WORKSHEET A

STATEMENT OF THE PROBLEM

David L. Clark

The weakness of much of our research is that we have failed to take seriously the initial step in research design, that is, formulating the problem. Artists, musicians, novelists, playwrights, inventors, developers all know (and teach as best they can) that variation in the quality of creative products is affected by the way in which the creator formulates the problem. But in education, and much of social science research, we have turned the process upside down. We concentrate on precision in methodology, e.g., normative, experimental, qualitative research techniques, while tolerating imprecision in problem formulation. The latter design step is obviously the more complex step since the complexity of design specification is related directly to the number of options available to the designer. And at no time does the researcher have a broader field of options than at the point of problem formulation. Doctoral students (typically neophyte researchers) are often signal examples of the range of available options as they cast about sometimes for months trying to "find a worthwhile problem."

Professor Fred N. Kerlinger is a well respected empirical positivist whose work in research methodology is often cited as a model for precision in the <u>a priori</u> construction of research design. Listen to what he has to say about problem statements:

- "It is not always possible for a researcher to formulate his problem simply, clearly, and completely." (Kerlinger, 1973, p. 16)

- "If one wants to solve a problem, one must generally know what the problem is." (p. 17)

- "What is a good problem statement? . . . there is no 'right'

   way to state one." (p. 17)

Do you suppose Dr. Kerlinger would be equally comfortable with the same propositions about methodology, e.g., "If one wants to investigate a problem, one must generally know how to go about it;" not even a close call because, you see, there is a "right way to design a methodological approach to investigating a research problem.

Defining a Problem

The argument to be proposed in this worksheet is that there are generic methods which researchers use intuitively to generate problems. Before turning to problem types, however, we need to establish a definition of a problem. I will argue that:

A problem is a situation resulting from the interaction of two or more factors (e.g., givens, constraints, assertations, beliefs, conditions) which reveals an anomaly or contradiction which, in turn, yields (1) a perplexing or enigmatic state, (2) an undesirable consequence, or (3) ambiguous preferences or choices from among courses of action.

Contrast this definition with the one asserted by Kerlinger and you will discover quickly why Dr. Kerlinger has so much difficulty in offering guidelines for formulating problems. He defines a problem thusly:

"A problem, then, is an interrogative sentence or statement that asks: what relation exists between two or more variables?" (Kerlinger, p. 17)

The second of the two definitions catches the first phrase of the former definition and then stops. The consequence is that a problem becomes defined as a question or hypothesis. The inadequacy of Kerlinger's definition is apparent as he turns to defining hypotheses and notes that, "A hypothesis is a conjectual statement of the relation between two or more variables." (p. 18) His first example of an hypothesis turns out to be, "Group study contributes to higher grade achievement." (p. 19) If one were to accept his definition at face value, that hypothesis becomes a problem by adding the word "does," i.e., "Does group study contribute to higher grade achievement?"

Something is obviously missing in Kerlinger's definition and, in fact, that something is crucial. The specified relation between the variables must provoke an interaction hitherto hidden from the author or reader which, when revealed, is contradictory or anomalous. A question can be asked about the interaction between any two variables. A problem reveals that the interaction has consequences. And the result of the anomaly or contradiction, in turn, leaves one perplexed, disadvantaged, uncertain. The result of the interaction answers the question, why investigate the problem. The problem is justified as worthy of inquiry precisely because it yields an anomaly, or an undesirable consequence, or moot alternatives.

A Format for Generating Problems

Analyzing the definition suggests some common features of problems. The givens, constraints, assertions, beliefs, and conditions suggest that the problem statement contains propositions. There are always at least two of them and they interact. From this point on, I will label the first proposition as the principal proposition and the second as the interacting proposition Assuming that they interact, they should have two levels of effect, i.e., they reveal an anomaly or conflict which, in turn, yields a perplexed state, an undesirable consequence, or ambiguous preferences. One can obviously speculate about the anomaly or conflict — how can it occur in an orderly world? This speculation ought to be a part of this design phase because it lends a further sense of direction to the inquiry. The researcher will attempt to track down one or more of the speculations. This step will be labeled as the speculative proposition(s) Structurally, then, I would argue that a research problem consists of the following three parts:

1- Principal proposition —— ordinarily stated in the form of a given; a generalization; a generally accepted proposition; an accurate description of a condition; an approved policy; a widely accepted theory; ordinary knowledge about practice.

2- Interacting proposition —— stated in the same terms as the principal proposition but it contradicts, contravenes, notes exceptions to, challenges, or casts doubt upon the principal proposition.

3- Speculative proposition(s) —— examine or speculate about the most likely causes of the apparent anomaly or contradiction; set the direction for the inquiry; complete the sentence, "The principal and interacting propositions co—exist in my best judgment because

This structure would be of even greater utility if the nature of the relationship between the principal and interacting propositions were to assume generic forms of contradiction and conflict or combinations of these forms. An analysis of a variety of research problems and studies seems to indicate that they do just that. The following listing, although undoubtedly incomplete, encompasses many of these forms:

(1) Provocative exception

(2) Conflicting evidence

(3) Knowledge void — incomplete knowledge for the present or future

(4) Action—knowledge or knowledge—action conflict (5) Action — action conflict

(6) Formal knowledge — experiential knowledge conflict

(7) Action—theory or theory—action conflict

(8) Knowledge—theory or theory—knowledge conflict

(9) Theoretical conflict

(10) Policy—knowledge or knowledge—policy conflict

(11) Policy—action or action—policy conflict

(12) Policy—theory or theory—policy conflict

(13) Policy — policy conflict at the same or different policy levels

(n)

It is important to understand these forms as well as the format because the combination of the two provides you with a powerful tool to "play around with" in your substantive area of specialization while testing out alternative problems you may wish to pursue. The following section will take a few examples of these types and illustrate them briefly.

Sample Problems in Notation Form

1. **Provocative exception**

   A. <u>Principal proposition (PP)</u> -- core city urban schools which draw heavily from lower socio—economic level student populations are characterized by low student achievement, low staff morale, high rates of absenteeism, high vandalism.

   B. <u>Interacting proposition (IP)</u> —— a significantly large number, although a low percentage of such schools, are average or better on all or most of the characteristics noted in the PP.

   C. <u>Speculative proposition(s) (SPs)</u> —— unanticipated achievement may be caused by leader (principal) behavior; teacher characteristics; special funding provisions; school—community relationships; curricular structure or materials; etc.

