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AUTHOR	Hull, William L.; And Others
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ABSTRACT

A framework to aid in estimating the impact from educational research and development (R&D) products was developed at the National Center for Research in Vocational Education at the Ohio State University. The dimensions of the framework (product development, distribution, implementation, utilization and effects) are explained in detail. The criteria are defined and enumerated. These include systematic development, quality, user orientation, strategic distribution, multiple channels, widespread distribution, sequential implementation, support systems, cost feasibility, multiple patterns of use, time on task, integrated use, user satisfaction, individual growth, organizational change, and societal contributions. The assessment should be done after a product has been in use for a period of time. The logical continuation of this research would be to quantify the dimensions and criteria. This would enable evaluators to compare R&D products using an overall impact potential score. (DWH)

A CONCEPTUAL FRAMEWORK FOR MEASURING R&D PRODUCT IMPACT

William L. Hull, Kay A. Adams, and Debra D. Bragg

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Answering the question "what difference did an educational innovation make in a practice setting?" is a difficult and time-consuming process. Yet the question will not go away. Scarcity of funds for educational research and development (R&D) places great importance on answers to this question. Sponsors of applied R&D often expect some evidence of successful change due to the innovation before continuing financial support. Given these expectations, more needs to be known about collecting impact data.

The costs for conducting impact studies are high. Timing of the studies can be critical. Unfortunately, the timing of impact studies often corresponds to the sponsor's funding calendar rather than the lapse time needed for an innovation to foster changes in an educational setting. Premature evaluation of an R&D innovation can reveal little change, resulting in termination of a project. Finally, rarely are conditions in practice settings amenable to the conduct of impact studies using experimental designs. Typically, random assignment of students to groups is not possible, and natural control groups do not exist. Control groups often are replaced by documentation of naturally occurring events. Thus, the study of impact can become a phenomenon based on perceptions rather than statistical evidence.

The objective of this research was to conceptualize the process of program improvement using products from R&D projects. This process involved the development of a quality product, its distribution to primary user audiences, effective implementation, and sustained use in a practice setting. If an evaluator can relate events associated with the quality diffusion and use of educational R&D products to impact, it should be possible to estimate the likelihood of change (impact) occurring from use of a product.

Staff at the National Center for Research in Vocational Education at The Ohio State University developed a framework to aid in estimating the impact from R&D products. This framework evolved over a five year period, 1978-82, as evaluations were conducted in a series of studies on vocational education R&D innovations. The central data base for this framework was obtained through impact studies of 28 selected state-developed and National Center products; both qualitative and quantative data were collected through case studies and surveys. An extensive review of the diffusion literature revealed 267 impact studies of educational innovations. After the framework was formalized, it was reviewed by participants in the Fifth Nationwide Vocational Education Dissemination and Utilization Conference, and revised. Since that conference, the framework and criteria have been reviewed by nine experts in dissemination and evaluation, establishing its content validity. The following assumptions were made in the development of the framework:

- Impact from R&D products is issue-orientated and site-specific; that is, the worth of a product for resolving a problem on site depends upon its relevance to the problem(s) on that site.
- New ideas can be packaged in a transportable format for use in diverse settings.
- The primary output from a funded R&D project, normally a R&D product, is the most usable vehicle for tracing effects of the project.
- R&D products can be used by persons not involved in their development.

- Acceptance and use of an innovation developed elsewhere is less expensive to an adopting site than developing the innovation.

- Accountability is the driving force behind most impact studies.

This type of evaluation requires attention to the specific situation in which the innovation is adopted (Patton 1982). This framework allows an evaluator to identify and categorize some of the most critical, general, dimensions needed for R&D impact to occur in a practice setting.

Despite the general nature of the framework, it may not be comprehensive enough to apply to all settings or to all R&D products equally. An evaluator can be situationally responsive by using this framework as a starting point and expanding or eliminating criteria as needed. An empirical test of this general model is necessary to determine to what degree the criteria relate to impact in various settings.

R&D Impact Comceptual Framework

Figure 1 depicts salient features of the conceptual framework. It contains dimensions of the framework and the criteria within each dimension. First the dimensions will be explained, then the criteria. The dimensions are:

Development. Impact begins with development of the product. The criteria of systematic development, high quality, and user orientation can be attained during development of the product. Often, field test data can be used as a basis for rating a product on these criteria.

Distribution. The distribution criteria should encourage the spread of the R&D product to primary audiences, increase the likelihood of the product's acceptance, and generate support for its use.

DEVELOPMENT	DISTRIBUTION	IMPLEMENTATION	UTILIZATION	EFFECTS
Systematic Development	Strategic Dissemination	Sequential Implementation	Multiple Patterns	USER SATISFACTION
High Quality	Multiple Channels	Support Systems	Integrated Utilization	INDIVIDUAL GROWTH
User Orientation	Widespread Dissemination	Cost Feasibility	Time on Task	ORGANIZATIONAL CHANGE
				SOCIETAL CONTRIBUTIONS
FORMATIVE				SUMMATIVE

Figure 1. R&D Impact Criteria

Implementation. Implementation strategies determine the product's point of entry into an organization (e.g., at the classroom level). Cost feasibility studies and the need among practitioners for support systems aid the timely implementation of R&D.

