Using Formative Evaluation for the Selection of Instructional Materials

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ABSTRACT: Instructional materials selection practices vary widely in the way they are administered and conducted, the criteria that are used, and the precision with which they are carried out. In this paper a two-phase instructional materials selection process is presented. The process is based on considerations from the design and formative evaluation of competency-based instruction. The purpose of the first phase is to select materials that have the best potential for affecting learning outcomes desired by a local or state educational agency. The purpose of the second phase is to verify decisions made in Phase I, and make recommendations to teachers about how the materials can be used most effectively. The paper also includes a comparison between the guidelines for materials selection published by the State of Florida and the considerations recommended in this paper.

The production and sale of instructional materials and equipment to public schools has become a highly competitive, two-billion dollar industry. The decisions required of materials selection committees have been made more difficult than ever by curriculum diversification and proliferation of competing instructional products. Not only are there more products to look at, but the majority of the market is controlled by large, often diversified, corporations capable of developing broad curriculum programs and supporting sophisticated promotional campaigns for their products (Jacobs, Maynard, McMahon, Miller, Priest, Rice, & Snyder, 1975, pp. 511-526). Instead of reviewing several different third-grade readers, a selection committee may now find itself judging complete elementary school language development programs designed for use across several grade levels.

But how critical is instructional materials selection? Do instructional materials really have that much effect on what students learn? Jovanovich (1964, p. 65) contends that, "the book makes the course as often as the course makes the book." In a school district evaluation report, Banks (1973) concluded that adopted textbooks were the principal planning source for instruction in both elementary and secondary grade levels. This effect on curriculum is also long lasting, for once textual materials have been purchased they are normally used for 4 to 8 years. Additionally, Kirst and Walker (1971) estimate that up to 75 percent of a child's classroom time and as much as 90 percent of the homework time are spent using text materials. If instructional materials play this prominent a role in curriculum planning and implementation, then materials selection practices do contribute significantly to the educational process. In this paper, current selection practices will be summarized briefly, then suggestions will be made for using systematic, formative evaluation techniques for selecting instructional materials.

Current Practices in Materials Selection

One characteristic common throughout state and district selection practices is the lack of standardized, systematic procedures. Practices vary widely from state to state, from district to district, and from curriculum area to curriculum area within a given state or district.

Selection and Adoption Procedures

Adoption is a process through which a state or district board of education certifies that a given instructional material is appropriate for use in that state or district. Several materials will usually be adopted for each curricular need so that schools have a choice. After adoption is complete, a school will select among the approved choices and make its purchase. In about 30 percent of the states, schools are legally required to use state-adopted texts and in another 20 percent, state adoption is conducted but purchase of approved materials is optional. Another 10 percent of the states have a mixture of state control and local autonomy that varies with grade level and size of district. Finally, 40 percent of the states have no adoption legislation, thereby leaving all decisions about instructional materials to the school districts or schools (Jacobs et al., 1975, pp. 515-16). The variety found in the way adoption and selection are administered is equally apparent in the way adoption and selection are conducted. (For simplicity, the term *selection* will be used in the rest of this paper to mean both adoption and selection, except at points where specificity is needed.)

That selection is done by committee is the factor most common among selection practices; however, the commonality goes little further. The process can be as informal as three high school teachers comparing notes after a publishers' "book fair," or as formal as a legally constituted state evaluation committee using input from a state-wide sample of all partners in public education. Committees are usually temporary rather than standing and may be convened as seldom as every 4 or 5 years. The potential is thus high for inconsist-

ency in philosophy, procedure, competency, and perceived purpose. The criteria used for judging the quality of materials are also inconsistent.

Selection Criteria

Criteria for judging the quality of materials can be thought of in two categories: (a) those criteria that address the characteristics of the materials, such as size and shape, scope of content, use of objectives, and inclusion of tests, and (b) those criteria that address the effects of the materials, such as student achievement, teacher attitude, and implementation costs. Scriven (1973) refers to these two types of criteria as intrinsic and payoff, respectively.

