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Teacher Certification and the Economics of Information

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Introduction

During the last decade, many traditional aspects of our educational system and its preparation of professionals have been challenged (Smith, 1975). To a large degree, it is argued that the programs that are accredited for providing professional training have little demonstrated relationship with the proficiencies that they are supposed to develop (Jacobs, 1976). Moreover, the certification or licensing of professionals, whether based on examinations or the receipt of training in accredited programs, is also being questioned as a procedure for assuring that professionals are qualified in their fields.¹

Nowhere is this phenomenon more evident than in the recent ferment on the accreditation of teacher-training programs and certification procedures for teachers. In virtually all states, teachers have been traditionally required only to complete a list of courses that meet the state requirements within an accredited program in order to be certified (Conant, 1963;

Koerner, 1968). Not only is there no direct measure of how successful the programs are in providing well-trained teachers, but there is a large amount of inferential evidence that suggests that the outcomes are erratic and quality control is nonexistent. For example, few if any teacher-training candidates are eliminated from such programs for lack of proficiencies, even though it is highly unlikely that all candidates in all programs would meet reasonable professional standards in a function as demanding as teaching. This anomaly is exacerbated by the fact that teacher-training programs have traditionally enrolled persons with the lowest academic proficiencies of any major area of study as reflected by measures of high school preparation as well as test scores (Coleman, 1966; Educational Testing Service, 1955; Haven, 1967; Wolfle, 1954). It is also mirrored in the widespread dissatisfaction with the apparently wide variance in teaching effectiveness among individual teachers and the public demands for accountability.

In response, states like California and Illinois have been exploring alternative methods of setting out new standards for the training of teachers or measuring teacher performance in order to improve the quality of persons entering the classrooms. But, such a search for new alternatives is beset with a variety of problems. In this paper, I will attempt to consider some of these issues by looking at accreditation of programs and certifica-

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¹ Friedman (1962, Chap. 9) has argued that occupational licensure tends to lead to monopoly control on entry to a profession by the profession, itself, as well as to practices that are self-serving for the profession and in conflict with the social good.

tion of individuals for professional roles in the context of an exercise in the economics of information. By setting out a conceptual framework for reviewing these questions, I believe that the alternatives and their consequences might be made clearer. While I will refer specifically to the accreditation of teacher-training programs and the certification of teachers, the analysis will be general enough that it could be applied to the health professions, architects, lawyers, and a wide variety of other professionals.

Before discussing the development of a conceptual framework for evaluating the accreditation of teacher-training programs and certification of teachers, it is useful to ask the more basic question of why we are concerned with teacher licensing in the first place. Often we take for granted the social need for any activity that has persisted as long as this one. Certainly, this is true with respect to the certification of teachers where the criteria which we use to certify are questioned while the basic function of certification is not. Surely we can consider a world where we would not expend resources in this direction. For example, what if all of the benefits of education were conferred upon individuals and their families, and students could choose schools or even individual teachers who met their particular needs? Further, let us assume that teachers would not receive tenure protection of life-long contracts, but rather the typical arrangement entailed a 1- to 5-year contract. Such a system would be similar to the general conditions set out for an education voucher approach where families would be given tuition vouchers by the state that would be redeemed at any "approved" school, and such schools would compete for students by attempting to attract and retain them (Coons & Sugarman, 1978; Friedman, 1962; Levin, 1979).

In such a case, it is not clear that we would want to worry about teacher certification or accreditation of those training programs that are preparing teachers. Individual students and their parents would simply decide for themselves if they liked the schooling that was being provided, and they would select their

schools and individual teachers according to their own criteria. Schools that were unsuccessful in attracting or retaining students because of poor teaching as perceived by actual or potential clientele would have an incentive to dismiss those teachers and hire other ones. In the long run, the best teachers in society would be retained by the schools, and the poorer ones would have difficulty in obtaining employment. The determination of who was good and who was bad would be actualized through the market-choice mechanism where the clientele themselves, parents and students, would make such decisions. There is, then, a set of hypothetical conditions where we would not have the need to construct a system for certifying teachers or accrediting teacher-training programs.

But, there are at least three reasons why the problem is not so easily soluble. First, a basic rationale for public support of schooling is that there are benefits conferred on the entire citizenry by a system of schools that address certain uniform social goals such as a common set of values and knowledge for the functioning of a democratic society. While the precise content of this common set is contestable, the fact that we expect schools to do more than satisfy only the private whims and desires of each student and family is not contestable (Levin, 1979). Accordingly, we must have some way of assuring that the schools are meeting these social goals as well as satisfying individual needs.

Second, it is not clear that students and their parents are able to evaluate the quality of teaching in an appropriate way. For example, the teacher who entertains his students while teaching them little of value may be preferred by students to a teacher who provides less entertainment but more substance. Even if test results indicate that the child is not learning very much, it is difficult to isolate the quality of teaching from many other factors in establishing the causes of failure (Averach, 1974; Hanushek, 1979). This is not to say that we should not put somewhat more reliance on student and parent opinion than we presently do, for I believe that something is to be gained

from increasing the voice of these groups in teacher selection and retention (Levin, 1970). But, the replacement of the present system by one of student and parent opinion is obviated by the fact that the perceived signals of good teaching that are received by these constituencies could be misleading.

