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ABSTRACT

The improvement of instructional methods or the solutions of problems of an instructional nature requires information that is not usually part of the Canadian common experience and must be discovered by means of research. Types of fundamental and applied research are discussed, including action, developmental, evaluation, and diagnostic research. The disciplines on which postsecondary educational research has relied are discussed, followed by descriptions of the following methodologies: descriptive, case and field studies; correlational designs; causal-comparative research or modus operandi designs; experimental research; and quasi-experimental designs. Areas of impact (student learning, instruction, and institution) and types of improvement (optimizing, facilitative, and remedial/quality control) are also discussed. It is concluded that the development of expertise in postsecondary instruction will require university support to motivate professors to improve their instruction; educational researchers to help them do it; funding to aid in the research; and a network to link researchers and research. Contains 33 references. (KM)

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CSSHE Professional File

Improving Postsecondary Instruction Through Research

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This is the third issue of the **Professional File**. *The purpose of the* **Professional File** *is to present one or more solutions to a current problem in postsecondary education. The solutions that will be described have been found to be successful on at least one campus. Topics and authors will be approved by the Publications Committee and the Executive Council of CSSHE. The* **Professional File** *will be published three or four times per year by CSSHE and will be distributed free of charge to CSSHE members. This* **File** *presents an approach to improving postsecondary instruction. I welcome your comments and suggestions regarding this series.*

Norman Uhl. Editor

ABSTRACT

We tend to rely on experience in undertaking educational improvement. While this may be the case in some situations, the improvement of instructional methods or the solutions of problems of an instructional nature requires information that is not usually part of our common experience. If instructional improvement is to be achieved, research must be carried out to discover the new information necessary that will assist in attaining the desired results. This paper discusses different research methods which could be used to improve instruction. The development of expertise in postsecondary instruction will require university support to motivate professors to improve their instruction; educational researchers to help them do it; funding to aid in the research; and a network to link researchers and research.

RÉSUMÉ

Nous avons tendance à considérer l'amélioration en général comme un processus facile dont nous possédons déjà les éléments qu'il suffit d'appliquer. Cependant, la solution d'un problème touchant l'enseignement exige habituellement des informations dont nous ne disposons pas. C'est pourquoi, si l'on veut trouver des solutions valables, il faut avoir recours à la recherche. Cet article présente diverses méthodes de recherches visant à l'amélioration de l'enseignement. De plus, pour développer l'expertise en matière d'enseignement postsecondaire, il faut s'assurer le support de l'université pour motiver les professeurs à améliorer leur enseignement et les chercheurs en enseignement à les aider. L'université devrait également participer au financement nécessaire à la recherche et à l'établissement d'un réseau de communication entre les chercheurs.

The improvement of postsecondary instruction is a complex issue. Good instruction depends not only on the professor teaching the course but on the relationship of the course to other courses in a program of studies, students' preparation and abilities, and the general learning environment provided by the institution of higher education. All of these factors affect the teaching and learning situation, and some of them are more easily optimized than others. I use the term *optimized* because good instruction is a matter of engineering to achieve the best possible learning results in a variety of situations, some of which may be easier to deal with than others. For example, in a well structured discipline such as physics or mathematics, problems of instruction are more likely to occur in making the subject matter relevant to students' lives. In less well structured fields of study, the chief problem may be to achieve a coherent framework that students can use to guide their thinking. Each of these learning situations will require a different approach and a different solution.

Because different approaches are necessary to improve instruction depending upon the field of study and the particular problem, it is useful to look at the improvement of instruction as a research question. This is also a feasible perspective because new social science methods have been developed to handle the complex set of variables that affect teaching and learning. University and college teachers have engaged in a variety of kinds of research to solve teaching and learning problems and to better understand their fields or their students.