Intrinsic criteria are used almost exclusively in materials selection. Application of intrinsic criteria, however, is quite uneven. Many selection committees use well conceived evaluation checklists and suggested instruments are common in the professional literature in most content areas (e.g., Breiter & Menne, 1974; Dykstra, 1969; N.E.A., 1973). Often, however, selection criteria are generated by the review committee and vary widely according to the committee members' backgrounds, skills, interests, and philosophical approach to the content area and the educational process. Even in evaluation checklists where intrinsic criteria have been systematically derived, the congruence among criteria is seldom questioned. For example, it is not enough to ask whether objectives, content, activities, and tests exist in an instructional material; one must also ask whether the content and activities match the objectives, and whether the tests measure the objectives. An evaluation checklist that includes this concern is provided in the SWRL Product Selection Kit (SWRL, 1975).

Payoff criteria are almost never used in materials selection. One reason is that data are not available. Komoski (1974) estimates that only 1 percent of all instructional materials have been verified by even a single learner. Komoski and Eliott (1973) recommend a learner verification and revision (LVR) procedure for collecting payoff data that could be used for improving the materials and for selection decisions. LVR is perhaps better known to instructional developers and evaluators as formative evaluation. Proof of LVR and/or plans for future LVR are currently required in California and Florida before commercially produced materials can be reviewed for state adoption. LVR legislation has been criticized as being vague, difficult to enforce, too costly, and a threat to creative teaching, teacher autonomy, student and teacher privacy, and the commercial viability of small publishers (Jacobs et al., 1975). Some publishers do use formative evaluation in developing instructional materials and there is research that indicates that formative evaluation is an effective way to detect and correct weaknesses in materials (Baker and Alkin, 1973). Economic and philosophical constraints, however, would seem to predict that in the near future formative evaluation will not be used widely in commercial publishing.

Using Formative Evaluation for Selection

The purpose of formative evaluation is to collect data about the effectiveness of instructional materials during development, and then to use the data to guide revisions that will improve the materials before they are released for general use. Both intrinsic and payoff data are collected and there is evidence to indicate that the process does work. If formative evaluation is effective in detecting weaknesses in materials under development, could the process be used for detecting weaknesses in commercially published materials submitted for selection? Could intrinsic and payoff data be collected by a state or district selection committee? If the answers are "Yes," then the use of a systematic formative evaluation model for materials review might be a positive step toward eliminating some of the inconsistency found in current materials selection practices.

A Procedure for Selection and Verification of Instructional Materials

This section of the paper will describe a two-phase selection and verification procedure that is based on contemporary practices in formative evaluation. The first phase of the procedure prescribes expert judgment of instructional materials (intrinsic data) and is recommended for the materials selection process. Data collected during the selection process would be used to judge the merits of all of the proposed materials, to rank the materials, and to choose the best materials for adoption. Learner trials of materials that have been selected (Payoff data) are suggested for the second phase, the verification process. During the verification process, data would be used to confirm the effectiveness of the materials, to detect weaknesses in the materials, and to develop recommendations for teachers about how the materials could be used most effectively. Table 1 contains a summary of the selection and verification phases.

dures that are too ambitious for existing financial, time, and personnel constraints are unlikely to be implemented. This reality leads to the suggestion that full LVR procedures are too expensive, time consuming, and technically difficult for most materials selection committees. By eliminating the payoff data from those data normally collected during a formative evaluation, the process becomes feasible for use by a materials selection committee. It is thus assumed that Phase II (see Table 1) would seldom be undertaken by a selection committee. Omission of Phase II would obviously result in a loss of precision in decisions about the effectiveness of materials; however, there are two general benefits to using Phase I alone.

First, the intrinsic data that one would collect in a formative evaluation reflect the considerations and components that an instructional designer would build into competency-based materials. If one accepts the competency-based model, then it is logical to evaluate materials using criteria that reflect that model. In effect, one would be asking, "How closely do these materials conform to a competency-based ideal?" Thus one would be selecting materials according to a set of principles, and some theory, about what "good" instruction should be. Second, collecting a full range of intrinsic data could help ensure that an appropriate range of relevant questions and criteria are used to judge the merit of commercial materials. Effects of rater bias and lack of training in materials design or selection could be diminished.

Phase I: Selection of Materials

The intent of this paper is not to develop instruments for selection committees to use in materials selection. Rather, the intent is to suggest a manner in which formative evaluation criteria can be used to make systematic comparisons between educational agency expectations and materials submitted to that agency for adoption.