Finally, the establishment of teacher tenure after a short period of employment—usually 3 years—precludes the flexibility in hiring and dismissing teachers according to the feedback received from students and parents. While the arguments for protection from dismissal after a probationary period are rather complex, the institution of teacher tenure does, in fact, exist. Given the political power of the educational professionals, this institution is likely to continue to persist. Moreover, there are some compelling arguments in support of tenure, particularly the need to protect teachers from arbitrary dismissals of a political nature. The fact that political values change from time to time and across different populations can arbitrarily jeopardize the career of a teacher who represents an unpopular viewpoint in a hostile climate.

Thus, the facts that we expect the schools to provide benefits to society that go beyond the sum of those conferred upon individual students (Weisbrod, 1964), that it is difficult for many students and their parents to judge certain aspects of teacher proficiency, and that teachers cannot be instantaneously dismissed, mean that somehow the state must be concerned about the quality of teaching. It cannot be left only to the individual judgments of students and their parents or the educational administrators who are vested with managing the schools in behalf of society. The purpose of certification of teachers and accreditation of the programs in which they received their training is to provide information on whether teachers possess the minimum proficiencies that are required from the teaching function. Because this is an exercise in the provision of information, it is important to review the criteria for setting out how one selects the infor-

mation that is necessary to make a certification or accreditation decision.

Accreditation and Certification and the Economics of Information

How can the conceptual framework represented by the economics of information contribute to the construction of a certification or accreditation policy? The economics of information is based upon the assumption that the provision of information has both a benefit and a cost (Stiegler, 1961). The benefit that is attributable to information derives from its value in improving decision making and its resultant outcomes. For example, the consumer who finds in an advertisement that he can purchase an item that he needs at a reduced price will receive a benefit from that information that is equal to the price reduction. The cost of information refers to the resources required to collect, analyze, and disseminate it as well as the cost to the user of acting on it. Such costs include not only the pecuniary ones that we can find on accounting statements, but also such “nonaccounting” costs as the information-user’s time in obtaining the information.²

The design of an information system would be based upon the objective of maximizing the benefits of the system relative to its cost. Moreover, it would only be undertaken if its benefits exceeded its costs. A simple consumer example is instructive. Assume that a person is seeking a new car and he visits his local automobile agency to ascertain prices. He selects a particular model that will satisfy his needs, but he decides to think about it before buying. Outside of the automobile agency, he purchases a newspaper and turns to the auto section. There he finds that he can obtain the same model for \$200 less, but the agency

² The use of certification criteria to identify more “productive” employees for hiring purposes is an area of economic literature that has received wide attention in recent years. One particular concern that has been raised is the social efficiency of such a mechanism. For a major treatise on the role of education and other certification criteria as “market signals,” see Spence (1974). For the role of information in labor markets, see Stiegler (1962).

is 10 miles away. He returns to the automobile agency and shows them the advertisement, and they agree to reduce the price by \$200 to make the sale. For the relatively nominal cost of the newspaper and the value of the man's time, he was able to receive a benefit of \$200.

The overall pattern of this simple example is reflected in the concept of teacher certification and accreditation of teacher training programs. That is, it is tacitly assumed that by providing the information that is implicit in certification or accreditation standards and requiring that it be satisfied by prospective teachers and/or training programs, the benefits to society of maintaining high teacher standards will exceed the costs of the information requirements; and, in a somewhat related vein, the costs of the educational or selection process for meeting these standards will be less than the social benefits that accrue from such requirements.

But the abstraction of the teacher certification or program accreditation example is hardly as compelling as the example of price information for the car buyer. For one thing, we do not know the benefits of any particular requirement nor are there easy ways to calculate them. In part, this is because the benefits are often incommensurable and cannot be easily quantified. (A major survey of the economics of information under conditions of uncertainty is found in Hirshleifer and Riley [1979].) Moreover, there are many different constituencies who might have an interest in teacher proficiencies, and each of these might be concerned with very different types of benefits. Finally, the ability to tie any particular benefit to a social constituency and any particular certification requirement for teachers or program requirement for institutions to social benefits is severely limited.

Let us take a rather common attribute that we expect of the schools—that of reading proficiencies—and ask how it can be related to social benefits. It is possible to ask the question: How much is it worth to society to know that the average teacher possesses at least minimal proficiencies for the teaching of reading? The first consideration is whether the absence

of that information would make any difference in whether teachers have this proficiency. That is, at least one possibility is that persons who select teaching as a profession and prepare for that eventuality possess the minimal skills that are required to teach reading, and a random selection of that pool of trained persons would yield as good a group of reading teachers as any that we could select through the typical certification or program accreditation approach. In this case, there would be no social benefits accruing to the use of resources for requiring the latter information.