2. **Knowledge—action conflict**

    A. P.P —— the most significant period of educational intervention, especially in the case of retarded or disadvantaged learners, is during the pre—school years —— birth to age five.

    B. I.P —— least well developed funding patterns, teacher certification standards, operating programs are found in all states for this group of learners.

    C. S.P.(s) —— may be caused by tradition of K—12 free schooling; value conflict regarding the parental role with young children; unwillingness to increase educational costs for any purpose; lack of awareness of research evidence in the area; etc.

3. **Policy—knowledge conflict**

    A. P.P —— development of detailed state and/or Federal rules and regulations to enforce educational requirements, e.g., P.L. 94—142; or to audit educational program requirements, e.g., Title I of ESEA; or to encourage the diffusion of innovations, e.g., state plans in vocational education.

    B. I.P — evidence from the Rand studies that local districts use processes of adaptive implementation in carrying out state and Federal programs —— that local program achievements are often impeded by programmed implementation requirements.

    C. S.P.(s)—— unfamiliarity of policy makers with diffusion research; willingness to trade—off maximum diffusion capacity to safeguard disenfranchised student populations; informal acceptance of adaptive implementation as an operative, but unsanctioned, mode of practice; lack of sensitivity to local needs by higher level policy makers; exchange of goals in diffusion for more personal power; etc.

4. **Theoretical conflict**

    A. P.P —— organizations, including schools and colleges, are by definition goal attaining entities. They succeed to the extent that they achieve their stated goals.

    B. I.P —— most complex organizations in our society do not have goals in the ordinary sense of that term. They consist of a variety of individuals each of whom places constraints on the institution. In the final analysis schools exist for teachers not students, e.g., when a reduction—in—force is required the best teachers are not retained, those with the longest tenure are retained.

    C. S.P.(s) —— traditional research on organizations has affirmed the P.P. not because it is true but because there has been a model bias in the research; both perspectives are required to understand behavior in organizations; a minimal set of survival goals characterize organizations —— constraints operate on a more daily basis; etc.

Knowledge Void: A Special Case

A few of you may have noticed that one problem type, the knowledge void, does not emanate from nor generate a conflict. The term conflict is not used in relation to the provocative exception but clearly the I.P. is in conflict with the generalization or aphorism noted in the P.P. A knowledge void argues simply that not enough is known in some area of concern and the cogency of the interaction is ordinarily the surprise or disquiet of the inquirer about the incomplete knowledge. These studies are characteristically:

(1) Development projects

(2) Evaluation studies

(3) Future studies

A feature of these "special cases" is that it is ordinarily irrelevant to speculate about why the void occurred. The conclusion is frequently self—evident, e.g., no one bothered to do it yet, and seldom related to the interests of the researcher in further inquiry. In these instances the term "speculation" should be replaced by "specification." If a knowledge void which would lead to a development project is being described in the P.P. and I.P., the final proposition should describe the dimensions of the needed development, e.g., a test, or an instrument, or a textbook. The original National Science Foundation curriculum projects would have followed this format. The Physical Science Study Committee, for example, could have described in the P.P. the deficiencies in secondary school physics texts. The I.P. could have pointed out the availability of information to improve those text materials but would at least have noted that no current effort was being made to remedy the situation. The specifying proposition should then have described the aspects of the curriculum revision needed currently, e.g., introducing new theoretical content, weeding out incorrect empirical and theoretical assertations and data, linking the texts to the inquiry process employed by physicists, etc.

Evaluation studies are normally designed to reduce the circumstances in which practitioners must act on incomplete knowledge of process or product outcomes. In this case, the specifications required are the aspects of the program or intervention to the evaluated.

Future studies are, by definition, knowledge voids. Again the researcher has no interest in speculating about the void, it exists by definition, but should instead specify the pieces of the void (s)he will attempt to fill.

End Notes

Functions . Up to this point the emphasis in the worksheet has been entirely on establishing the existence of a problem. Actually a fully developed narrative problem statement attempts to accomplish three functions:

1. Establishing ——— to establish the existence of two or more factors which, by their interaction, produce an anomaly or contradiction resulting in an enigmatic or perplexing state, an undesirable consequence, or ambiguous preferences or choices from among available courses of action.

2. Relating ——— to relate the problem to its general antecedents (i.e., educational, scientific, social).

3. Justifying ——— to justify the utility, significance, or interest inherent in the pursuit of the problem.

After the problem has been established, or as a part of establishing it, the inquirer is responsible for relating the problem to its antecedents. Problems do not exist in vacua but stem from particular circumstances. The juxtaposed factors leading to the problem have histories; these may be of a scientific, social, educational, economic, origin. It is not the purpose here to describe the context of the proposal, since this will be done in detail in a later section. What is necessary is a sufficient description of antecedents to put the statement in perspective so that the researcher and the reader will be able to appreciate the problem in the tradition of inquiry of which it is a part.

A final function of the problem is to justify the utility of significance of pursuing or solving the problem. If problems are to be assessed for their significance some criteria must be brought to bear. These criteria include, e.g., heuristic value, programmatic sequencing, social utility, scientific interest, and the convenience and concern of the researcher or developer. These criteria will be defined later in the worksheet on objectives.

References

Kerlinger, F. N. (1973). Foundations of behavioral research (2nd ed.). New York: Halt, Rinehart & Winston.

WORK SHEET B

RELATED RESEARCH AND LITERATURE

David L. Clark

This worksheet does not deal with a design task. Instead it discusses an instrumental activity which serves all of the steps you will be taking in the design process. To obtain a perspective on this activity, let's dispel a few common misunderstandings surrounding the use of related research and literature, to wit:

- Your research ought to be novel, i.e., unique to its field of inquiry.

- A review of related research ought to be included as a

  section or chapter in a research study.

- The most important part of a research review is the summarization of findings from previous studies.

Perspectives on Related Research

Novelty. The whole mindset of a "unique" study gets you off on the wrong foot in mounting a review of research. The advantaged researcher is one who can place her/his study in a tradition of inquiry which has preceded it. At the other extreme of the hypothetical continuum of uniqueness, your study may, in fact, be an actual replication of a previous investigation. Neophyte researchers often form or are counseled to the opinion that not discovering prior research on the topic of a study represents the ultimate goal of a research review. Nonsense! You want to build upon, contrast with, modify, verify, or deny the ever—growing knowledge base in your field of study. The more work that has preceded you, the more help that is available to you.