TABLE 1. A procedure for selection and verification of instructional materials

	Purpose	Type of Data	Sources of Data
Phase I: Selection	Select materials that have the best potential for affecting learning outcomes desired by the educational agency.	Intrinsic	Considerations from formative evaluation, agency documentation, expert opinions, proposed materials, and publisher's documentation
Phase II: Verification	Verify decisions made in Phase I and make recommendations to teachers about how the materials can be used most effectively; i.e., as published, with additions, or with revisions.	Payoff	Considerations about student performance, student attitude, teacher attitude, and implementation procedures

The column on the left side of Table 2 is a list of intrinsic factors that one could consider in conducting a formative evaluation. The column on the right side of Table 2 lists general questions that are drawn from those intrinsic factors and could be used to guide a review of instructional materials.

Philosophy

The first consideration to be reviewed in developing selection criteria is the philosophy of the educational agency. The question of importance is whether the philosophy of the agency is reflected in the instructional materials. For example, if a state were to decide to increase individualization in instruction, then materials selected should enable the learner to work independently. If a district were developing a "back-to-basics" program, then materials would not be expected to include much enrichment instruction. The current trends in a state or district may be reflected in statements that describe the philosophy of the agency. These statements can often be used to generate guidelines that can be used as criteria to assess the compatibility of proposed materials with existing philosophies.

Learner Characteristics

The characteristics of the learner can be used to develop criteria for materials selection. The age, interests, ethnicity, achievement level, and other factors that describe target students should all be considered when evaluating the appropriateness of materials. For example, specific statements describing the intended learners will be valuable in determining whether the vocabulary used in the materials is appropriate, the practice activities will be interesting and challenging, the students can identify with children pictured in the materials, and whether the length of each lesson and unit is appropriate for students in that age range. An accurate description of the students for whom the materials are intended will facilitate the work of the selection committee throughout the evaluation process.

Instructional Goals

Instructional goals can be used to help focus on relevant selection criteria. The committee will need to determine whether the goals established by the agency are congruent with those in the proposed material. Information on instructional goals can generally be found in the publisher's promotional materials, table of contents, the preface, or in third-party evaluations such as those conducted by the Educational Products Information Exchange Institute (EPIE). The goals found in the materials can be compared with those published in the agency's scope and sequence statements or curriculum guides.

Instructional Objectives

Criteria related to instructional objectives are valuable in assessing the appropriateness of materials. A major question is whether the objectives specified in agency curriculum guides and by content experts are included in the materials in the prescribed scope and sequence. In addition to this compatibility criterion, objectives should also be evaluated for such characteristics as whether they are worthwhile, clearly stated, and measurable.

Content

There should be congruence between content specifications found in the agency's curriculum guide or provided by subject matter experts and those included in the materials being evaluated. Some other questions related to content include whether it is bias free, well organized and sequenced, worthwhile, contemporary, accurate, comprehensive, authentic, motivational, and objective-referenced. Sometimes when instructional objectives are not explicitly stated in the materials, it is possible to infer them from well developed content. However, it is very difficult to develop good objectives from incomplete or disorganized content.

Instructional Strategy

Another design point that is useful in developing selection criteria is whether a research-based instructional strategy can be identified in the materials. Components of strategy to assess are:

- the manner in which learners are motivated to study the materials;
- whether learners are reminded of similar material they already know;
- whether material is presented clearly with ample examples, rules, and demonstrations;
- whether relevant practice exercises are included;
- whether students receive feedback on the quality of their performance on practice exercises;
- whether feedback is presented in a manner that enables students to use it to adjust their performance on subsequent practice activities;
- whether opportunities are provided for summaries and reviews at logical points throughout the materials; and
- whether suggestions are provided for enrichment and remediation.

If students are intended to use instructional materials independently, then the instructional strategy should be well developed and student guidance should be included in the materials. Materials intended to be teacher-managed often leave much of the instructional strategy to the resourcefulness of the teacher. If the strategy is to be implemented by the teacher, then explicit directions for doing so should be included in the teacher's manual.