In contrast, let us assume that the use of certification and program accreditation standards does indeed improve the selection of teachers with respect to their skills at teaching reading. What is this benefit worth? Conceptually, the benefit would be equal to the overall improvement in reading weighted by the social value placed on improved reading. But, how can we put a value on increased reading proficiencies? While some persons might attempt to determine such a value by looking at the specific relation between labor market earnings and reading test scores while holding other factors constant, it is difficult to argue that reading levels should be evaluated only in terms of their labor market values. Such a practice would ignore the cultural value of improved reading as well as its value to persons outside of the labor market such as housewives, children, and retired persons.

But if such basic educational and teaching outcomes as reading are difficult to evaluate with respect to their benefits, how can we hope to evaluate the contribution of certification and accreditation to improved teaching performance in such areas as citizenship, social values, work behavior and so on. Each of these last aspects of teaching is difficult to define in itself, and even if they were defined adequately they would be difficult to associate with benefits that might be measured in the monetary units used to measure costs.

Not only are we beset with a variety of obstacles when we attempt to assess the social benefits of particular improve-

ments in teacher proficiencies that might be engendered by certification and accreditation standards, but the problem is more complicated when we consider the large number of different audiences who have different educational demands. For example, some parents would place a high value on teachers having a highly structured approach to the teaching function, while others would place a negative value on such proficiencies. Some parents believe that good citizenship is inculcated by ingraining an unquestioning respect for the flag, the government, and the political institutions and history of the nation, while others believe that it is just as important or more important to build in a capacity for self-criticism that would emphasize the maltreatment of the Indians, the deleterious roles of large corporations, environmental issues, corruption in government, unjust wars, and slavery, along with information on the prouder accomplishments of the nation.

Moreover, different constituencies have different wishes. Employers wish the schools to produce good and loyal workers who are highly trainable and are able to control their emotions, while patrons of the arts desire students who can capitalize on their emotions in a highly creative and imaginative form. There are some implicit conflicts between these two sets of goals if the social conditioning that is required for producing good workers is not consonant with that which is required for producing good artists. Some groups argue for uniformity in language skills and cultural formation, while others believe in a pluralistic, multicultural, and multilingual approach that emphasizes the contributions and importance of a wide variety of cultures to the formation and functioning of the society. The point is that there is hardly a common set of goals and objectives that can be used to assess credentialing and accreditation standards in carrying out a benefit-cost calculation.

Finally, even if we could associate particular benefits with the attainment of an educational result and we could agree on the desirable mix of educational objectives, it is necessary to know what aspects of certification or accreditation will

improve the productivity of teachers who meet the licensing standard or of training programs that meet the accreditation standard. Our state of knowledge on any systematic relationship between program requirements and teaching proficiencies or measurable personality characteristics of teachers and their effectiveness is so deficient that there is no set of standards for either certification or accreditation that can be justified on research grounds (Averch et al., 1974). This does not mean that there is not a large body of research and conclusions on these subjects, but rather it means that such evidence is often contradictory or limited only to a few very narrow criteria that are not generalizable to something as generic as teaching proficiency (Heath & Nielson, 1974). (A more optimistic assessment is Gage [1978]. Also see Gage and Winne [1975], and Borich [1975, Part I].) Moreover, the complexities of the teaching situation with its subtle interplay of individual and social interactions and variety of subjects, activities, and settings is likely to prevent our success in uncovering findings that can be used to prescribe in precise terms both programs and certification standards.

If we are not able to measure benefits of different certification or accreditation requirements, or to agree on what goals accreditation or certification should emphasize, or to ascertain which particular teacher or program characteristics are associated with those results that we can agree are desirable, how should we use an economics of information or any conceptual approach to setting out accreditation or certification information? The answer is that such a conceptual framework might not be used in a formal way, but it can definitely contribute in a heuristic way by forcing us to ask the question of whether any particular requirement is likely to yield benefits that exceed the costs of providing and meeting the standard that is set out. That is, we are forced to evaluate the probable consequences of any particular requirement rather than being permitted to construct a certification or accreditation approach that does not consider the benefits and costs associated with it.

This does not mean that there is only one possible approach and that an economics of information type of assessment will reveal it. For when there is a great deal of conflict over desirable objectives, when there is difficulty in ascertaining how one might measure the attainment of objectives, and when it is not possible to relate particular teacher or program characteristics to objectives, there must necessarily be no single ascertainable solution but rather a variety of them. However, this does not mean that all solutions are equally acceptable. Some will be better than others in conferring a higher level of probable benefits relative to their costs, and these are the ones that evaluation could pursue. Thus, in this framework, the economics of information represents a way of thinking about the problem in seeking a solution rather than a mechanistic set of calculations for obtaining a single optimal result.

Alternative Approaches and Cost-Utility Criteria

The particular problems in constructing formal estimates of costs and benefits for different credential or accreditation standards suggest that a cost-utility approach be adopted. A cost-utility approach considers the costs and perceived benefits of the various alternatives. Costs are estimated by considering the various resource requirements for obtaining the information and for the resources demanded by individual teachers and programs for meeting the requirements. Utility refers to the value of the outcomes, an estimate based partly upon intuitive evaluations. That is, any particular alternative can be rated on a number of dimensions according to perceived benefits as estimated by the decision maker or ratings of the relevant audiences. For example, parents, teachers, administrators, businessmen, and others could be surveyed to see how they rate particular outcomes, and educational researchers, teachers, and administrators could rate the possibilities that particular training, knowledge, or personality requirements would meet those objectives. From these ratings it would be possible to construct expected utility scales that enable one to

compare the estimated values of different alternatives. (For an intuitive approach to utility theory, see Stokey and Zeckhauser [1978, pp. 237-254]. For applications, see Edwards, Guttentag, and Snapper [1975]; also Chernoff and Moses [1959, Chap. 4].)