KINDS OF RESEARCH

Let us first look at what kinds of research, both fundamental and applied, are being done, and at the issues and questions which arise from this research (Table 1). Fundamental research often is done within disciplines and particularly in psychology, and is concerned with epistemological questions, such as validation techniques in a discipline; or with contextual questions, such as professors' value systems or expectations. The research is fundamental in the sense that it provides us with basic knowledge of the field of postsecondary teaching and learning, and also in the sense that it is

Table 1

Improving Postsecondary Instruction Through Research

Kinds of Research	Area of Impact	Type of Improvement
Fundamental	Student Learning	Optimizing
Applied: action developmental evaluation diagnostic	Instruction	Facilitative
	Institution	Remedial/ Quality control

not immediately applicable to the courses we teach. Applied research takes many forms. Action research is more frequently done but less frequently available because it is not published. It tends to concern specific problems and not to meet standards of scientific rigor. For example, an evaluation of errors made in a unit of instruction can be used to change classroom presentation emphasis or the kinds of problems students are given to solve. Findings from specific teaching situations like this are, however, less likely to have a conceptual framework or to be published.

Developmental research appears to be increasing. Developmental projects, so called because a process or product is developed and tested, are often concerned with teaching methods, although more work also is being done with instructional materials. Having graduate education students develop and test their own learning materials in curriculum design courses has a double payoff (Geis, 1987; Weston, 1986). Students learn developmental testing procedures and the university benefits from improved instructional materials. In the seventies, government agencies and private foundations in North America funded large curriculum projects, but in the eighties the colleges and universities themselves, rather than funding agencies, have tended to provide support for developmental research.

Evaluation research is more often associated with the review of entire programs, and thus occurs at the institutional level, but much attention has been paid to instructional problems. For example, in his work on classroom-teaching behaviors related to teaching effectiveness, Murray (1985) used student ratings of instruction to determine which teaching behaviors were evaluated most highly by students. Research on program review is primarily descriptive, with attention focusing on the locale being studied and the particular achievements and problems of educational units. Little analysis or meta-analysis has been done of the teaching characteristics of effective departments or programs over a discipline or a college. Centra's (1980) research on the characteristics of prestigious departments suggests that departments gain recognition from their research and not their teaching. The Carnegie study on higher education described professors in the most highly ranked institutions as teaching smaller classes and spending fewer hours in the classroom (Trow, 1975). This has continued to be so. Teaching load and the proportion of faculty time devoted to teaching are lowest in large, private, urban, graduate institutions (Bowker, McFerron & Lynch, 1987). Less attention in the literature has been paid to what makes departments effective in their teaching.

Diagnostic research is used in instructional improvement projects, where a professor will be videotaped and will peruse the tape with a counsellor and with the results of student ratings of instruction, so that specific problem spots can be located and smoothed out. Again, relatively little of this kind of research is published. In a criticial review of research on improving college teaching, Levinson and Menges (1981) found three reports on college level microteaching projects. McKeachie et al. (1980) and Aleamoni (1978) have examined the use of student ratings combined with consultation to improve instruction. One hears of diagnostic research and can often experience it at conference workshops such as those of the Professional and Organizational Development Network in Higher Education (POD) or Improving University Teaching (IUT). It is considered, however, to be one of the most effective methods of improving teaching, since it concentrates attention on teaching behaviors that the teacher then can change and review.

WHO DOES THE RESEARCH?

We encounter here a strange phenomenon, for the development of a special-

ization in this area has been slow, and researchers who would name postsecondary teaching and learning as their area of expertise are rare. In the past decade the areas on which universities have tended to seek advice are management and finance rather than teaching and learning. Indeed, there has been a feeling that teaching expertise lay in the hands of the individual teacher or discipline, and that to investigate university teaching across disciplines would be an intrusion.

Psychology has contributed most to the organized study of teaching and learning in postsecondary institutions. The two North American university centers specifically devoted to the study of university and college teaching and learning, the National Center for Research to Improve Postsecondary Teaching and Learning (NCRIPTAL) at the University of Michigan, and the Centre for University Teaching and Learning at McGill University, are staffed with professors with backgrounds in psychology. All of the professors who contributed to the volume *Using Research to Improve Teaching* (1985), published in the Jossey-Bass series on *New Directions for Teaching and Learning*, were psychologists, and most fundamental research in the area is done by those with backgrounds in psychology.

But very interesting work on teaching and learning has been done in different disciplines, and a greater effort at finding and sharing this research is necessary. Often it is found in disciplinary teaching journals such as *Science Teaching Sociology*, or the *Journal of Medical Education*. Research is also presented at conferences on higher education sponsored by the American Educational Research Association, Division J; the American Association for Higher Education; the Association for the Study of Higher Education; the Society for Research in Higher Education in the United Kingdom; the Canadian Society for the Study of Higher Education; and the Higher Education Research and Development Society of Australasia.