Discreteness. You should never set out on your review of research and literature with the notion that you are writing a chapter, or a monograph, or an article. The review is an instrumental activity not an end in itself. The establishment of the existence of a problem (the initial design activity which was discussed in Worksheet A) illustrates this point perfectly. Either or both the principal and interacting propositions are established as credible by the knowledge base of the field. As they are discussed, relevant research is cited. When you feel comfortable with those propostions you begin speculating about the interaction between the two. Are all speculations equally plausible? Of course not, and one of the ways in which you can distinguish among them is on the basis of the results of previous studies. If the personal characteristics of school leaders have consistently shown no relationship to the performance of teachers or students in schools, that would seem to be an unlikely speculation to explain the existence of maverick urban schools. On the other hand, leader behaviors may have shown a modest or strong relationship —— suggesting this as a more likely direction.

The central point of this argument is that you are using the review of research to design and carry out your study. Instrumental activities should not be viewed apart from their service function. If occasionally a review can be used as a unique synthesis of knowledge so much the better. Most of them cannot be so justified, but many are, nonetheless, still treated by the researcher as if they were unique contributions.

Focus.   Reviews of research tend to be focused on findings of previous studies. Findings may help you establish the existence of a problem. From time—to—time you may even be able to compare your findings with one or more previous studies. But the function of the review is to help you at each of your design steps: choosing a logical structure, framing objectives and questions, devising appropriate procedures. You should enter the review task with this broad net in mind so that you at least have a chance of capturing relevant data in each category.

A Strategy for the Task

If you want to use the work of previous and contemporary authors to best serve your purposes in designing and carrying out your study, you need a search strategy. Chart B-i is designed to be used to formulate such a strategy. The left—hand column notes that the review can unearth a variety of data from the sources which are used, i.e., what was learned in the study, what theoretical or logical perspectives were employed, what procedures were followed, and even how the study was managed and staged. The nine columns of sources suggest that you have many places to turn for assistance and the often—noted phrase in the research designs of neophytes, ". . . directly related studies were found. . . .", usually reflects a weak search strategy, not a paucity of related literature. The functional dimension stretches beyond describing the sources to evaluating and relating them. Unless you have a feel for the quality of the previous research, i.e., unless you can evaluate it, its meaning to your study is obscure. Would it make sense to adapt an invalid instrument? And finally you need to decide what is, in fact, relevant or the review becomes a kind of garbage can for your 3 x 5 cards.

Conventional Research Review. Now contrast Chart B—i with most reviews of research which you have read. Conventional reviews tend to concentrate almost exclusively on findings (Row 1). They emphasize directly related studies, i.e., Rand D reports, and fall back on the general literature as a weak second choice. They are generally descriptive; seldom evaluating previous work; sometimes relating it to the current inquiry. You could capture most of what occurs in such reviews in one cell of the chart.

Widening the Net. We have already discussed briefly the utility of focusing on all aspects of previous studies and reports and the necessity of evaluating and relating as well as describing. But he sources themselves deserve additional definition:

Treatment of Data

Describe	Evaluate	Relate

Source of Data

Foci of Data	Rand D Reports		General Literature				Contemporary Events		
	Directly Related Studies	Analogous Studies	Problem Delineation	Commentary	Exhortation	Narration	Studies	Literature	Practice
Content of the study-finding	1	2	1	2	2	1-2	2	1-2	1-2
Perspective of the study-logical structure	1	1	2	2	3	2	1	2	3
Procedures of the study	1	1	3	1-3	3	3	1	3	
Logistics of the study	1	1	3	1-3	3		1	3	3

Key:

1- Likely data source

2- Possible data source

3- Unlikely data source

Chart B-1. Dimensions to be included in a comprehensive review of related research.

- *Directly related studies* — This sources need little comment. Within your field of concern, e.g., educational administration, you will find a set of studies dealing with your problem area, let's say school level leadership behavior. You would be unlikely to miss these and no one would argue that they are not highly relevant to your task.

- *Analogous studies* — you are much more likely to miss studies which are less directly related to your topic. Continuing with the leadership example, you should consider the more general literature on leadership in non-school settings as analogous reports. If you turned initially to studies reported in the *Educational Administration Quarterly* you should move secondarily to a journal such as the *Administrative Science Quarterly*. The *Handbook of Research on Leadership* might turn out to be more important than, for example, a summary of research on the principalship.

- *General literature* — holding no special brief for the subclassifications used here, this category represents usable, ordinary knowledge of interest to researchers. Many books and periodicals attempt to delineate the conditions in or problems of the field experientially or theoretically. Other authors are engaged in more general commentary which may be used, e.g., research methodologists write texts and technical tracts which occasionally may be of key importance to a given study. The literature of exhortation frequently signals calls for change in the field while the literature of narration includes descriptions of practice, often either formal or informal case studies.

- *Contemporary events* — The third cluster of columns describes non-published sources which, if available to the inquirer, could add a critical contextual dimension to a study. Well- established researchers can access these sources through an informal network of colleagues. Less experienced researchers often have to rely on more standard techniques, e.g., current convention programs, listings of recent foundation and contract grants, Science Information Exchange of the Smithsonian.

Establishing Priorities. In Chart B-l an effort has been made to place a priority on the data which are likely to be obtained from various sources. Feel free to argue about the priorities; they do vary somewhat from study to study. One or two examples will give you an understanding of how they were determined, e.g.:

- Findings from directly related studies are classified as a "1" in row 1. Analogous studies are classified "2." This is because findings from the latter require interpretation or inferential logic when applied to education. In contrast, there is less interpretation involved in a adapting a logical structure or an instrument or a technique so analogous studies are classified as "l"'s in rows 2, 3, and 4.

- The problem delineation literature is noted as a "1" in the first row because it so often employs techniques of synthesis or aggregation of prior work and often tends to be applicable directly to the step of problem delineation in your study.

- Contemporary studies, if they can be accessed, are noted as more likely to contribute information on structures or procedure than on findings since they would be expected to be unfinished.

Devising a Strategy Assume that you have modified the priorities in Chart B-1 to fit your study, what can you infer as an optimal strategy for proceeding. I would suggest:

1. Your major concern in the limited time you can devote to the review of research should be on the cells designated as "l"'s.