Cost data can be obtained by first matching each alternative against the resources requirements necessary to meet it. For example, if an accreditation requirement is posited as a particular set of courses and internship, it is possible to determine what the cost is of that set of experiences for a typical trainee. There are also costs for monitoring the program by public authorities to be certain that they are meeting the requirements, and there are costs to the institution associated with site visits and periodic reports to the accrediting authorities. In addition, the time of the trainee must be taken into account because some accreditation or certification requirements will necessitate a greater expenditure of time on the part of the teacher-trainee than will other standards. Because the procedures for ascertaining costs are described in some detail elsewhere, it is not necessary to report costing methods in greater detail here (Levin, 1975).

Rather, the application of cost-utility analysis can best be demonstrated by considering the alternatives for certification or program accreditation. In general, there are three types of requirements that can be considered for assessing teacher competencies: (1) educational and training characteristics, (2) knowledge and personality attributes that can be ascertained through a testing program, and (3) behaviors that can be ascertained through direct observation of trainees or probationary teachers. Educational and training characteristics represent relevant aspects of the teacher's formal educational and training preparation. Typically, they are the only factors that are considered in the accreditation of teacher-training programs by voluntary associations such as National Council for Accreditation of Teacher Education (NCATE) or by state credentialing authorities. Normally, prospective teachers are required to take an approved list of courses at an institution that has an appropriately trained faculty,

an adequate library, and a joint arrangement for providing approved in-service experience or "practice teaching" with a local educational agency. Moreover, specific credentials are given on the basis of having taken specialized training in the appropriate areas.

Of course, the education and training characteristics approach to accreditation and certification need not be limited to present forms. A much greater qualitative monitoring of programs and courses could be adopted to improve the quality control aspect of this route. In fact, one change that might be made in existing requirements is that a written and detailed record would be prepared for each trainee on both his or her strengths and weaknesses in fulfilling each requirement. This record could be utilized by prospective employers to examine the pattern of attainments of each potential teacher, and it is likely that it would provide much more information than the typical list of grades and the relatively cursory hiring interview. Moreover, it would likely stimulate those instructors who would be required to both train and rate teacher-trainees to be much more thoughtful in considering strengths and weaknesses of each trainee as well as providing a more constructive feedback on performance to each trainee than does the traditional grading system.

Knowledge and personality attributes that are thought to affect teaching prowess are the second type of requirement that might be considered for certification although they are less relevant to program accreditation. Such traits include the cognitive knowledge of subject matter and such pedagogical principles as the construction of curriculum, appropriate use of materials, ability to diagnose learning needs, proficiency at evaluating student progress, and so on. Personality attributes include such factors as flexibility, interpersonal traits, tolerance of cultural differences, and other factors that are important for good teaching.

It is believed that at least the cognitive characteristics might be measured through written and oral examinations. For example, knowledge of subject matter can be tested in a traditional manner as

can certain aspects of professional knowledge. The National Teachers' Examination of the Educational Testing Service represents one device for assessing both intellectual aspects and professional knowledge of the prospective teacher, and school districts such as New York City have required that all secondary teachers pass a specific subject matter examination to be eligible for licensing in any particular subject. Other written examinations can be constructed that will be tailored toward the other specific requirements that are believed to be important for good teaching.

In addition, it is possible to set out procedures for oral examination of prospective teachers with respect to their knowledge, creativity, and personality factors in order to assess their appropriateness for teaching. The extent to which both oral and written examinations can evaluate the factors that are important to teaching is problematic in that it depends not only on the identification of what is important, but also on the ability of examinations to measure those dimensions that are considered to be important. This is a matter that we will return to later, and it also pervades the third of the alternatives, assessment of teaching behavior through the direct observation of trainees or probationary teachers in the classroom.

In recent years, this approach has become formalized under the title of Competency-based Teacher Education (CBTE) or Performance-based Teacher Education (PBTE), and it is being widely recommended as an answer to the problem of certifying teachers as well as of assuring teacher accountability (Borich, 1975; Gage & Winne, 1975; Heath & Nielson, 1974; Rosenshine & Furst, 1973; Smith, 1975). Essentially, the logic of this approach is constructed as follows. From research on teaching effectiveness, it is possible to generalize about the characteristics that are required for good teaching. Accordingly, particular performance-based criteria can be set out for each dimension that is shown to be associated with teaching effectiveness. Teachers and teacher-trainees will be observed and rated according to whether they meet the

minimal criteria along each of these dimensions. For example, if personal warmth is thought to be an important requisite for teaching primary age children, teacher-trainees and probationary teachers could be evaluated through direct observation of their teaching in order to see how well they demonstrate warmth in their classroom relations. Other dimensions from enthusiasm to subject knowledge to creativity to cultural sensitivity would also be assessed through ratings of classroom performance of trainees.

