

Selecting and defining a research topic

The research topic

Selecting and defining a research topic is the first step in applying the scientific method. and research topic (also called the research problem or purpose) provides focus and structure for the remaining steps in the scientific method; it is the thread that binds everything together. Selecting and defining a topic should entail considerable thought. An initial topic that is broad and complex often proves unmanageable for study, and the researcher must narrow its scope to implement or complete the study. When properly defined, the research topic reduces a study to a manageable size.

Identifying

A research topic

Throughout our school careers, we are taught to solve problems of various kinds. Ask people to list the 10 most important outcomes of education, and most will mention problem solving skills. Now, after many years of emphasis on solving problems, you face a research task that asks you to find, rather than solve, a

problem. If you are like most people, you have had little experience finding problems. For beginning researchers, selection of a problem is the most difficult step in the research process. thus, Some graduate students spend many anxiety-ridden days and sleepless nights worrying about where they are going to find a problem to address in their theses or dissertations.

The first step in selecting a research topic is to identify a general subject area that is related to your area of expertise and is of particular interest to you. Remember, you will be spending a great deal of time reading about and working with your chosen topic. Having one that interests you will help you maintain focus during the months of conducting your study.

Sources of Research Topics

You may be asking yourself, “Where do research topics, questions, purposes, or problems come from? Where should I look to ferret out topics to study?” The four main sources of research topics are theories, personal experiences, previous studies that can be replicated, and library searches.

1. Theories

The most meaningful problems are generally those derived from theories. A theory is an organized body of concepts, generalizations, and principles that can be investigated. Educationally relevant theories, such as theories of learning and behavior, can provide the inspiration for many research problems. For example, Jean Piaget posited that children's thinking develops in four stages: the sensorimotor stage (birth to approximately age 2 years), preoperational stage (approximately age 2 to 7 years), concrete operational stage (approximately age 7 to 11 years), and formal operational stage (approximately age 11 years and older). Piaget described tasks and behaviors that children can and cannot do at each stage. Whether aspects of Piaget's theory operate as suggested is a good basis for many possible research topics. For example, a researcher may explore certain factors that may affect the length of time children take to pass from one stage to the next.

Research focused on aspects of a theory is not only conceptually rich; such research also provides information that confirms or disconfirms one or more of those aspects and may suggest additional studies to test the theory further. Take a moment now to think of two other theories that are popular in education and, from them, identify a few topics to investigate.

2. Personal Experiences

Another common way to identify research topics is to examine some of the questions we commonly ask ourselves about education. Questions may arise when we participate in class discussion, read articles in local newspapers and educational journals, or interact with others. When we observe or read about schools, teachers, and programs, we should ask ourselves questions such as, “Why does that happen?” “What causes that?” “What would happen if . . . ?” and “How would a different group respond to this?” Normally we think only briefly about such questions before returning to our everyday business, but such questions are probably the most common source of research topics because they capture our interest. It is hard to imagine an educator who has never had a hunch about a better way to do something (e.g., increase learning or improve student behavior) or asked questions about a program or materials whose effectiveness was untested (e.g., questioning why a writing program was successful or why science materials were not).

3. Studies That Can Be Replicated

An additional source of research topics is previously published studies, many of which can be replicated. A replication is a repetition of a study using different subjects to retest its hypothesis. No single study, regardless of its focus or breadth, provides the certainty needed to assume that similar results occur in all or most similar situations. Progress through research usually comes from accumulated understandings and explanations, and replication is a tool to provide such accumulated information.

In most cases, the method of a replication is not identical to the original study. Rather, some feature or features of the original study are altered in an attempt to stretch or move beyond the original findings. For example, the researcher may select a different sample of participants for the replication in the hope of determining whether the results are the same as those found in the original study. Or the researcher may examine a different kind of community or student, use a different questionnaire, or apply a different method of data analysis. There are a variety of interesting and useful ways to replicate studies in the many domains of education. For example, a possible replication study may focus on how students' use of computers in classrooms affects their

achievement, and the study may extend original studies in the area by providing computers to children who have not previously had access to such technology.