2. Within that category you should begin with easy access sources — that usually means the already published material and the material in your own field.

3. You can often use the cells of easy access as bridges to the more difficult sources, e.g., a researcher with a continuous record of publication in a field may be a good bet for an informal contact on contemporary studies in the field. The danger to be avoided in using this strategy is that some fields or traditions of research are so parochial in their view as to suggest that there is no analogous literature when it does exist.

4. Play the chart horizontally as well as vertically. If you have generated an adequate problem statement, ask yourself specifically which sources (some of which you will not have examined intensively) might yield the most help in choosing a logical structure. The chart recommends that analogic and current studies are now of greater importance (assigned a "1" instead of a "2") while directly related studies retain their "1" classification.

An Assessment of a Research Review

Can you now tell a good review of research and literature from a bad one? A good effort has some identifiable characteristics:

- It contributes to all aspects of the research design — it is not findings—bound.

- A wide variety of data sources have been used. Analogous as well as directly related studies are included. The researcher has not ignored the general literature of the field while emphasizing the research literature.

- An effort has been made to find and use the most recent knowledge base which can be accessed.

- The researcher is critical of the data sources. (S)he distinguishes between adequate and inadequate studies, using the former and discarding the latter.

- The sources employed are directly relevant to the research effort of the current study. The effort at comprehensiveness has been tempered with selectivity.

Worksheet C

LOGICAL STRUCTURE: A PERSPECTIVE ON THE STUDY

David L. Clark

The logical structure of theoretical framework for a study should accomplish two purposes in the design of the inquiry:

1. Posit a vantage point, a perspective, a set of glasses through which the researcher will view the problem. The adoption of an explicit perspective recognizes that an inquirer in typically unable to examine a problem from all perspectives simultaneously. This broad view on the problem will be labeled as the study's macro-structure.

2. Specify the terms and relationships within which the problem is to be formulated and solved. This step involves: inventorying the basic concepts or clusters of variables which are the focus of the study; defining concepts or variables for which the meaning is not self— evident; and relating the concepts and variables to one another as they will be examined in the study. This level of structural specification will be referred to as the study's micro-structure.

The Macro-structure —— Adopting the Basic Perspective

Inexperienced researchers are frequently put off by the complexity suggested by such terms as theoretical framework or logical structure. They need not be. Every sub-field of specialization generates macro—structures while researchers, and sometimes practitioners, use repeatedly in their work. For example, in the study of administration the Weberian model of bureaucratic organization dominated the field for literally decades giving rise to substructures which ranged from time and motion studies to role theory studies to investigations of increasing subordinate productivity by manipulating job descriptions and extrinsic rewards.

From the early 1950's to the late '60's a genre of alternative structures emerged which placed greater emphasis on the study of the individual in the organization. Sociologists discussed informal organization. Argyris related organizational roles to the needs and expectations of adulthood. McGregor popularized the terms Theory X and Theory Y. None of these structures was more popular than the Getzels—Guba Model which asserted that every organization exhibits idiographic (individual) and nomothetic (institutional) dimensions, which when they are in or out of balance determine organizational behavior.

More recently, organizational theorists are generating a plethora of models which argue that the essential characteristics of an organization are not captured by viewing the organization as a bureaucratic system. These theorists now provide structures as diverse as Ouchi's Theory Z, Weick's loosely coupled systems, March, Cohen and Olsen's organized anarchies, and such other depictions of organizations as incentive exchange systems, clans and collectives.

The intent of this worksheet is not to provide you with a cursory review of the theories of administration. The foregoing illustrations were designed to illustrate that fields of study abound with logical structures and theoretical frameworks. And these

diverse framworks focus your attention on different aspects of your problem. Researchers employing a bureaucratic model tend not to focus on loose coupling. If they discover the phenomenon, it would be likely to be classified as a system malfunction. Does that make the Weberian perspective inappropriate for organizational studies? Definitely not — it depends upon the problem being investigated. The Weberian perspective, for example, ought to have high yield in studies of interactions near the apex of the hierarchy, e.g., superintendent—school board relations. It might be much less appropriate in an arena of high political volatility, e.g., collective negotiations. What can we say so far about macro-structures:

1. They are numerous. Macro-structures are the devices through which theoreticians, researchers, and practitioners try to make sense out of their too-complex worlds.

2. Macro-structures are reconstructed logics, simplifications of the world about us. Nothing ever happens exactly as is pictured by the structure.

3. They are partial views of the area being studied. The user must assess the degree of fit between a particular structure and her/his problem.

4. Macro-structures can be viewed as competing or complementary perspectives. Advocates tend to the former view, users the latter.

5. The great utility of macro-structures in research is that they make explicit the limitations which the observer brings to the observation of the phenomenon being studied. The observer, then, has the opportunity to assess the appropriateness of fit and/or trade-offs involved in employing a particular structure.

Now suppose that after accepting the desirability, even the necessity, of a macro-structure for your research designing you find your paper and your head blank. What sources are available to support an inquirer in inventorying macro-structures that might be appropriate for his/her design tasks? Previous research studies are an obvious source. These inquiries will have employed either implicit or explicit structures which were pertinent to their inquiry. This data source is especially useful since the appropriateness and heuristic value of particular structures can be examined in action. Knowledge syntheses in various fields will almost inevitably review the major structures used in the field. Advanced texts are common sources of this information. Even better are the handbooks which have become common in the last 20 years, e.g., *Handbook of Research on Teaching* (Travers, 1973), *Handbook of Leadership* (Stogdill, 1974). Frequently an individual researcher or group of researchers take on the task of updating the knowledge base in their field as, for example, the Havelock summary of the literature on the change process (1969) or the Averch et.al. summary of research on school effectiveness (1972). These syntheses are likely to assist you by commenting critically on the available structures as well as describing or inventorying them.

To this point the worksheet may have led you to the conclusion that you will simply adopt an existing perspective. That is not necessarily the case. You may adapt an existing structure as, for example, Ned Flanders did when he borrowed from Bales' interaction analysis model in social psychology the elements of a new model for use in classroom observation. Or you may piece together more than a single structure or sub-

parts of two or more structures to fit your problem. Occasionally, you may be forced to attempt to invent a structure of your use. This latter strategy, however, often forces you to revise your research thrust and concentrate initially on the theory construction necessary to support your empirical work.