Utilization. Various product use criteria can encourage the appropriate trial use of products, stimulate the integration of products into existing operations, and increase the chances of continued product use.

Effects. Product effects criteria should accurately describe changes in individuals, organizations, or society attributed to use of R&D innovations.

The dimensions are somewhat sequential in nature (e.g., implementation of a product following distribution), however, some recycling may occur among the criteria. For example, a product may be high in quality, but not user orientated, or it may have to be modified before it can be widely distributed. However, in most cases these criteria will be met if the product is to have impact.

Dimensions Explained

Paramount among these concepts is the development of a high quality product. A three-year study (Louis, Rosenblum, and Molitor 1981) of the National Institute of Education's research and development utilization program found product quality to be particularly important in predicting the degree of impact. Product quality is considered a measure of the relevance of the product to the situation and the degree to which it is a genuinely new way of doing things. The National Center's Advisory Council reviewed criteria in the evaluation model proposed in this paper and rated the development criteria at the very top of the list. Quality control of R&D products is difficult to achieve, however, and even more difficult to have accepted in the field as an important indicator of potential impact. As Klein (1978) points out:

> . . .users are not systematic in their approach, and seldom use effectiveness criteria. My experience working with user groups, such as teachers, supports the notion that the users feel very unqualified to look at even summary reports on evaluation. (P. 119)

Quality control of R&D products is an uphill battle for developers. Money is scarce, and some people assume that money allocated for product development automatically results in a good product. What is needed is more evaluations of products while they are being developed, with clear indicators of what the products can do for potential users. The great need for quality standards is documented in the Committee on Vocational Education Research and Development (1976) report and has been emphasized more recently by Worthington (1981).

Widespread distribution of R&D products is implicit in the concept of comprehensive dissemination, as defined by the Dissemination Analysis Group (DAG) (1976). DAG's four-level definition of dissemination (i.e., spread, exchange, choice, and implementation) has been endorsed by professionals in the field of educational dissemination at the June 1977 Dissemination Forum.

The DAG conceptual definition of comprehensive dissemination forms an underlying rationale for assessment of impact, as captured in the conceptual framework in Figure 1. The first-level definition of spread resembles a one-way casting out of knowledge similar to the idea of widespread dissemination used in the impact conceptual framework.

Another concept relating to impact from R&D products is effective implementation of the product in diverse educational settings. Some people subscribe to the view that good products will sell themselves. But product developers do not always know how products will be used. As articulated in the DAG (1976) report, products are selected by users for program improvement interventions. R&D products must be accompanied by support systems that involve physical and financial resource allocations. Product implementation and use must be endorsed by those in authority for institutionalization to occur.

Fullan and Pomfret (1977), in their review of curriculum implementation studies, identify the following factors influencing effective implementation:

- characteristics of the innovation, such as its complexity or difficulty of change required by the innovation;
- strategies of implementation dealing with resource support, timing of the intervention, feedback mechanisms, and participation in the innovation process;
- characteristics of the adopting units, such as their demographics and ability to solve problems; and
- macro-sociopolitical factors, such as incentive systems, the role of evaluation, and political complexity.

In an insightful article on incentives for innovation in the public schools, Pincus (1974) reviews bureaucratic factors supporting innovation and characteristics of institutional settings. He concludes by saying:

> . . .in a diverse society. . .at any one time there will be a variety of standards. A major focus of R&D policy should be . . .experimentation and. . .incentives that encourage new patterns of institutional behavior. (p. 139)

The possibility of an R&D product being modified in the process of becoming adopted by an institution is always very great. The Rand Corporation (Berman and McLaughlin 1978) conducted a study that included the Part D Exemplary Programs authorized by the Vocational Education Amendments of 1968. The study showed effective projects to be characterized by mutual adaptation of both the product and the adoption site during the implementation process. The study also found professionalism to be a primary motivation when teachers undertake extra work. Clarity of objectives likewise had a major effect on implementation. In addition, comprehensive projects were found to be no more effectively implemented than simple projects; in fact they were somewhat less likely to produce teacher change. These findings suggest the value of incremental goal setting when introducing an R&D product into an established educational setting.

Another concept related to impact from R&D products is <u>sustained use of the R&D product</u>. Causal models constructed by Crandall et al. (1982) to explain findings from a sample of 146 schools in ten states show that teacher commitment and elapsed time (i.e., the length of time the teacher has been using the innovation) are significant predictors of change in practice. The centrality and importance of teacher commitment or ownership are underscored by consistent patterns in subsets of the data. Organizational change, on the other hand, reflects the importance of the principal's management style and leadership. The principal's ability to adopt a "take charge" attitude provides the only route to institutionalization of R&D-based innovations.