Library Searches

Another commonly cited source for a research topic is a library search. Many students are encouraged to immerse themselves in the library and read voraciously in their areas of study until research topics emerge. Although some research topics may emerge from library immersion, they are considerably fewer than those emerging from theories, personal experiences, and previous studies. Trying to identify a topic amid the enormous possibilities in a library is akin to looking for a needle in a haystack sometimes we find it, but not very often. Clearly libraries are essential sources of information in the research process, but the library is most useful to the researcher after a topic has been narrowed. Then library resources can provide information to place the topic in perspective, reveal what researchers have already learned about the topic, and suggest methods for carrying out a study.

Narrowing the Topic

For most quantitative researchers and some qualitative researchers, the general topic area must be narrowed to a more specific, researchable one. A topic that is too broad can lead to grief. First, a broad topic enlarges the task of reviewing the related literature, likely resulting in many extra hours spent in the library. Second, broad topics complicate the organization of the literature review itself. Finally, and most important, a topic that is too broad tends to result in a study that is general, difficult to carry out, and difficult to interpret. Conversely, a well-defined, manageable problem results in a well-defined, manageable study.

Note that the appropriate time to narrow a topic differs for quantitative and qualitative approaches. Quantitative research typically requires that the researcher spell out a specific and manageable topic at the start of the research process. Conversely, for most qualitative research, the researcher often enters the research setting with only a general topic in mind. Following observation over a period of time, the qualitative researcher formulates a narrower research topic.

For ideas on narrowing your topic, you may begin by talking to your faculty advisors and to specialists in your area to solicit specific suggestions for study. You may also want to read sources that provide overviews of the current status of research in your topic area and search through handbooks that contain many chapters focused on research in a particular area.

Characteristics of Good Topics

Selecting a good topic is well worth the time and effort, and there is really no excuse for selecting a trite, overly narrow problem. Besides, it is generally to your advantage to select a worthwhile problem because you will certainly get a great deal more out of it professionally and academically. If the subsequent study is well conducted and reported, not only will you make a contribution to the existing knowledge base, but also you may find your work published in a professional journal. The potential personal benefits to be derived from publication include increased professional status and job opportunities, not to mention tremendous self-satisfaction.

First characteristic: Working with an interesting topic helps a researcher stay motivated during months of study. Being interesting, however, is only one characteristic of a good research topic.

A second characteristic: a fundamental characteristic of a good topic is that it is researchable. A researchable topic is one that can be investigated through collecting and analyzing data. Problems dealing with philosophical or ethical issues are not researchable. Research can assess how people feel about such issues, but it cannot resolve them. In education, many issues make great topics for debate (e.g., “Should prayer be allowed in the schools?”) but are not researchable problems; there is no way to resolve these issues through collecting and analyzing data. Generally, topics or questions that contain the word should cannot be answered by research of any kind because ultimately they are matters of opinion.

However, a slight wording change can turn an unsearchable topic into a researchable topic. For example, studies that examine the effects of school prayer on teachers and students, the effects of grouping practices on classroom learning, or the consequences of being held back in a grade can be carried out. Such studies, as worded, can tell us about the varied consequences of these practices. The decisions that any school or teacher makes regarding those

practices can then be based in part on those studies, but ultimately those decisions also involve issues that go beyond any research study.

A third characteristic of a good research topic is that it has theoretical or practical significance. People's definitions of significant vary, but a general rule of thumb is that a significant study is one that contributes in some way to the improvement or understanding of educational theory or practice.

A fourth characteristic of a good topic is that the research is ethical. That is, the research must not potentially harm the research participants. Harm encompasses not only physical danger but emotional danger as well.

A fifth important characteristic is that the topic is manageable for you. Choosing an interesting topic in an area in which you have expertise is not sufficient. You must choose a topic that you can investigate adequately, given your current level of research skill, the resources available to you, and the time you can commit to carrying out the study. The availability of appropriate participants and measuring instruments, for example, is an important consideration.

Stating the Research Topic

After you have selected and narrowed your research topic, you should draft a written statement of that topic. The way in which a topic is stated varies according to the type of research undertaken and the preferences of the researcher. As with other parts of the research process, the approach differs somewhat for quantitative and qualitative studies.

Stating Qualitative Research Topics

At this point in the research process, qualitative research topics often are stated in more general language than quantitative ones because Developing research questions breathes life into the research topic statements. To use a teaching analogy, it is like taking the aims of the lesson (the topic statement, broad statement of outcomes) and developing the instructional objectives for the lesson (the research questions, “bite-sized,” narrow questions). These research questions will also validate that you have a workable way to proceed with your research. There is a direct connection between the research question and the data collection strategies the researcher will use to answer the question. The research questions add another level of specificity to the development of the research and provide the researcher with an action plan for the development and

identification of research instruments.