The Micro-structure —— Specifying the Basic Constructs of the Study

By now you have moved solidly into your design task. You have:

1.   Established the existence of a problem.

2.   Speculated about why the problem exists.

3.   Asserted a perspective for viewing the problem.

The micro-structure is your first effort at synthesis in the study's design. The intent of the micro-structure is to specify the key terms and relationships within which the problem will be formulated and solved. The search for those key terms and relationships be although it does not end, with the material you have already developed.

Step one in constructing a micro-structure is a content analysis of your principal and interacting propositions. Stripped of their explanatory and background material, the key elements in these propositions are almost certainly concepts that will be central to the study. Step two in building the micro-structure is a selection of those speculations or elements of the speculations which are of most interest to you in the study. You may wish to consider this a temporary choice which will be re-examined as the design steps progress but you should nonetheless exercise the choice. Step three is an integrative and modificatory process. You need to assess the key concepts against the macro-structure which you have chosen since particular structures will highlight some concepts and deemphasize others. The purpose of these three steps is to inventory the key concepts (variables) of your study. Although the heart of the inventory is in your own material, you should also turn to other empirical studies in the area and examine the variables on which they focused. This may modify your inventory and may even suggest that the earlier steps you took, e.g., your speculations, were incomplete.

Let's move back to the first example in Worksheet A and demonstrate briefly how the foregoing process might work:

A. *Principal proposition* - core city urban schools which draw heavily from lower socio-economic level student populations are characterized by low student achievement, low staff morale, high rates of absenteeism, high vandalism.

B. *Interacting proposition* - a significantly large number, although a low percentage of such schools, are average or better on all or most of the characteristics noted in the principal proposition.

C. *Speculative proposition(s)* - unanticipated achievement may be caused by leader (principal) behavior; teacher characteristics; special funding provisions; school—community relationships; curricular structure or materials; etc.

The principal proposition suggests the primary focus of observation, i.e., core city urban schools, and a list of variables that characterize them:

1. low student achievement,

2. low staff morale,

3. high absenteeism, and

4. high vandalism.

The interacting proposition, in the form of a provocative exception, adds no new concepts but simply affirms the status of (1-4) as variables in such schools. The speculative proposition lists five new concepts (or variables) in such schools and I will add to my inventory only one of these items on which I intend to focus, i.e.:

5. leader behavior.

My inventory is now taking shape and I need to modify it in light of my macro-structure. Let's assume for simplicity that I chose to examine the problem using the venerable structure which emerged from the Ohio State leadership studies of the 1950's, i.e., initiating structure and consideration. I can now extend my basic inventory of concepts to seven:

6. initiating structure, and

7. consideration.

With the inventory in hand, I must turn my attention to the task of defining. At this stage in my design, I am not responsible for generating operational definitions. I am responsible for (a) providing informative, clarifying definitions of unfamiliar terms and (b) offering definitions of focus which will be employed in the study. In the former category, it would probably be helpful to include a classical definition of initiating structure, i.e., refers to the leader's behavior in delineating the relationship between himself and the members of his work group, an in endeavoring to establish well-defined patterns of organization, channels of communication; and methods of procedure" (Halpin, 1966, p. 86). I might also choose to offer a definition of focus on the concept initiating structure by specifying my interest in subordinates' perceptions rather than observations of leader behavior. In contrast, it is neither necessary nor appropriate at this stage in my design to operationally define this concept as an output of the Leader Behavior Development Questionnaire. In the same way, I may wish to define student achievement as fitting the recent research tradition of instructionally effective schools, i.e., the performance of students from lower socio-economic backgrounds in basic skills, but I would not invest time and energy in attempting to specify how such performance would be measured.

My third responsibility is to relate the concepts and variables to one another as they will be examined in the study. This is not a procedurally oriented design but an overview of the relationships are of primary interest to me. In this case, I am speculating that leader behavior may modify student achievement, staff morale, absenteeism, and vandalism. I could picture the main effect of my study, thusly

Perceived leader behavior

    (a)   Initiating structure   student achievement

                                     staff morale

    (b)   Consideration   rate of absenteeism

                                       rate of vandalism

This modest effort at relating doesn't settle the design of the study at all. I may end up placing primary emphasis on descriptions of leader behavior - perhaps in only a single school. I may wish to examine many schools at various levels of achievement, morale, etc. and place my focus on the relationship between the two sets of variables. My crude effort at relating does suggest that there are other variables (at least the additional four in the speculative proposition) which will be relevant to the relationship I have posited. At this point in time, my effort at relating has resulted in an ordering of the concepts central to the study.

End Notes

    * Dealing with a logical structure or theoretical framework may feel unfamiliar to you. However, it is a step you will take implicitly or explicitly. You will adopt a perspective through which to view the problem. No inquirer can investigate a problem from all perspectives simultaneously. This design step allows you to clarify your perspective to yourself and others.

    * The more that is known in a problem area, the tighter the structures or perspectives that can be posited. The less that is known the looser will have to be the perspective.

    * Logical structures are often achievements of inquiry as well as guide posts to inquiry. As you proceed to work through your problem you may modify, re—structure, even abandon what seems to be an appropriate a prior structure. Logical structures are argued by inquirers employing naturalistic methodology to always be the outcome of the inquiry, i.e., to emerge from the data of the study.

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WORKSHEET D

OBJECTIVES AND QUESTIONS

David L. Clark

Once a problem is established and a conceptual framework has been explicated, the inquirer is ready to grapple with the issue of which, among many possible, objectives s/he will focus upon in the study. The key to understanding this step in the inquiry process is that every objective (correctly framed) has two aspects: <u>action</u> and <u>content.</u> So, for example, an evaluation study might pose the objective, "to determine the effect of PSSC physics materials on science achievement." The action aspect is represented by the phrase, "to determine," while the content aspect is "the effect of PSSC physics materials on science achievement."

Defining the Objectives

The objectives of a proposal delineate the ends or aims which the inquirer seeks to bring about as a result of completing the research, development, or evaluation undertaken. An objective may be thought of either as a solution to the problem or as a step along the way of achieving a solution; an end state to be achieved in relation to the problem. The sentence often used as a problem statement, i.e., "The purpose of this project is to ," is properly completed by the insertion of the objectives.

Generating Objectives

Any given inquiry is likely to have several objectives and these objectives could, obviously, be displayed in the form of a matrix or gird if the objective were broken into its action and content aspects. A two way table would be formed — the rows of which would be defined by the action aspects and the columns defined by the content aspects.