The Office of Educational Research and Improvement in Washington, D. C. awarded grants in 1986 to researchers in disciplines such as computer science and physics to study student learning in their disciplines. In Canada, the Social Science and Humanities Research Council began a special grants program to support research on education and work. Some provinces, such as Quebec, lead in support for educational research. The Spencer Foundation in the last year awarded grants to researchers for educational studies in the fields of anthropology, sociology, psychology, history, English, human development, philosophy and religion, communications, and administrative and policy studies. Funding for educational research, however, trails far behind funding for research in science and technology.

RESEARCH METHODOLOGY

With many different kinds of research being done by people from diverse disciplines, it might be expected that research methods vary widely. Research in postsecondary teaching and learning, however, can be categorized under the headings used to describe educational research.

Descriptive, case and field studies systematically describe a situation or area and are used to collect factual information that describes background and existing phenomen to identify problems and to make comparisons. In a field as young as higher education, a great deal of descriptive work is needed, although this kind of work must be accompanied by a conceptualization of the area being studied and careful attention to the rules for drawing and verifying conclusions. For example, the establishment of what the learning task is in a particular field is primarily one of describing different components in each unit of instruction and how the components are sequenced for the most effi-

cient and effective learning to take place. A guide for this kind of research is Miles and Huberman's (1984) *Qualitative Data Analysis: A Sourcebook of New Methods*. The book describes methods which can be applied in field situations so that findings meet the criteria of coherence, consistency, and precision.

Correlational designs investigate the extent to which variations in one factor correspond with variations in one or more other factors. These designs are appropriate where there are multiple variables, for example, a study of all the teaching behaviors which affect overall ratings of teaching effectiveness or student learning. Correlational designs permit the measurement of several variables and their interrelationships simultaneously and they do this in terms of the degree of relationship rather than making a single decision of similarity or difference. The major limitation of correlational designs is their inability to identify cause and effect, that is, they measure congruence but not directed contingency.

Causal-comparative research or modus operandi designs allow researchers to observe some existing consequence and search back through the data for plausible causal factors. An example would be the attributes of effective teachers as defined by their performance compared with records over the preceeding ten years for extra courses or particular courses they had taken, or other possible factors which would have affected their performance (see Scriven, 1974).

Experimental research investigates possible cause and effect relationships by exposing one or more experimental groups to different treatment conditions and comparing the results to those of a control group not receiving the treatment. This requires rigorous management of the variables and conditions by direct control or through randomization. Experimental research most readily meets the criterion for validity because it can establish most clearly the link between treatment and effect, but it is most difficult to achieve because few situations in postsecondary education can be experimentally controlled. In sections of large courses, where students can be randomly assigned, and the treatment is discrete, experimental research is possible. Work done by Perry, Abrami, Leventhal and Check (1979) and by Sullivan and Skanes (1974) on the relationship between student ratings and student achievement are examples of this kind of research. The precision gained by this kind of research is often at the cost of comprehensive coverage of all the variables operating in the context.

Quasi-experimental research designs attempt to approximate the conditions of an experiment in situations which do not allow the control or manipulation of all relevant variables, for example, to investigate the effects of spaced versus massed practice in learning economics in four different classes without being able to assign students to the treatment at random. To compensate for the absence of control through randomization, the researcher attempts to overcome threats to the validity of the project by ascertaining that variables such as the history of the project, maturation of students, or effects of testing, selection, or mortality have not confounded the treatment results.

Research methods range from quantitative, that is, using precise measures which can be analyzed numerically, to qualitative, using language and methods for sorting and categorizing data which are not quantified. Descriptive, field and causal-comparative research depend upon qualitative methods and will be more conceptual in emphasis. This does not mean that these kinds of research can escape the requirement to be coherent and consistent, but the criterion of comprehensiveness will undoubtedly be more important than that of precision. Quantitative methods are designed to provide more precise measures, but may be limited in their comprehensiveness. There is obviously a tradeoff between

precision and comprehensiveness which must be resolved in any research project.