While we have set out three sets of standards because they are analytically different, they can also be combined into a single accreditation or certification approach. For example, all prospective teachers could be required to complete an accredited training program which would entail specific educational experiences of a particular quality as reflected in the facilities and faculty of the training institution. Successful completers of such programs would then undertake examinations with respect to subject and professional knowledge as a first phase of the certification procedure, and, subsequently, they would be rated according to the various dimensions of their classroom performance before receiving a license or teaching credential.

But, how could we subject these approaches or any combination of them to a cost-utility analysis? Before attempting to answer that question, we must recall two difficulties that we discussed above. First, the criteria which we will desire for our teachers will obviously depend on educational goals, and these are likely to be subject to great controversy among different constituencies. Second, there is a great deal of uncertainty as to what types of personality characteristics, knowledge, and classroom behavior are necessary for producing any particular educational outcome. This means that evaluation of any particular approach will be fraught with assumptions about what are appropriate educational outcomes as well as what is the teacher characteristic that produces these outcomes. To a very great degree, these assumptions will be based upon viewpoints or commitments that

are derived primarily from opinions and value judgments rather than from systematic research. In fact, the difficulties of uncovering generalizable factors which can be linked to teaching performance and effectiveness is evident throughout the literature (Travers, 1973).

Given this uncertainty and the lack of an appropriate knowledge base, the subjective nature of much of what follows is obvious. Yet, a number of stages are proposed for setting out a policy for accreditation or certification. These include (1) the specification of educational outcomes or desirable teacher behaviors; (2) the setting of a value or social utility for each of these outcomes or behaviors; (3) the specification of teacher characteristics that are associated with each of these outcomes or teacher behaviors; (4) the specification of alternative methods for assuring the existence of those characteristics as well as the probability of each method in successfully identifying the attainment of the characteristic and the cost of each alternative; and (5) the cost-utility comparison.

(1) *Specification of Educational Outcomes or Desirable Teacher Behaviors*

Ultimately, we cannot escape the direct confrontation with values in that we must begin by specifying what we believe to be important educational outcomes or important dimensions of teacher behavior that we believe will lead to desirable educational results. The difficulty in doing this is, of course, vested in the fact that different constituencies such as different groups of parents, businessmen, taxpayers, and students with a legitimate interest in education may have considerably different views on what are desirable outcomes or teacher behaviors.

(2) *Setting a Value or Social Utility for Each Outcome or Behavior*

Once the important, desirable, or possible educational outcomes were specified, we would need to ascertain their social value. That is, it is unlikely that any set of teacher certification or accreditation standards could fulfill all of the outcomes for two reasons: First, many of the results will be in conflict, so fulfillment of one will necessarily mean the obviation of another. For example, if we wish

to emphasize cultural pluralism with multiple values in education, we will violate the wishes of those who seek a single universal set of cultural values as a prerequisite for citizenship. Second, limited resources will also likely preclude our meeting all of the possible educational outcomes that might have some value, even if all were considered to be favorable with no conflicts among them. Accordingly, we must provide appropriate weights or utilities for each outcome or teacher behavior in order to specify a measure of its value relative to other possible outcomes or teacher behaviors. This can be done by obtaining ratings from representatives of the various constituencies on a utility scale. Procedures for implementing this approach are found in many sources (Chernoff & Moses, 1959; Edwards, Guttentag, & Snapper, 1975). At best, these approaches will only permit a relative ranking of outcomes or teacher behaviors under certain restrictive conditions (Arrow, 1963; Sen, 1970). But they do represent a reasonable basis for differentiating among the importance of different outcomes or teacher behaviors.

(3) *Specification of Teacher Characteristics Associated with Each Outcome*

Once we have specified and set a value on the different educational outcomes or teacher behaviors, it is necessary to specify which particular *observable* or *measurable* characteristics of teachers will indicate the attainment of the educational outcome or the existence of the teacher behavior. In the case of educational outcomes, we must know which measurable or observable aspects of teachers are connected with each outcome or behavior. For example, if the outcome is mathematics proficiency of students, we might posit that a set of teacher characteristics such as mathematics competence, knowledge of techniques of curriculum construction in mathematics, and so on are associated with the outcome. These connections might be drawn from research literature, professional judgments, and common sense. They might also be associated with an estimate of the probabilities by which it is believed that the presence of the teacher characteristic will result in the desired outcome. Such a

probability serves to express a degree of certainty or uncertainty about these relationships.

(4) *Specification of Alternative Methods for Assuring the Presence of the Teacher Characteristic*

Following the specification of desirable outcomes, their social values, and measures or indicators of associated teacher characteristics, we explore the possible alternatives for certification or program accreditation. For example, if mathematics knowledge is one of the teacher characteristics that we have deemed to be related to mathematics outcomes for students, we might ask how we can assure that teachers have this characteristic. One possibility is that of program accreditation, where we monitor and evaluate programs to assure that no teacher passes through the program without partaking of particular educational experiences. A second approach would be an external examination for certification. A third approach would be the observation of prospective teachers by qualified evaluators while the former are carrying out teaching internships. Each of these is also associated with a different probability of meeting this requirement.