Where would the particular row and column headings come from? From the preceding discussion it should be clear that column headings (content aspects) would be derived from the problem and the conceptual framework. Thus, column headings will differ from study to study.

Row headings, dealing with action aspects, are not nearly so variable as noted in Chart D-l. The number of possible actions available to a researcher or a developer is finite. If it were possible to develop a taxonomy of such research or development actions, then this taxonomy, when set against the conceptual framework in the proposal, <u>would generate all possible objectives explicitly and make it possible to choose from among them in some systematic way</u>.

When a researcher first approaches a new area about which almost nothing is known, all that can be done is to develop phenomenoligical descriptions. The researcher may describe what he/she sees in terms of certain variables (the beginnings of a conceptual framework) and may make efforts to determine their amounts. Such qualitative and quantitative descriptions will be termed <u>depicting</u> the first category of the research taxonomy. Once description has occurred in some detail, then it is possible to <u>relate</u> the various depictions qualitatively, by comparison and contrast, or quantitatively, through correlational and related techniques. When certain relationships have been established, a next step is to account for them through the development of conceptual

frameworks in terms of which the relationships may be predicted, understood, and controlled. This process will be termed conceptualization and may be carried out either analytically or synthetically. Finally, the conceptualizations will yield certain hypotheses which can be confirmed or rejected for the phenomenological world; this process will be termed testing.

The thrust of this argument is not that the particular four terms chosen are the necessary or even the best depiction of the possible actions that might be taken, but rather that such actions are finite and, consequently, can be used conveniently to assess the full range of objectives that might hypothetically be posed for any given study. The terms are gross and may be made more operational by the following sub—classification of possible research actions:

Chart D-1

Inventory of Possible R, D, & E Actions Which Can Be Employed by Inquirers

Major Terms	Minor Terms	Synonyms
Depict	Describe (qual.)	Identify, define, distinguish, determine, limit.
	Estimate (quant.)	Appraise, rate, count, rank, measure, standardize, norm, extrapolate.
Relate	Compare (qual.)	Liken, contrast, collate, match.
	Correlate (quant.)	Connect, associate, regress.
Conceptualize	Analyze	Examine, categorize, abstract, reduce, deduce.
	Synthesize	Prepare, develop, construct, systematize, compose, assemble, induce.
	Reproduce	Model, analogize, devise, metaphors.
Test	------------------	Confirm, resolve, substantiate, verify, disprove.

To assist in generating objectives, you may wish to construct a two way table which portrays action aspects on the vertical dimension and content aspects on the horizontal. This step has the advantage of testing the adequacy of decisions arrived at in

the choice of objectives, e.g., are key substantive terms noted on the horizontal dimension missing altogether from the objectives? was this a matter of explicit choice? does this indicate a weakness in the problem or framework sections? are there new entries not noted in the previous sections? might it be possible to compare rather than simply describe? etc.

These steps should, of course, assist substantially in justifying the objectives selected finally for the inquiry. Although there are no hard and fast criteria which can be employed to assess the relative merits of competing objectives, the following may be of assistance to the inquirer:

1. Heuristic value The researcher should choose those objectives which, in comparison to the others, give most promise of opening the field fully and leading quickly to useful insights.

2. Programmatic value A particular piece of research or development, while having its own starting and stopping place, may be related programmatically to other research or development already completed, currently underway, or projected. Certain objectives may therefore be chosen over others because they help to complete the mosaic of earlier research in an orderly way, because they are logical next steps in the emerging pattern, or because they lay a foundation for projected work.

3. Social utility This criterion has differential import for research and development. In the case of development, practical utility is of paramount importance. Development, by definition, is carried on to provide solutions to operating problems; the social utility of development must therefore be high. Given two alternative objectives for development, the one with the higher social utility obviously has precedence. In the case of research, utility has a lower priority. Some of the most significant research findings have emerged from studies which had little if any apparent connection to the practical world. Nevertheless, all other things being equal, even the researcher would probably choose an objective of social significance in preference to one without such significance.

4. Scientific interest This criterion is, in a way, the analog of the criterion of social utility. It has comparatively little import for development but a great deal of meaning for researcher. Research is concerned with adding to or extending knowledge, which is the scientific domain. Hence objectives which are likely to contribute most directly to the major concerns and issues of the scientific community should have precedence over other objectives. The developer is less concerned with whether his work has any impact on the scientific community but would, all other things being equal, choose that objective which is likely to have some utility for advancing science.

5. Personal interest and convenience Lacking any more compelling basis for choosing among objectives, the researcher or developer may turn to considerations of his/her personal interest and convenience. Interest is likely to have already been served through the choice of the problem, but even among the objectives, some are likely to be more interesting to pursue than are others. It will certainly be the case that some will be more convenient to pursue: less costly, subjects closer by, timing more easily accomplished, and the like. These considerations, while admittedly personal, are nevertheless legitimate, although it is obvious that they must be applied in a context in which the other criteria listed above have received first consideration.

<u>Defining Questions</u>

The statement of questions or hypotheses is actually a two—step process, i.e.:

a) Selecting the key questions to be pursued from among several questions appropriate to the objectives.

b) Operationalizing the definitions that will be employed for the major variables in the study in preparation for describing the design, instrumentation, and analysis appropriate to the inquiry.

In research studies, the term hypothesis implies a derivation, within a hypothetic—deductive theoretical system, of a particular assertion or prediction. The hypothesis is subject to test, i.e., to confirmation or rejection on empirical grounds. The term question implies an interrogative statement which can be answered by data, which is logically related to some conceptual framework, but which does not necessarily stem from the framework through logical deduction. Hypotheses then are developed when the degree of sophistication of the conceptual framework is high, approximating that of a hypothetico-deductive theory. Questions are appropriate when the degree of sophistication is low and rigorous deductions are therefore not possible.

In the case of development, the hypotheses or questions are usually more appropriately called design specifications. Some problem solution is to be developed. If the development functions properly, it will alleviate or eliminate the problem, or produce some new desired outcome. The specifications of the mode of operation of the new development, and the outcomes expected from it, are in every sense design specifications, just as are, for example, statements indicating the form to be taken by a new prototype carburetor and the ways in which that carburetor should function.