But a larger issue concerning research in teaching and learning must be addressed. The variables affecting student learning fall into two main categories, those which will be labelled attributional and those which will be labelled situational. The attributional variables include what students bring with them to the learning situation. This includes their past learning experiences, their abilities, and their cognitive structures. To illustrate, if students have been selected rigorously, have had previous courses in the area, or are familiar with the basic vocabulary in a discipline, they will more likely be successful in a particular course. The effect of these attributional variables is relatively high. Grade point average, for example, is used as the best predictor of success in later courses. In contrast, situational variables such as teaching method or time on task may account for 15 percent of the variance. It is therefore important to understand what characteristics students bring to the learning situation before measures of educational treatments are taken. If we recognize that there are two types of variables, we must take a broader and more comprehensive approach to research on postsecondary learning. The validity and utility of our research depend upon careful consideration of the context in which we are working.

AREAS OF IMPACT

Research to improve teaching has three levels or areas of impact. The areas are interrelated but in fact focus on different sets of variables. Research on student learning is often done within a discipline and focuses on specific relationships between curriculum and instruction. For example, engineering programs have as a primary objective the development of problem-solving skills; therefore, much attention is paid to what those skills consist of, and entire engineering courses may be devoted to this topic. At a broader level, instructional research is concerned with the review of a curriculum for sequencing and redundancies, or with the effects of particular teacher behaviors on learning across disciplines. At the most general level, institutional reviews or sectorial studies by provincial or state education departments determine which programs will be offered.

STUDENT LEARNING

A major social issue governs interest in student learning today: the needs of the information society have turned learning or its products, knowledge and skills, into a commodity. Governments question how well their postsecondary students are being equipped to compete in a world market of expertise. Tertiary education and the education of teachers once again have become topics of global interest. Meanwhile, European research (Hounsell, 1987) suggests that most students are not learning the deep cognitive structure and processes of the fields they are "studying", but are instead adopting a surface approach to learning which allows them to pass examinations but does not fix concepts and procedures in memory.

In a study of faculty expectations of students' ability to think, it was found that only sixty percent of the professors of undergraduate courses expected all of their students to be able to think logically (Donald, 1987a). Expectations were higher in the natural and social science disciplines (83 percent) and lower in humanities (33 percent). Professors' expectations that their students be able to reason with abstract propositions closely matched their expectations for logical thinking. Previous research has suggested that perhaps half of the entering student population may be capable of thinking logically (Higgins-Trenke & Gaite, 1971; McKinnon, 1978; Ross, 1973).

Obviously a major research question

is what university students are expected to learn and how their task differs across disciplines. This kind of research requires close cooperation on the part of epistemologists and subject matter experts, and is research of a qualitative, descriptive nature. Some disciplines have invested substantially in research of this kind, while others have not attempted it. In a review of methods of representing cognitive, content, and curriculum structure in different disciplines, a considerable number of studies were found in well structured domains such as physics (Donald, 1987b). Studies were also found in biology, English, law, political science, radiology and education, but other disciplines have not been investigated. Much fundamental research needs to be done to establish what indeed students are expected to learn in a course or program, and to establish a vocabulary which can be utilized across disciplines. Much applied research also is needed to match professors' expectations with students' entering abilities to produce the optimum curriculum.

Another approach to student learning is to look at the intellectual skills which students are expected to develop during postsecondary education. Furedy & Furedy (1986) suggest that research on critical thinking has been limited by the lack of agreement about what it means. Research has been done, however, on the attributes of critical thinking; this involves the analysis of students' written work by trained observers or raters to determine if reasoned, substantiated judgment has been used. The ability to think critically becomes crucial in thesis production. Recent work by the Furedys has focused on the relationship of critical thinking to clear and effective writing in theses and in other scholarly productions.

In a project on intellectual skills in the university, professors in selected courses were asked to describe what skills they expected students to have, what skills were developed in the course, what skills were evaluated, and which were important in the professor's discipline (Donald, 1985). A comparison of the skill development in the courses studied suggested major disciplinary differences in the kinds of skills considered important. For example, in physics, emphasis was on the development of inferential skills, but in the engineering program, these were assumed and students' abilities to describe and select information were stressed. More detailed work on similarities and differences within and between disciplines is underway to determine if a core set of skills can be delimited.