In addition to specifying the alternatives for assuring the presence of the particular teacher characteristic, we must assess the costs of each alternative. For example, some of the alternatives will require rather substantial testing or observation programs, while others will only require the accreditation of training programs with no government testing or observation of teachers. Let us assume for the purposes of this exposition only the cost of obtaining the information on teacher characteristics. That is, different information requirements for assuring the attainment of particular standards may also entail differences in training programs. But, we will concentrate only on differences in costs of obtaining and utilizing the information on certification or program accreditation.

Previously, we set out three types of informational requirements for certification purposes: educational and training characteristics of the potential teacher (e.g., completion of requirements in an accred-

ited program); knowledge and personality attributes ascertained through a testing program; and behaviors ascertained through direct observation of trainees or prospective teachers. According to the analysis that we set out above, it is the last which is most likely to provide reliable information on teacher performance, followed by the testing approach, with the accredited program approach delivering the least reliable information on teacher characteristics. But, the observation approach is also very expensive relative to the other two. In order to provide information on teacher behaviors through observation, it is necessary to utilize trained observers who obtained data on the prospective teacher in a variety of different situations and settings. The resource costs for doing this are very high relative to either testing programs for proficiencies, or certification on the basis of completion of an accredited program. The latter requires only that programs be reviewed periodically and that graduates provide proof that they have completed such programs. How are we to choose among the three approaches or combinations of them?

Cost-Utility Comparisons

Given the types of data that we have set out, we can proceed in the following way to make cost-utility comparisons. Recall that the previous four stages enabled us to obtain the following information:

- (1) educational outcomes or teacher behaviors;
 - (2) utilities or social values of each of the outcomes or behaviors;
 - (3) specification of measurable teacher characteristics associated with each outcome or teacher behavior;
 - (4) probability that the existence of the particular characteristic will produce the educational outcome or teacher behavior;
 - (5) specification of alternative methods for assuring the characteristic;
 - (6) probability that the particular method will assure the characteristic;
 - (7) the cost of each alternative method.
- Given these data, we can construct cost-

utility estimates for each alternative method of providing information on teacher characteristics as well as variants of each. The procedure would require that we weigh each educational outcome by its utility. This, then, is multiplied by the probability of any particular measure assuring the attainment of the outcome as well as the probability of the particular information approach providing reliable information on the teacher characteristic. Expected utilities can be obtained for each educational outcome while varying the measures of teacher characteristics and alternatives for obtaining the information, or for each alternative method of gathering information while varying educational outcomes and measures of teacher characteristics.

Using a shorthand notation, it is possible to calculate the utilities in the following way:

$(U_i)(P_{ji})(P_{kj})$ = Expected Utility of fulfilling the i 'th educational outcome, using the j 'th teacher characteristic, utilizing the k 'th method of assuring the presence of the j 'th characteristic,

where:

U_i = the social utility of the i 'th educational outcome ($i = 1, \dots, n$);

P_{ji} = the probability that the presence of the j 'th teacher characteristic will assure the attainment of i ($j = 1, \dots, m$);

P_{kj} = the probability that the k 'th alternative for providing information on teacher characteristics will assure the presence of the j 'th characteristic ($k = 1, \dots, p$). If we divide information methods into three types: (1) program accreditation (2) testing; and (3) direct observation, then ($k = 1, 2, 3$).

Using this approach where values for each of the variables can be ascertained by public opinion surveys in the case of educational outcomes and utilities, and subjective judgments by relevant experts in the case of the probabilities, it is possible to estimate utility values for particular educational outcomes as well as their

expected values for any particular combination of teacher characteristics and method of obtaining the information.³

In addition, it is possible to estimate the costs for each method of obtaining the information by analyzing the resource components that are necessary for each approach. Thus, the costs of program accreditation, of a particular type of testing program, or systems of direct teacher observation can be analyzed according to their resource ingredients and costs. The methodology for this has been explicated elsewhere (Levin, 1975). Given both the expected utilities and costs of each alternative information system, it would be appropriate to choose that which provides the highest level of utility per dollar of resource allocation among the requisite dimensions of educational outcome. The fact that the solution will vary according to the type of educational outcomes that are reviewed, their estimated utilities, the teacher characteristics which are associated with these outcomes, and the nature of the information system for obtaining data on the teacher characteristics means that there are a large number of alternative components that can be analyzed in constructing an appropriate system.

Even variation within each alternative can be evaluated in the cost-utility context. For example, the greater the number of items in an examination, the higher the reliability of ascertaining the presence or absence of a particular teacher characteristic. But, the larger the number of items, the greater the cost of the examination program. Accordingly, it might be possible to review the cost-utility values for examination programs with different components and of different lengths (Cronbach & Gleser, 1965) as well as to apply the same type of analysis to varying the rigor and monitoring of program accreditation or the extensiveness of teacher observations.