Generating Hypotheses and Questions

Questions or hypotheses flow from the conceptual framework, as noted earlier. They represent a further narrowing of the objectives, and a further step toward operationalizing what is to be done (a preview of the procedures). Whether one asks questions or tests hypotheses depends upon which action stage of the research process is involved; thus depicting or relating are typically concerned with answering questions (although they may be involved as a step in testing) while testing is usually concerned with hypotheses. In either event, the questions or hypotheses do not just arise by chance; they are the definite consequences of the conceptual framework which has been brought to bear on the problem.

Figure D-l is designed to serve as a guide in relating the questions or hypotheses directly to the statement of objectives. On a separate sheet of paper, you should record the objectives row-by- row just as they were stated in the proposal. Column two asks you to consider whether the objective suggests multiple questions which could be pursued. If the answer to that question is "yes," as is usually the case, you should record the several questions or hypotheses suggested by the objective. It is from among this population of questions that you will choose those that you, in fact, intend to pursue. Column four queries whether alternative operational definitions are possible for the key terms of the question. Again, the answer is almost always "yes" and the questions need to be re-

framed so that the operational definitions of the key variables to be pursued in the study are made explicit.

Figure D-1

Checklist Grid for Generating Questions

(1) List of Objects Chosen for the Study	(2) Are Multiple Question Appropriate to the Objectives?		(3) List of Re-framed, Operationally Defined Questions and Hypotheses	(4) Are Multiple Operational Definitions Possible for Key Terms?	
	YES	NO		YES	NO
1.			1.		
			2.		
2.			3.		
			4.		
			5.		
3.			6.		
4.			7.		
			8.		
n.			n.		

WORKSHEET E

PROCEDURES

David L. Clark

The discussion to this point has been concerned almost exclusively with ends. At some point in thinking through a proposal a researcher or developer must turn to the question of means. Just what steps will be involved in accomplishing the research or development objectives?

More attention has been given to the development of procedures than to any other aspect of the research process. At the conclusion of this worksheet you will find a set of supplementary readings which briefly sample this rather extensive literature. The worksheets will not attempt to duplicate this literature; it is already available to you in comprehensive and comprehensible form. The intent of the worksheet "Procedures" is to provide you with a strategic "feel" for approaching the task of laying out the procedures to be followed in your study and to suggest some general tactics which can be followed in accomplishing this task.

Defining the Procedures

The procedures are the operational blueprint which the inquirer will follow in completing the proposed study, i.e., in accomplishing the objectives of the study. Their adequacy or inadequacy will determine the success of the project but they deal with the "how" not the "what" or "why" of the research. Procedures are a necessary but not sufficient condition for a successful inquiry. They have no power to make a silk pursue from a sow's ear. They can, conversely, make sows' ears of silk purses.

The procedural description must account for (1) the variables to be considered and the conditions to be controlled or manipulated in the study; (2) the sources of data to be used in the inquiry; (3) the sample to be involved in the study; (4) the data collection procedures to be followed; (5) the analysis to which the data will be subjected; (6) the managerial, logistical, and scheduling features of the study.

These supplementary readings differ from those included in previous worksheets. You are not expected to read the selections but, rather, to chose those germane to your problem, e.g., Measuring Human Behavior may be a useful tool document if you are searching for an appropriate instrument in the fields covered by the volume; Futurism in Education will be of significance to you if your study requires further methodology; the several chapters of Kerlinger introduce and survey methods that may be useful to you. There are a view references that are included because they treat general topics in inquiry methodology. These may be of common interest and are asterisked to designate their general character.

Functions of the Procedural Statement

1) Outlining —— to outline the overall research design within which the inquiry will be conducted or the action plan within which the development will be effected.

2) Detailing —— to detail the research design or action plan sufficiently to show how the integrity of the research findings or developments will be safeguarded

(maintaining internal validity) and how their generalizability to populations of interest will be preserved (maintaining external validity).

3) Operationalizing —— to make operational the variables or conditions in the investigation or development by specifying the instrumentation or the techniques of instrument development including their selection or development.

4) Analyzing —— to posit the analytic scheme or framework which will be employed in treating the data generated by the inquiry in a method appropriate to test the hypotheses or questions of the study.

5) Organizing —— to describe the organizational plan, i.e., the work schedule or sequence of events and requisite resources that will be involved in conducting the research or effecting the development.

6. Qualifying —— to qualify the conclusions or generalizations which can be drawn fromt he research or development in terms of any special conditions inherent in the research design or action plan.

Common Deficiencies of Procedural Sections

—— The missing elements.

____ The overlooked data sources.

—— The project within a project (missing instrumentation).

—— The non—qualified, externally invalid study.

—— The great disclaimer.

—— The incomplete description.

—— Inappropriate or weak control decisions.

—— The inaccessible or invalid data source.

—— The over—reach study.

Generating a Procedural Statement

As noted earlier, rich resources exist in the literature of educational R and D an the social and behavioral sciences dealing with the technical questions confronted by the inquirer, especially in the "R" portion of R and D. There is no possibility that the worksheet can cover methodological or procedural matters in any such detail or, for that matter, that it could even touch upon the wide variety of inquiry methodologies which can be employed in a study. What it will attempt to do is to touch upon some elements of the procedural planning which commonly confront inquiries regardless of their problem area or methodological orientation.

The first suggestion is to take a step ignored by many inquirers and in many proposals, i.e., outlining the overall design of the inquiry and the procedural approach to be used in the study. There are obvious advantages in such an overview to the proposal reader; what is often overlooked are the advantages to the inquirer in delineating the forest before drawing in the trees. If you can describe succinctly and clearly the major components of the procedural section before attempting to detail the actual steps to be

followed in the study, you will have in hand a procedural map of your territory which can serve as a guide to you in wending your way through the myriad specific details that will surely arise in your procedural description. Imagine, if you will, that you are writing an abstract of the section; or that you are applying for a grant to an agency that requires a three to five page prospectus (one of which can normally be devoted to procedures) before deciding whether or not to invite the submission of a final proposal. The necessary points to be covered in the "outlining" section unfortunately cannot be specified for all proposals because of distinctions across methodologies. If you are fortunate enough to be using an experimental design in a field in which the methodology is well- developed, you could convey a significant amount of information by designating an "incomplete-block design" but no similar shorthand terminology would make sense in, for example, an historical inquiry, a development project, or, even, a normative survey. In general the overview should attempt to include:

1) Major variables to be covered in the study and conditions to be controlled or manipulated.

2) Major data sources to be tapped.