Research into student learning in postsecondary institutions is in its infancy: concepts are still being investigated and terminology tested for fit. Both fundamental and applied research is being done in the area, and work in various disciplines points to a broad spectrum both of expectations of what students should learn and of approaches to instruction, the topic of the next section.

INSTRUCTION

Instructional research has two main foci: the curriculum and the actual process of instruction. We could expect research in this area to be applied rather than fundamental, since it often deals with actual classroom practice, but the work done by Becher (1981) on disciplinary differences and by Murray (1985) and Perry (1985) deals with fundamental issues of curriculum and instruction. Becher interviewed over 200 academics in six disciplines in British and American universities to determine what differences exist across disciplines. He found major differences in the epistemology, the organization of the discipline, and disciplinary values and expectations. For example, disciplines or specialist fields within them could be characterized by hard or soft knowledge, and by their intrinsic or extrinsic justification (pure and applied). They could also be characterized by the degree of concentration

of resources and by the degree of paradigm development. Each of these characteristics would be a major influence on instruction in a discipline.

Murray's work has been fundamental in the sense that it identifies specific low-inference behaviors associated with teacher effectiveness that could be applied in most teaching situations. These behaviors, studied by means of classroom observation of teachers and recorded on a standardized rating form, ranged from speech and nonverbal behavior to organization and interaction in the classroom. Each behavior was specific and observable, such as "moves about while lecturing" or "asks questions of class", both showing good interrater reliability (.83 and .86, respectively) and correlating significantly with teacher rating.

Murray took the next step, however, and applied this knowledge about teaching behaviors in a course which trained professors in a limited set of the behaviors known to contribute substantially to overall teaching effectiveness. After a twenty week training program, the teachers who had followed the training showed significant improvement in their teaching ratings. Murray's research thus had practical payoff for university instruction.

Instructional development research is largely based on the work of educational researchers such as Gagne (1977), Merrill (1975) and Scandura (1977). They have examined ways of organizing instruction in increasing hierarchies or in problem-solving modes for optimum learning. Pioneering developmental research was carried out in a curriculum review of a first year engineering program. The method used was to set out on a big board the concepts taught in each course in the program so that links between courses could be determined and redundancies considered (Woods, 1968). The review allowed all involved in the program to see where their contributions to the program fit and where other courses linked most closely or overlapped.

In a project to outline the objectives of undergraduate education in political science, Goldman, Schoner and Pentony (1980) developed an inventory of concepts used in political science and had a panel of experts rate each concept for its importance in the curriculum. The vocabulary then was categorized to reveal the organizational structure of the discipline, and frequently used terms were compared with those considered important in the discipline. The concept inventory then was used to identify the scope of content in individual courses in specified areas of political science. These methods provided political science professors with an overview of their field and the important concepts that their students might be expected to master in their courses.

It is evident that a variety of methods can be used to increase our knowledge of the curriculum in a domain, and to enable us to improve teaching. Very few of these research methods have to do with what is thought of as "teaching improvement" in the remedial sense of turning a non-communicative scholar into a stimulating lecturer, although Murray's research would prove useful in such a situation. Instructional research appears to be much more concerned with facilitating learning and with determining the characteristics of a curriculum in a domain.

INSTITUTIONAL RESEARCH

Institutional research serves another purpose. Planning is the ideal aim; more often the institution is concerned with the day to day assurance of quality. Thus research in this area is more likely to be applied and evaluative, including cyclical reviews of departments or programs; and sectorial studies by education departments or ministries. Teaching and learning measures in these studies will of necessity have more to do with the staff/student ratio or the number of students graduated than with epistemol-

ogical issues. The question of efficiency may dominate that of effectiveness where the distribution of resources is at stake.

What is looked at in an institutional review of teaching? Many universities and colleges now have in place a system of student ratings of teaching. This coincides with the great deal of research done on the validity and utility of student ratings. Less research has been done on other kinds of ratings such as colleague ratings, although Centra (1980) has examined their utility. Institutions rarely make use of other measures of teaching such as participation in innovative teaching methods or curriculum studies, nor do they use student learning as a measure, although student learning is fundamentally what good teaching is about.