³I have not treated the rather serious challenge of how to aggregate the preferences or perceived utilities of individuals and different constituencies. This is a problem which has been well treated in the literature, although virtually all solutions require one to accept a rather strong set of premises. See, for example, Arrow, 1963 and Fishburn, 1964.

A Simple Comparison

It is best to aggregate the analysis by educational outcome because there will be many teacher characteristics associated with each potential educational result. In that way, a cluster of teacher characteristics can be related to any particular educational outcome with respect to the probability of achieving that outcome in the presence of those characteristics. Then each information alternative that might be used as the basis for certification or program accreditation might be explored with respect to the probability of providing information on that set of teacher characteristics as well as costs. All of these data can be combined to assess the respective costs and utilities of the different approaches.

A very simple example is shown in Table I. These data are contrived for purposes of illustration, so that they should be considered as a hypothetical use of the analysis rather than an actual comparison. The particular educational outcome that is posed is mathematics achievement of students at the appropriate grade level. The social utility assigned to this outcome is 10 on a 10-point scale. The particular teacher characteristic that is evaluated is the knowledge by the teacher of mathematics at the appropriate level, and it is deemed that the possession of that knowledge yields a .25 probability that students will meet the educational outcome. The respective probabilities for the three methods of information for certification purposes are .3 for program accreditation; .9 for testing; and .7 for direct observation. The respective costs per each candidate are \$1.00, \$2.00, and \$10.00.

Multiplying the utility of the outcome by the probabilities yields an expected utility for program accreditation of .75, for testing of 2.25, and for observation of 1.75. Thus, the testing approach shows the highest expected utility followed by the observation option, and the lowest one is indicated for program accreditation. But, program accreditation is also associated with the lowest cost followed by testing and then observation. When the costs and utilities are combined, the optimal choice is the testing approach

TABLE I
Illustration of Cost/Utility Comparison

Educational Outcome_i = mathematics achievement appropriate to grade level.

U_i = 10 on a 10-point scale.

j 'th Teacher Characteristic—knowledge of mathematics at appropriate level.

P_{ji} = .25

P_{ki} = .3 for program accreditation; .9 for testing proficiency; .7 for direct observation.

Cost = \$1.00 per candidate for program accreditation;
 \$2.00 per candidate for testing;
 \$10.00 per candidate for direct observation.

Method	Expected Utility	Cost	Cost/Utility
Program Accreditation	.75	\$ 1.00	\$1.33
Testing	2.25	2.00	0.89
Observation	1.75	10.00	5.72

with a cost of only \$0.89 per unit of utility. Program accreditation costs about \$0.44 more per unit of utility, and observation costs almost \$5.00 a unit more.

Of course, the order of the cost/utility results might change from teacher characteristic to characteristic, so it is best to take clusters of characteristics for each educational outcome and analyze these as a group. This is particularly important where there are cost-economy involved in any particular information approach so that it does not cost much more to observe or test multiple characteristics of teachers than it does to observe or test a single one. That is, the high fixed costs associated with the strategy mean that the marginal or additional cost for gathering data on a particular behavior are rather small (Levin, 1975). This also suggests that the analysis be carried out among alternative information systems with respect to all of the types of relevant information that they might provide rather than doing it strictly on an educational outcome or teacher characteristic basis.

Summary and Implications

The problems inherent in the construction of systems of teacher certification or program accreditation are unusually se-

vere. Conflicts among constituencies in what are desirable educational outputs as well as a lack of knowledge base by which teacher characteristics can be associated with particular outcomes are severe obstacles to the design of a new approach to teacher certification. Rather, such a system must be based upon some agreement on objectives and a reasonable knowledge of the relationship between measurable teacher characteristic and these outcomes. Given the formidable gaps in our knowledge about teacher effectiveness and inherent conflicts among different constituencies on desirable educational objectives, how is it possible to design a new system for certifying teachers and other educational professionals?

In this paper, we have suggested that the area of the economics of information might provide a framework for addressing this issue. The economics of information is relevant because the provision of a system of certification is an exercise in establishing the eligibility of persons to teach on the basis that they meet these requirements. In order to ascertain whether they meet these requirements we must develop a system of information, and each alternative for constructing that system is associated with a potentially different value to society and a different

cost. Since the economics of information approach represents a way of evaluating the relationship between the costs of information and its usefulness, it is suggested as an appropriate method to apply to teacher certification and program accreditation.

In particular, we applied a cost-utility framework to this issue by setting out a method for evaluating both the social value or utility of particular certification approaches as well as their costs. The usefulness of this methodology is twofold. First, it may be possible to use it to construct formal calculations of costs and utilities of different alternatives. Second, it gives a heuristic framework for asking questions about designing new systems of obtaining information for teacher licensing, certification, and program accreditation. That is, the method requires the exploration of any proposed modification by asking questions about the changes in social utility embodied in the alteration of standards as well as changes in costs. The method also enables the analyst to decompose the problem into its specific components including the specification of educational outcomes or teacher behaviors, of utilities or social values of these outcomes or behaviors, of specific teacher characteristics associated with such outcomes or behaviors, as well as the probabilities of the presence of particular teacher characteristics producing those outcomes, of the probability of alternative certification approaches identifying and obtaining appropriate teacher characteristics, and of the associated costs of alternative certification or accreditation approaches.