TABLE 2. Questions for review of instructional materials

Considerations from formative evaluation	General questions for state and local selection committees to use in reviewing instructional materials
Philosophy	Is the educational philosophy of the agency (state, district, school) congruent with the philosophy and procedures in the materials?
Learner characteristics	Are the learner characteristics of the target population congruent with learner accommodations in the materials?
Instructional goals	Are the instructional goals outlined by agency administrators and stated in curriculum guidelines congruent with the scope and emphasis of goals in the materials?
Instructional objectives	Are objectives specified in agency curriculum guides and by subject matter experts compatible with those included in the materials?
Content	Is the content specified in agency curriculum guides and by subject matter experts consistent with that in the materials?
Instructional strategy	Are research-based instructional strategies reflected in the instructional materials?
Student assessment	Are valid, reliable, criterion-referenced tests included in the instructional materials for pre-, practice-, and post-assessment?
Instructional guide	Is there sufficient guidance for installation and management of the instructional materials?
Utilization	Are cost and format, as well as requirements for time, personnel, media, facilities, and equipment acceptable to the agency?
Consistency within instructional materials	Is there consistency within the instructional materials; e.g., are content and instructional strategies appropriate for the objectives; do tests measure achievement of the objectives; and are all components appropriate for the target population?
Developmental documentation	Are data included that provide evidence that the materials have been used successfully in a variety of instructional settings?

Student Assessment

Provisions for student assessment should be evaluated. The committee should determine whether criterion-referenced tests for pre-, practice-, and post-assessment are included with the material. In addition to the requirement that tests be criterion-referenced, good test construction procedures are necessary. The clarity of directions and items, the response behavior expected, and the length of tests are only a few of the facets that can be reviewed to assess the adequacy of tests included with materials.

Instructional Guide

Well developed instructional materials should include an instructional guide to provide teachers and administrators with the information they need to use the materials with a variety of learners in different classroom settings. These guides should be checked to determine whether they include such information as record-keeping procedures, group and individual pacing and management plans, suggestions for implementing a sound instructional strategy, and background references. Ideally, the guide should provide the teacher with all the information needed to use the instruction successfully with target-group students.

Utilization

There are several design points that should be considered relative to using instructional materials in a classroom. Some of them include: cost of the original and supplementary materials; the durability and expected life; the amount of supplementary or expendable materials necessary to support the instruction and practice activities; special equipment needed to use the materials; the number of professional and staff personnel needed to manage the materials; special environmental considerations such as lighting or soundproofing; and the acceptability of the format and instructional strategies to the intended users.

Consistency Within Instructional Materials

All of the considerations listed above are interdependent, like the components of the systems design model on which they are based. The importance of this consideration must be emphasized, for this is a critical point at which the materials evaluation approach presented in this paper differs widely from other systematic models, such as those by Morrisett and Stevens (1967) and Eash (1970). After considering the merits of each component of the instructional materials, the overall consistency among components should be evaluated. The instructional goals should be based on the philosophy of the agency, and the objectives and content should be derived from the goals. The instructional strategy should be appropriate for the content and the types of skills specified in the objectives. Tests included with the materials should measure performance specified in the instructional objectives. All components of the instructional materials should be appropriate for the intended learners. Often it is necessary to evaluate the internal consistency of the materials on an objective-by-objective basis or at least by sampling enough objectives in different parts of the materials to determine whether consistency exists.

Developmental Documentation

If developmental documentation is available, it should be evaluated to determine whether intended learners are similar to those used for LVR during the original developmental process. Conditions under which the materials were evaluated should be assessed as well. A few examples of information that should be available in an LVR report are: the design of the verification study, the procedures that were followed in

TABLE 3. Instructional materials review questions compared with instructional materials selection literature in Florida

Considerations from formative evaluation	General questions for state and local selection committees to use in reviewing instructional materials	*State of Florida documents* A[1]	B	C	D	E
Philosophy	Is the educational philosophy of the agency (state, district, school) congruent with the philosophy and procedures in the materials?	2[2]	2	2	2	2
Learner characteristics	Are the learner characteristics of the target population congruent with learner accomodations in the materials?	2	2	2	2	2
Instructional goals	Are the goals for instruction outlined by agency administrators and stated in curriculum guidelines congruent with the scope and emphasis of goals in the materials?	3	3	3	3	3
Instructional objectives	Are objectives specified in agency curriculum guides and by subject matter experts compatible with those included in the materials?	1	1	1	2	1
Content	Is the content specified in agency curriculum guides and by subject matter experts consistent with that in the materials?	3	3	3	3	3
Instructional strategy	Are research-based instructional strategies reflected in the instructional materials?	1	2	2	2	2
Student assessment	Are valid, reliable, criterion-referenced tests included in the instructional materials for pre-, practice-, and post-assessment?	1	2	2	2	2
Instructional guide	Is there sufficient guidance for installation and management of the instructional materials?	1	2	2	2	2
Utilization	Are there constraints within the agency to adoption of the instructional materials?	1	1	1	1	1
Consistency within instructional materials	If there consistency within the instructional materials: e.g., are content and instructional strategies appropriate for the objectives, do tests measure achievement of the objectives, and are all components appropriate for the target population?	1	1	1	1	1
Developmental documentation	Are data included that provide evidence about successful use of the instructional materials?	3	1	1	1	1

