, if a member of the faculty at Iowa State University in the College of Veterinary Medicine wishes to conduct a meaningful research program, funds to support this work must be obtained from extramural sources. In other words, support for research comes from a sponsor outside of the university. Furthermore, the individual faculty member must identify sources, seek them out and prepare the grant or contract applications according to specific required protocols.

Although the university provides some support, the level is unrealistic to fund any major project and it is generally considered to be "seed" money for pilot-type studies, the results of which are used by the faculty member as the basis for seeking adequate support from an extramural source. It is also recognized that the university has provided funds for the purchase of some major equipment intended for use by a large number of investigators. An example in this category is the electron microscope. However, maintenance of such equipment is expected to be obtained by faculty members out of their individual grants or contracts.

The research proposal envisioned and written by the faculty member is expected to provide extramural support for the following general categories: (1) Personnel—technical assistance, graduate student and post-doctoral financial assistance, student and non-student hourly help; (2) Equipment—computers (mini/micro) for on-line data analysis or funds for computer time from the ISU Computation Center, oscilloscopes, various electronic instruments, chromatography instruments, and in general, any and all major equipment needed to perform the work; (3) Supplies—chemicals, drugs, surgical instruments and supplies, photographic film, recording paper, animals and their care to include food, bedding, housing, animal room attendant's labor and any additional treatment required, such as vaccinations, care of sick animals, quarantines, etc.; and finally, a category called (4) Other—travel to scientific meetings to include room, board, registration fees, costs of publishing research results, costs of telephone operations related to research and any unanticipated needs.

A general policy implicit in research projects funded from extramural sources is that there should be no cost to the university for the work being done. To this end, a percent of all salaries and wages is charged to the grant or contract and this money is intended to defray the costs of space, utilities and whatever is incurred by the university as a result of the project. The percent figure varies with the locality and the conditions, but recently was 58% of all salaries and wages on Iowa State Veterinarian

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any grant or contract proposal that was submitted by faculty members at Iowa State University. This percent is only a recent example and that figure is revised frequently by federal agencies. The overhead (i.e. the 58%) paid to the university has been reported to amount to approximately 2.5 to 3.0 percent of the total university budget and is used by the university at large. In fact, only an infinitesimal amount is returned to the college, to the department, and none to the faculty member from whom the proposal originated.

On the other hand, if a faculty member with extramural support for his research elects to move to another university, then the personnel supported by the research grant or contract may either make arrangements to go to the new institution or they may be faced with the burden of finding another faculty member with research support who can fund their position or graduate education. Furthermore, it is a general policy of the university to retain all equipment obtained for the research and the faculty member is faced with the choice of giving up on the project or of seeking additional funds to purchase equipment to continue his work at the new institution.

Research Proposal

Research proposals are submitted either as a contract application, which means that one is contracting to do specific work and little deviation from the stated proposal is permitted by the funding agency, or the research proposal is submitted as a grant application, which permits a greater degree of flexibility in that one performs studies on a topic area in an organized fashion and variance, within limits, from the specific stated goals is permitted. The large funding agencies for research support are federal ones. Some of these are: NIH (National Institutes of Health), NSF (National Science Foundation) and the various departments of the Federal Government such as Defense, Environmental Quality, and Agriculture to name but a few. Other non-profit organizations as well as industrial sources can provide research support, but these are generally less well endowed and therefore, the probabilities of obtaining significant support are proportionally reduced.

In preparing a proposal, the first step that a faculty member takes is to inquire as to whether or not his/her research interests are supported by the prospective funding agency. Once this has been resolved, the appropriate application forms are obtained. While the format of the application varies, in general it will consist of: (1) a descriptive title of the project, (2) an abstract of some 200-300 words, (3) a general statement of the overall objective or long term goals of the research, (4) descriptive background information which consists of selected research findings that have been published in scientific literature and a list of references (a critical feature of this section is pertinence of the selected data to the proposed project), (5) the general hypothesis or hypotheses which will be tested by the proposed research, (6) the rationale or basis for carrying out the study as proposed, (7) the specific objectives of the proposed research, (8) the general methods which will be used, to include forms of data analysis, (9) the experimental protocol, which is a sequencing of the steps of the research and includes the working hypotheses, your expected results and the implications of these expectations, (10) preliminary data which is helpful in that it is an indication that one is capable and able to do the work as proposed as well as showing that the study is in fact a feasible one, (11) the significance of the findings of the work, (12) a bibliography of the principal investigator (faculty member submitting the proposal), (13) if the research involves the use of experimental animals, then a statement is made regarding their care and handling along with a statement of the procedures to be followed (this portion of the proposal is carefully reviewed by the veterinarian responsible for animal care and all phases of the project involving animals must receive his approval), (14) statements of facilities and equipment available to conduct the research, to include animal housing and personnel available to care for the health and welfare of the experimental animals, and (15) the budget—a realistic budget must be prepared by the investigator which includes (a) all salaries, wages and fringe benefits of the personnel as well as overhead to be received by the University, (b) equipment costs, (c) supply costs, (d) travel costs, (e) publication costs, (f) computer costs, (g) other costs to include such items as maintenance contracts for equipment, repair and maintenance of other equipment not covered by maintenance con-

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tracts, building modification costs, etc. (the budget is prepared for the duration of the proposal which in most cases is three to five years).

Review of the proposal begins with one's peers and after appropriate corrections the proposal is submitted to the chairman of the department who makes his suggestions and corrections. Next, the Associate Dean of Research for the College makes his recommendations after careful review and the Dean of the College must also give his approval. The business office of the University and the Vice-President of Research for the University carefully review the proposal and assign their approvals after which it is submitted to the funding agencies. At the funding agencies, the proposals are allocated for review and after thorough processing, recommendations for approval and funding, approval and not funding, or non-approval are given. Realistic estimations are that less than 15 to 20 percent of the grants and contracts will eventually receive funding. As can be seen, it is a formidable task to obtain research support in a teaching institution. The writing of a good quality proposal requires six months to one year. A realistic time frame of one to one and one-half years can transpire before a well written proposal is funded.

In the event that the proposal is funded, the faculty member then continues with the business aspects such as ordering equipment, hiring personnel, determining and selecting qualified graduate students, etc. When all of these problems have been successfully attacked, then the actual research can begin.

As the data begins to be acquired, reports of progress to the funding agencies must be made since the faculty member is held responsible for the conduct of the proposed work in all its phases. These reports are in addition to publications and presentations of the work at scientific meetings.

**Conclusion:**

With all of the additional work required of a faculty member-scientist, a legitimate question is, "Why do it?". The answer is not a simple one. The amount of additional work required is great, it must be done in addition to the 'primary responsibility' of teaching students of the profession and in most instances there are no additional external incentives for the faculty member-scientist. The incentives must come from within the individual and each faculty member-scientist must find his/her own answer. In my opinion, teaching and research exist in a symbiotic relationship. One feeds off the other to the mutual benefit of both and to the ultimate benefit of the student. In rapidly developing fields such as pharmacology, it is no longer sufficient to know that the information exists in the appropriate texts, but it is essential that one knows from whence the information in the texts comes. With this perspective, teaching becomes more efficient in that the quality of the information can be assessed before it is transferred in an organized manner to the student.

Finally, it is the duty of the faculty member-scientist to adequately prepare students interested in graduate education for the tasks that will face them in teaching and in research. The significance of the role of the graduate student interested in becoming a faculty member-scientist is the realization of the responsibility one faces in teaching large numbers of professional students. The link to the quality of education for students of the profession in the future resides in the quality of education received in the present by the graduate student interested in becoming the future teacher and scientist in a College of Veterinary Medicine.