Institutions and, more often, professional programs, survey their graduates and the employers of their graduates to find out to what extent their training has equipped the students to operate in the professional milieu. In a study reported in the *Chronicle of Higher Education* (July, 1986), the criterion most used by institutional leaders to judge teaching was student pass rates on licensing tests, which were considered appropriate by 84 percent of the university leaders and used by 66 percent of them. This measure can only be applied, however, in certain professional programs. Ratings by graduates were considered appropriate by 84 percent of the respondents but were used in just over half the institutions. Thus institutions use measures not appropriate to many of the fields of study in the university. In institutional research, survey methods are most frequently used.

Another area of increasing interest in the university is the selection of students into the institution. With greater interest on the part of students in obtaining degrees and vocational qualifications in general, the selective admission of students to programs has become a major area of research for many institutions. The criteria used in selection and student success rates are often compared by regression analysis. As mentioned earlier, grade point average appears to have the greatest predictive value for student achievement. Programs have been set up to follow students admitted on the basis of other characteristics however (Pollock, Bowman, Gendreau & Gendreau, 1975). These alternative programs select students on the basis of maturity and motivation rather than on grades, and then compare their success with that of students admitted under normal procedures.

An important issue is the degree of support given within the university or college to different kinds of teaching research. Institutional research is most heavily supported and tends to deal with quality control issues such as the selection of students and the review of programs. Quality control is more heavily supported than other kinds of research on teaching in the institution. What does this do to other kinds of research on learning and teaching? The relationships among type of improvement, kinds of research and the areas of impact of teaching research are examined next.

TYPE OF IMPROVEMENT

Reference has been made throughout this paper to the different kinds of improvement that could be expected from different kinds of research in different areas. Sullivan's (1985) categories of remedial, facilitative and optimizing were intended to clarify the kinds of improvement that different teaching interventions would promote. He pointed out that remediating improvements identify and remove errors. Facilitative research is associated with identifying and using sound principles of learning to enhance student achievement. Optimizing innovation is a matter of establishing the best procedures and applying them. We have noted that institutional attention to teaching and learning has functioned at

the remedial level, in sharp contrast to a demand for optimal research in institutions of higher education. Furthermore, the kinds of teaching research most used by the institution are evaluative and diagnostic research, again more closely associated with remedial improvement or quality control.

Review of the kinds of research that are more fundamental and that have to do more with instruction and student learning suggests that these kinds of research are concerned with facilitating and optimizing improvements. Perhaps this is why they are given less attention within the institutional framework, that is, they represent steps beyond the basic level of functioning. But we could suppose that focusing attention on higher levels of improvement, and on facilitative and optimizing research on teaching would be both more far reaching and more inviting to professors. It would certainly be closer to the idea of excellence that has attracted professors to the academic life. In the study of effective programs and practices for improving undergraduate education, Eble and McKeachie (1985) point out that teaching improvement clearly deserves internal budgetary support.

Are professors ready for this kind of approach? Centra (1980) found that professors preferred to have their teaching judged on the basis of participation in innovative teaching methods or in curriculum studies, although these measures were rarely used. With technical support, this preference on the part of faculty to have their teaching evaluated on the basis of facilitative and optimizing practices easily might be developed. Concerned as institutions are with quality control, can they afford to look beyond to higher levels of improvement? Perhaps they cannot afford not to, as students become more sophisticated in their choice of postsecondary education. What kind of technical support would be necessary to assist professors in optimizing their instruction? The Australian universities formed educational development support units and have become leaders in innovative teaching methods (Moses, 1987). A far reaching professional competence in the field has been developed because of this. Certainly steps need to be taken to ensure that an awareness of the teaching and learning process is present in our universities and colleges, and developing a research capability in the field appears to be the most promising of avenues.

Research which involves professors working on instructional problems of particular relevance to them, supported technically by epistemologists and educational researchers in a program of research, and recognized in their institutions and their disciplines as doing work of great merit may be the answer to the need for teaching improvement.

HOW CAN RESEARCH ON INSTRUCTION BE ACHIEVED?