[1]State of Florida Documents:

A= Florida Law 233.07 through 233.48
B= *General Criteria for the Selection of Instructional Materials in all Subjects*, Florida DOE
C= *Criteria for Instructional Materials Selection in English/Language Arts*, Florida DOE
D= *Criteria for Instructional Materials Selection in Mathematics*, Florida DOE
E = *Criteria for Instructional Materials Selection in Elementary Schools*, Florida DOE

[2]Degree to which the consideration is included in Florida Documents:

4 = Standard is clearly stated in document, and explanations exist to ensure its effective use by committees.
3 = Standard was directly mentioned in document, but no explanation was included for committee interpretations.
2 = Standard was implied, but probably would not be recognized by committee.
1 = Standard was omitted from document.

choosing subjects and administering the study, and a description of revisions that were made in the materials.

The considerations and questions included in Table 2 are not intended to comprise a checklist that could be to evaluate instructional materials. Rather, these items form a framework from which evaluation checklists could be developed. Such checklists could be used to review and rank order a large number of materials. The product of this first phase of selection would thus be a list of the instructional materials that the committee believes are acceptable for purchase and use in the schools. In most instances, the selection procedure would end after Phase I. The state or district may not feel a need to continue to the second phase, or (even recognizing a need) may lack resources.

To an experienced educator, it might seem logical that selection committees would already be using the considerations listed in Table 2. After all, these are not new considerations. Anyone who has worked in instructional development has used them extensively. To provide some information on the extent to which the considerations in Table 2 are already being used, a comparison was made between those considerations and the guidelines for selection of instructional materials published by the State of Florida. The Florida guidelines were chosen for analysis, because Florida is one of two states that has enacted LVR legislation. It was hoped that Florida's position on LVR might be reflected in its guidelines for selection committees.

Five Florida documents were analyzed in this comparison. They were: Florida Law 233.07-233.48, the law related to instructional materials selection; general state criteria for the selection of instructional materials in all subjects; and specific subject area criteria related to English and language arts, mathematics, and elementary schools. The latter four documents were published by the Florida Department of Education for use by state-level materials selection committees. Each of the five documents was analyzed to determine whether it directly or indirectly included any of the 11 formative evaluation considerations proposed in this paper (see Table 2). The degree of inclusion of each consideration was rated at one of four levels:

1. Consideration absent.
2. Consideration implied but not specified.
3. Consideration specified as a criterion for selecting materials.
4. Consideration specified as a criterion for selecting materials, including standards and explanations for application.

The results of the comparison are included in Table 3. There were no fourth level ratings for any of the Florida documents. This can be interpreted to mean that all of the documents studied would need to be revised if relatively naive committee members were to use the documents effectively as guidelines for instructional materials selection. Two formative evaluation considerations were directly specified in all five documents: "instructional goals" and "content." They were rated as third level, however, because there were no guidelines on ways to use them for materials selection. The majority of the documents had a second level rating on the formative evaluation considerations. However, two considerations ("instructional objectives" and "developmental documentation") were mentioned in only two documents, and two other considerations ("utilization" and "consistency") were absent from all documents (level one).

It is apparent from this comparison that in Florida, the guidelines published for use in materials selection do not closely reflect principles of competency-based instruction. Thus, in one state at least, these principles that seem so familiar to an instructional developer have probably had little impact on the practice of materials selection.