3) Scope of generalization sought in the study (i.e., population and sample).

4) Processes by which data is to be collected.

5) Treatments to which data will be subjected.

This list will, of course, have to be modified and in some cases supplemented to fulfill the objectives of outlining the procedures. But, it should, at least, be a starting point for your consideration in this task. The crucial question for you to ask is, "what, in the context of this study, must the reader and I know before proceeding to the level of detailing procedures and methodologies?"

Assume that the outlining step has been taken. How do you "get a handle" on the problem of detailing the procedures, operationalizing the variables, and positing an appropriate analytic scheme? As a first step, consider the intern of these functions. In a generic sense, borrowing from the terminology of experimental inquiry, you are attempting to establish the internal and external validity of your research or development effort; that is, in the case of internal validity to establish the fact that the findings or products have integrity and are not artifacts of extraneous variables within the system, and in the case of external validity that they are generalizable or applicable to the population specified in the study. Consequently, variables to be manipulated or controlled and the sample to be involved in the study are critical design elements. It is, of course, possible to inject sources of invalidity in the study through improper instrumentation or analysis or data sources or data gathering procedures but the question of variables and sampling and a prior problems to be considered.

Variables. In specifying the variables to be considered in the study you obviously have an inventory with which to begin from your own problem statement, logical structure, objectives, and questions. List them out. But then turn back to your literature search. What variables have been treated in previous studies in the area and in associated areas? Which have been:

1) Ignored as of no consequence in the investigation. Did this a prior decision turn out to be:

a) A good one, i.e., seemed to have no effect or raise no challenge to the study.

b) A bad one, i.e., resulting in a limitation or apology in the final report; or cited in critiques of the research as a limitation of the study.

2) Controlled in previous studies. It is reasonable to infer that investigators control variables that are likely to cause "noise" in their inquiry. If you have not considered such variables in your original inventory you should do so.

3) Observed or manipulated. The substantive results of previous studies should provide strong clues as to whether such variables should be considered likely, unlikely, or still ambiguous candidates for inclusion in your investigation.

The explicit generation of an inventory of variables provides the inquirer with one of the basic tools required to develop an appropriate procedural section. It does not, however, attend to the basic questions which will have to be confronted once the variables are identified, i.e.:

1) Will they be manipulated or controlled?

2) Which are feasible to manipulate and/or control?

3) What are the options for control, i.e., randomization, statistical control, assignment?

Population — Sample. The questions or hypotheses are the clue to the population and sample of the study. They have already specified, perhaps inappropriately or not feasibly, the population that will be required to achieve the stated level of generalizability of the inquiry. Begin, at least, with this population definition and ask yourself the following questions:

1. Is there any reason not to employ the entire population?

a) cost

b) accessibility

c) nature of question

d) nature of group to whom answer to addressed

e) convenience to subjects

2. If yes, do the questions suggest that the answers are or should be generalizable to the population which cannot be studied as a whole?

3. If yes, a sample is required. It will have to be specified and key questions on the nature of the sampling (randomness, efficiency, representativeness) will have to be specified.

If the variables and sample of the study are to be considered the design elements, then data sources, data collection processes, and sequencing and scheduling project events might be considered process elements.

Sources of Data. Almost all studies offer a wide range of possible data sources of varying characteristics. Begin inventorying possible data sources with an open mind for the most obvious primary data source may turn out, in fact, to be inefficient or ineffective or both. Census tracts might, at first consideration, seem to be an unattractive alternative to personal interviews until the feasibility and, in some instances, validity of the latter are considered. Criteria to employ after developing an inventory of data sources include:

1. Recency

2. Accessibility—convenience

3. validity

4. Reliability

5. Efficiency

6. Ethical considerations

7. Political considerations

8. Complementariness

9. Representativeness or diversity

Data Collection and Analytic Processes. The processes to be employed in data collection and analysis will have to be sufficiently detailed to cover four areas of concern:

1. Methodology to be employed in data collection.

2. Instrumentation to be used in data collection.

3. Implementation of the methodology and instrumentation, i.e., where, how, and when of the processes.

4. Recordings and treatments of data gathered.

The problems inherent in these four areas vary so much from project to project that generalizations about the problems are almost impossible. For example, in any given inquiry the instrument(s) needed to operationalize the variables of the study and gather basic study data may be commonly used and easily available, e.g., an achievement test, and the entire issue can be covered in a single sentence. Or an instrument may be available, but not commonly known or used, in which case a statement of its validity and reliability is required. Or an instrument might be adaptable to the inquiry, in which case the process of adaptation and requisite field testing of the effect of the adaptation may be necessary. Or instrumentation may have to be invented <u>de novo</u> in which case the inquirer is confronted with what amounts to a project within a project.

Sequencing and Scheduling Considerations. The complexities involved in scheduling and sequencing a study's events are obviously related directly to the scope of the inquiry. Many externally funded grants and contracts require detailed budgets, personnel projections, organizational plans, and work schedules. Most dissertations, in contrast, are relatively simple to sequence and schedule but still involve the same basic components. The fact that most of the work will be accomplished by one person in no way diminishes the utility of identifying the events necessary to be scheduled and completed, assessing their interrelationship (i.e., whether they are independent work tasks

or whether one constrains another), determining their cost, and estimating the time involved in their completion. One method of going about this, which has been refined for use in educational R and D is theProgram Evaluation and Review Technique (PERT) and references adequate to familiarize the investigator with the technique are provided at the end of this worksheet.

Summary.   Figure F-1is provided as a checklist which may be used by the inquirer to assess the sufficiency of the procedural section of the proposal. The vertical dimension simply repeats the major components of the procedural description of an inquiry. Along the horizontal dimension, the inquirer can insert the substance of the inquiry beginning with the major objectives, moving to the questions or hypotheses, and finally to the variables specified for the study. Each cell should, at the completion of the procedures section, be designated as either accounted for or not applicable.

Figure F-1

INVENTORY CHECKLIST OF SUFFICIENCY OF PROCEDURAL DESCRIPTION

| | Objective #1 | | | | | Objective #2 | | | | |
| | Ques. A | | Ques. B | | | Ques. A | Ques B. | | Ques.C | |
Components of Section	v-1	v-2	v-1	v-2	v-3	v-4	v-5	v-6	v-2	v-4
Conditions to be controlled										
Sources of data										
Data collection and analytic processes										
Sequencing and scheduling										

Supplementary Readings

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