The value of the cost-utility application of the economics of information to this problem is that it enables us to make more systematic our analyses while still permitting a great deal of subjective evaluation. But in this way, the method of analysis as well as the subjective aspects become more explicit so that they can be fruitfully evaluated and debated by persons who have not been involved in the initial formulation of licensing standards. While this process may not reduce the heat associated with the present challenge to teacher certification standards, it

will tend to make more explicit both the subjective judgements and the premises that undergird a major area of both educational evaluation and policy analysis.

References

- ARROW, K. *Social choice and individual values*. New York: Wiley and Sons, 1963.
- AVERCH, H. *How effective is schooling?* Englewood Cliffs, N.J.: Educational Technology Press, 1974.
- BORICH, G. *The appraisal of teaching*. Reading, Mass.: Addison-Wesley, 1977.
- COLEMAN, J. *Equality of educational opportunity*. Washington, D.C.: U.S. Office of Education (OE 38001), 1966.
- CONANT, J. *The American high school today*. New York: McGraw Hill, 1963.
- COONS, J.E., & SUGARMAN, S.D. *Education by choice*. Berkeley, Calif.: University of California Press, 1978.
- CRONBACH, L.J., & GLESER, G.C. *Psychological tests and personnel decisions*. Chicago, Ill.: Illinois Books, 1965.
- CHERNOFF, H., & MOSES, L. *Elementary decision theory*. New York: Wiley and Sons, 1959.
- EDUCATIONAL TESTING SERVICE. *Statistical studies of selective service testing: 1951-53*. Princeton, N.J.: Educational Testing Service, 1955.
- EDWARDS, W., GUTTENTAG, M., & SNAPPER, K. A Decision-theoretic approach to evaluation research. In E. L. Struening & M. Guttentag (Eds.), *Handbook of evaluation research, Vol. I*. Beverly Hills, Calif.: Sage Publications, 1975.
- FRIEDMAN, M. *Capitalism and freedom*. Chicago, Ill.: University of Chicago Press, 1962.
- GAGE, N.L. *The scientific basis of the art of teaching*. New York: Teachers College Press, 1978.
- GAGE, N. L., & WINNE, P. Performance-based teacher education. In *Teacher Education, Seventy-fourth Yearbook, Part II, National Society for the Study of Education*. Chicago, Ill.: NSSE, 1975.
- HANUSHEK, E. Educational production functions. *The Journal of Human Resources*, 1979, 14 (3), 351-388.
- HAVEN, E. *The freshman norm sample for the general examinations of the college-level examination program, statistical report SR-67-32*. Princeton, N.J.: Educational Testing Service, 1967.
- HEATH, R. W., & NIELSON, M. A. The research basis for performance based teacher education. *Review of Educational Research*, 1974, 44 (4), 463-483.
- HIRSHLEIFER, J., & RILEY, J. The analytics of uncertainty and information — An expository survey. *Journal of Economic Literature*, 1979, 17, 1,375-1,421.
- JACOBS, R. (Ed.). *Flexible education for the health professions*. New York: Wiley and Sons, 1976.
- KOERNER, J. *Who controls American education?* Boston, Mass.: Beacon Press, 1968.

- LEVIN, H. M. (ED.). *Community control of schools*. Washington, D.C., The Brookings Institution, 1970.
- LEVIN, H. M. Cost-effectiveness analysis in evaluation research, In M. Guttentag & E. Struening (Eds.), *Handbook of evaluation research, Vol. 2*. Beverly Hills, Calif.: Sage Publications, 1975.
- LEVIN, H. M. Educational vouchers and social policy, program report no. 70-B12. In J. Gallagher and R. Haskins (Eds.), *Care and education of young children in America*. Norwood, N.J.: Ablex, in press.
- ROSENSHINE, B., & FURST, N. The use of direct observation to study teaching. In R.M.W. Travers (Ed.), *Second handbook of research on teaching*. New York: Rand McNally, 1973.
- SEN, A. K. *Collective choice and social welfare*. San Francisco, Calif.: Holden Day, 1970.
- SMITH, R. A. (ED.). *Regaining educational leadership: A critique of PBTE/CBTE*. New York: Wiley and Sons, 1975.
- SPENCE, A. M. *Market Signaling: Informational transfer in hiring and related screening processes*. Cambridge, Mass.: Harvard University Press, 1974.
- STIEGLER, G. J. The economics of information. *Journal of Political Economy*, 1961, 69, 213-225.
- STIEGLER, G. J. Information in the labor market. *Journal of Political Economy*, Supplement, 1962, 70 (October), 94-105.
- STOKEY, E. & ZECKHAUSER, R. *A primer for policy analysis*. New York: W.W. Norton & Co., 1978.
- TRAVERS, R. M. W. (ED.). *Second handbook of research on teaching*. New York: Rand McNally, 1973.
- WEISBROD, B. A. *External benefits of public education*, Princeton, N.J.: Industrial Relations Section, Princeton, 1964.
- WOLFLE, D. *America's resources of specialized talent*. New York: Harper & Brothers, 1954.

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