Before beginning a discussion of the second selection phase, it may be useful to point out that another use of the considerations listed in Table 2 could be to guide the appointment of selection committee members. Committee members should be chosen to provide the expertise needed to answer the selection questions. A content expert and content teacher should be included to provide information to the committee concerning the scope, sequence, timeliness, and accuracy of the content in proposed materials. A content expert and a content teacher would also be able to compare the materials with the scope and sequence in the agency's curriculum guides. Teachers and parents of students for whom the materials are intended should be included to provide the committee with information on student characteristics like interests, behavior, attention span, and typical achievement levels of students in the subject. Persons should be included on the committee who can adequately represent the interests of both sexes and all concerned cultural and ethnic minorities. An instructional designer should be included to provide the committee with information related to objectives, instructional strategies, criterion-referenced tests, and other design considerations. Finally, administrators should be included who are familiar with the goals and philosophy of the agency as well as the resources for and constraints or use of the materials.

Phase II: Field Trial

The second phase of the instructional materials selection process includes the use of field-trial procedures to collect LVR information about materials that have been selected for agency adoption. Materials selected during the first phase should represent the best available, but the best available may not necessarily be systematically designed or effective in causing learning. Rarely does an agency select only one set of materials. Generally several different sets of materials are adopted; the district or school is then free to choose among them for purchase. Phase II could be applied most effectively after adoption but before purchases are made. At that point field trial evaluation of the materials could take either a formative direction or a summative direction. If LVR data were already available on the materials, this phase probably would not be conducted.

Formative Field Trial

It is anticipated that the most practiced form of field-trial evaluation would be formative. Through the committee review process, intrinsic data would have been used to identify the best materials. Then through field trial, payoff data could be used to identify requirements for making the materials as effective as possible.

The procedures and types of data collected would be similar to those used in a typical, small-scale field trial; however, the purpose would be somewhat different. In a normal field trial, the purpose is to collect data for use in revising the instruction. It is obvious that one does not have much room for revision when working with commercially published materials. The purpose of the field trial would therefore be to collect data for use by potential buyers and users, about how to adapt and/or supplement the materials for optimum classroom use.

Data from field trials could be used in several ways.

1. If more than one set of materials were field tested, potential buyers could see how well each program's own goals were met, how well students and teachers liked each program, and what recommendations were made for supplementing and/or adapting each program.
2. For potential users, field trial results could be an aid in planning how to use materials in their own classrooms.
3. If the state or district conducting the field trial had sufficient resources, supplementary materials could be prepared based on instrumentation done

for the trial and on trial results. Such materials then could be sold or given to the schools.

4. Field trial results could also be supplied to publishers for consideration in later editions.

In the absence of LVR data from the publisher, a small scale formative field trial may provide valuable information about how well materials work with learners. If a heavy investment will be made in a particular set of materials, then the expense of a field trial may be well justified.

Summative Field Trial

The possibility of conducting a summative field trial during Phase II is mentioned here for the sake of completeness. A summative trial may be undertaken if a state or district wishes to compare several different materials and then adopt or recommend the best one. Summative comparisons among competing programs require careful experimental controls to ensure program fairness and the validity of conclusions. Because of the time and cost required and the variety of threats to valid conclusions, summative comparisons should be approached with caution.

Summary

Instructional materials selection practices vary widely in the way they are administered and conducted, the criteria that are used, and the precision with which they are carried out. In this paper a two-phase instructional materials selection process was presented. The process is based on considerations from instructional development and formative evaluation. In the first phase, the instructional completeness of the materials is evaluated by a selection committee. In the second phase, field-trial data are used to evaluate the classroom effectiveness of the materials.

The use of field trials by state or district selection committees would require time, resources, and expertise that are not normally expended for materials selection. Formative trials have been proven successful in improving instructional materials during development, but would the field trial suggested in Phase II provide better adoption or selection decisions than the committee deliberation in Phase I? One position on this question has been that there is no substitute for an actual trial (Rothkopf, 1963). However, Merrill (Note 1) recently reported high correlations between actual student performance and predictions of student performance that were based on expert reviews of the instructional strategies employed in the materials. Research should be continued in this area to develop guidelines for using intrinsic data for recognizing quality instructional materials, and for determining when the additional data available through a field trial is worth the additional expense.

Ultimately, however, the viability of a systematic selection process, or any selection process, will depend on how state and district officials perceive the role of instructional materials in education, and how they value that role.

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