To get research on instruction done, and to move the research area from a dispersed environment to a more focused environment, we need five major ingredients. The first is support from university administration in the form of time, funds, and recognition. Often our promotion and tenure procedures militate against professors doing research on teaching in their field. Instead of supporting instructional research or excellent teaching performance, the rules for promotion lead professors to specialize in a small research area and to avoid investment in teaching improvement research. Ideally, if universities honor excellence in teaching, promotion should be based on teaching excellence in the form of attention paid to conceptualization of the field of study and instructional development in it. Memorial University of Newfoundland is a leader in rewarding teaching excellence in this way.

Teaching research, as any kind of research, also requires help in the form of funds for research assistance,

materials, and computer time. Ten years ago, course development funds provided this kind of assistance in a sizable proportion of Canadian universities, but with the underfunding of the universities, this assistance was in many instances cut (see Donald, 1986). The amount required to support teaching improvement projects is relatively small, but is a crucial requirement if this kind of work is to be done.

The second ingredient is the presence of educational researchers who are familiar with the literature and methods of teaching and learning in postsecondary institutions. These may be found in units such as centers or pedagogical services, as in the Quebec universities, but they also may be present in faculties of education, in cognitive science centers, or in the disciplines. Psychology departments, for example, frequently house professors who have a special interest in problems of teaching and learning. What is important is that there be a critical mass of people interested in doing this kind of research and documented resources with which to do it. Often Canadian universities create committees of professors with this kind of expertise. For example, the University of Western Ontario and the University of Guelph have highly informed learning and teaching committees. Boehnert (1985) describes how the instructional development program operates at Guelph, and how technical support services are provided to professors.

We appear to fall most short in the third ingredient, funding provided for higher education research on a competitive basis. The Quebec government has been a leader in providing educational research funds, and McGill's Centre for University Teaching and Learning has been able to focus attention on teaching and learning research because of this support. The Canadian Society for the Study of Higher Education, in conjunction with the Canadian Society for Studies in Education, put forward a master plan to the Social Sciences and Humanities Research Council of Canada to improve education research in Canada by increasing the funds available, making education and work a strategic grants area, creating an education panel for the adjudication of proposals, and providing proposal writing workshops across the country. The number of proposals has increased substantially in the past few years, but funding levels are still too low to provide incentive for a sufficient number of researchers.

Fourth, we need a network. We are insufficiently aware of who is doing research in the area. We need a time and place to meet to discuss and plan the process and products of research in higher education. The annual meeting of the Canadian Society for the Study of Higher Education could provide the milieu, but its custom of choosing a specific topic of interest each year and its focus on policy issues in higher education work against the development of a network on postsecondary teaching and learning. The research interest groups set up by the CSSHE, one of which was on teaching and learning, were intended to provide a network, but the groups have suffered from a lack of organization to date.

The potential for a network was certainly present at the Conference on the Evaluation and Improvement of Teaching: the Canadian Experience, held in Montebello in 1983. The conference was funded by the Social Sciences and Humanities Research Council of Canada and sponsored by the CSSHE and the Canadian Psychological Association, and allowed some 70 university professors to meet to discuss issues in Canadian university teaching and learning. The Canadian Society for Teaching and Learning in Higher Education, an informal group of professors interested in improving their teaching, meets annually at a Canadian university. The Canadian Higher Education Research Network, supported by a grant from the Secretary of State, allowed a network of professors to communicate via Cosy on computer in

1986-87, and to discuss an agenda for research on access to student learning. A recent conference on the creation of a higher education research agenda, held at the Higher Education Management Center at the University of Manitoba in January 1988, allowed those interested in higher education research to meet to begin discussion of how this could be organized.

The last ingredient needed to make instructional research happen is publication assistance. The *Canadian Journal of Higher Education* publishes some articles on instructional research, but we need a press to publish monographs and to allow books to be published. Both the Society for Research in Higher Education in the United Kingdom and the Higher Education Research and Development Society of Australasia have publishing arms which allow them to produce and market publications in the field. Without a feasible means of publishing, Canadian research on instruction stands little chance of developing.

The essential ingredients for instructional research are then: university support for professors to do this kind of work; educational researchers to help them do it and provide a focus for this kind of activity in the university; funding to aid in the research, preferably federally coordinated; the establishment of a network, most likely through a learned society with computer links; and a place to publish, probably requiring government assistance. If we are to develop our expertise in postsecondary instruction, and to make links with other countries who are asking the same kinds of questions, we need a task force to make these things happen. It should have a high priority in our planning.

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