Each dimension contains criteria that can be used to measure the likely impact of a product. The optimal measurement procedure would include multiple indicators for each criterian within the four dimensions. Kerlinger (1979) points to the unreliability of depending upon single indicators for measurement. He describes measurement procedures as highly indirect, complex, and often difficult. When one considers the complex processes associated with impact, the need to give consideration and planning to measurement becomes doubly complicated. However, existing records may be used to collect data on dimensions of distribution, implementation and utilization. Also, fairly objective instrumentation has been developed to measure innovation use in educational settings (Hall and Loucks 1977). Furthermore, where more subjective data are needed, rating scales with multiple items may be used. For example, at the time of release, any given product can be rated on the criterion of product quality:

	Product Quality Low------------------High				
Scholarship	1	2	3	4	5
Utility	1	2	3	4	5
Communicability	1	2	3	4	5
Free of Biases	1	2	3	4	5

A similar measurement scale could be devised for other criteria within each dimension where it is not possible to obtain more objective data. Figure 1 classifies sixteen criteria by the five dimensions. A supporting rationale for the criteria and research findings related to development of the framework can be found in R&D Impact Criteria for Improving Vocational Education Programs (Hull, et al. 1983). The following describes each criterion within a respective dimension.

The Criteria Defined

Systematic development. A systematic process should be followed in developing R&D products. An ideal process would include conducting research and needs assessment/task analysis; reviewing relevant knowledge and practice; building a conceptual framework; sequencing development; conducting testing and revision cycles; disseminating the product; implementing the product; and evaluating the results.

__High quality__. Products should reflect scholarship, be useful, communicate clearly, be marketable, and be free of biases. Content should be accurate, up-to-date, focused on essentials, and complete.

__User orientation__. Representatives of relevant audiences should be identified and involved in designing, testing, and using innovations. Primary audiences should receive priority in dissemination efforts. The resulting product should contain practical information organized in an easy-to-use format.

__Strategic distribution__. Cost-effective strategies for distributing an R&D product should be devised on the basis of the characteristics of potential users, site-specific factors, and features of the product itself. Distribution should reach opinion leaders and influential organizations in the external environment.

__Multiple channels__. More than one channel for conveying information about products should be used. Communication should include mass media (e.g., brochures sent out by mail) and interpersonal channels (e.g., technical assistance). Normally, information duplication and overlap are assets rather than liabilities during the distribution stage.

__Widespread distribution__. Products should reach appropriate users. Thus, distribution to individuals in different roles, in diverse settings, and in many geographic areas may be necessary. Secondary distribution through workshops, reprints, libraries, the ERIC system, and so on should be encouraged.

__Sequential implementation__. The introduction of products should be sequenced to meet the needs and unique characteristics of an adopting site. Often potential users need to be introduced to segments of the product to avoid total rejection of the intervention.

Support systems. Support systems necessary for encouraging the full use of a product should be operational at the time of implementation. These systems are of three types: personal resources (e.g., administrative endorsement or site personnel endorsement), information resources (e.g., training in the use of support materials and procedures), and physical resources (e.g., dollars, supplies, and equipment).

Cost feasibility. Information describing the product's resource requirements should allow quick and easy estimates of the costs likely to be incurred by an adopting unit.

Multiple patterns of use. A product's use patterns will vary according to the conditions, intensity level, frequency, and extent of use. The users' setting, role, and demographic characteristics create the conditions for different types of use. Multiple patterns of use and secondary use of R&D by other than the primary user audience should be encouraged.

Time on task. An R&D product should be used frequently enough and long enough for its use to become an integral part of current practice. The audience's time in actually using the product should be maximized.

Integrated use. Use of a product should be intensive and pervasive throughout the organization. To accomplish this goal, personal commitment is required within the organization at all levels to institutionalize the product into organizational routines.

User satisfaction. The R&D product and its implementation should meet users' expectations and result in a positive user attitude toward the product. User satisfaction may be indicated by product advocacy or by creative adaptations.

Individual growth. Products should contribute to changes in an individual's attitude, knowledge, or performance.

Organizational change. R&D products should contribute to beneficial changes in the user's organizational policy, programs, practices, or structure. Beneficial changes may also include cost and time savings over current practice.

Societal contributions. R&D products should contribute new and significant information with the potential to advance knowledge, improve current practice, or influence social systems.

Summary

This framework was developed to aid evaluators in assessing the impact of R&D products. Ideally, this assessment would be done after the product has been in use for a period of time. During these summative evaluations often it is helpful to know how much the product has been used, what were the conditions, and the degree of product implementation. This formative evaluation data provides valuable insight into the pervasiveness of the impact. But in particular, the conceptual framework created in this project should help evaluators estimate the likely impact of a R&D product. A high quality product, widely distributed and fully implemented, with sustained use, is likely to have more impact than one which fails to possess these dimensions. The products' progress toward these criteria can be assessed at various points in time as appropriate. In this way, a R&D product accepted and implemented in a local setting, acquires an "impact potential."

A loqical next step for further development of this framework would be to quantify the dimensions and the criteria. This would allow evaluators to compare R&D products using an overall impact potential score. The score would vary depending on the implementation setting. The systematic use of this framework for selecting and using educational R&D products should upgrade the program improvement process. The information from these assessments should help research administrators, project directors, and evaluators gain increased impact from scarce R&D dollars.

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