Following are examples of research questions developed from the quantitative research topics.

■ “The topic to be investigated in this study is secondary teachers’ attitudes toward required after-school activities.”

Research questions: What are secondary teachers’ attitudes toward varsity athletics programs? What instructional strategies do secondary teachers use to accommodate student-athletes? How do these instructional strategies affect student achievement?

■ “The purpose of this study is to investigate the relation between school entrance age and reading comprehension skills of primary-level students.”

Research question:

What is the correlation between student entrance age at the beginning of primary school and their performance in reading comprehension at the end of first grade?

■ “The problem to be studied is the effect of wearing required school uniforms on the self-esteem of socioeconomically disadvantaged sixth-grade students.”

Research question: What is the effect of mandatory school uniforms

on the self-esteem of socioeconomically disadvantaged sixth-grade students?

Following are examples of research questions developed from the earlier qualitative research topics:

■ “The purpose of this study is to describe the nature of children’s engagement with mathematics. The intention is to gather details about children’s ways of entering into and sustaining their involvement with mathematics.” Research question: What strategies do children use to engage in learning mathematics? How do these strategies sustain student involvement in learning mathematics? How does being engaged with mathematics content affect student attitudes toward mathematics?

■ “This qualitative study examines how members of an organization identify, evaluate, and respond to organizational change. The study examines the events that members of an organization identify as significant change events and whether different events are seen as significant by subgroups in the organization.” Research questions: What are the unintended consequences of teacher involvement in the school-wide reform efforts? How do the school administrators involve teachers, students, and community members in the school-wide reform efforts? What

are the major challenges facing school administrators in building teacher support for the school-wide reform efforts?

■ “The purpose of this research is to study the social integration of children with disabilities in a general education third-grade class.”

Research questions: What instructional strategies do regular education teachers use to integrate children with learning disabilities into their general education third-grade class? How do regular education students accommodate children with learning disabilities in their regular classroom activities?

These examples illustrate the importance of translating qualitative and quantitative research topics into specific research

questions that provide the researcher with a methodological road map for how to proceed with the development of the research proposal.

Placement and Nature of the Topic Statement in a Study

It's helpful to understand how the topic statement is used in later stages of the research process. A statement of the topic is the first component of both a research plan and the completed research report, and it gives direction to the remaining aspects of both the plan and report.

The statement is accompanied by a presentation of the background of the topic, a justification for the study (i.e., a discussion of its significance) and, often, limitations of the study. The background includes information needed by readers to understand the nature of the topic. To provide a justification of the study, the researcher must explain how investigation of the research topic can contribute to educational theory or practice.

Thinking about the significance of your topic will help you develop a tentative hypothesis, which is a prediction about the research findings. A researcher typically uses the tentative hypothesis as a guiding hypothesis during the process of reviewing literature related to the research topic. In the example just given, a tentative hypothesis is that parent volunteers are equally as effective as salaried paraprofessionals. The tentative hypothesis is likely to be modified, even changed radically, as a result of the review of the literature, but it gives direction to the literature search and helps the

researcher narrow its scope to include only relevant topics. Clearly, it is important to develop a guiding hypothesis prior to starting your literature review.

Formulating and Stating a Hypothesis

A hypothesis is a researcher's prediction of the research findings, a statement of the researcher's expectation about the relations among the variables in the research topic. Many studies contain a number of variables, and it is not uncommon to have more than one hypothesis for a research topic. The researcher does not set out to prove a hypothesis but rather collects data that either support or do not support it. A written statement of your hypothesis will be part of your research plan and report.

Both quantitative and qualitative researchers deal with hypotheses, but the nature of each approach differs. We first discuss the quantitative use of hypotheses and then discuss the qualitative counterpart.

Definition and Purpose of Hypotheses in Quantitative Studies Hypotheses are essential to all quantitative research studies, with the possible exception of some survey studies whose purpose is to answer certain specific questions. A

quantitative researcher formulates a hypothesis before conducting the study because the nature of the study is determined by the hypothesis. Every aspect of the research is affected, including participants, measuring instruments, design, procedures, data analysis, and conclusions.

Hypotheses are typically derived from theories or from knowledge gained while reviewing the related literature, which often leads the researcher to expect a certain finding. For example, studies finding white chalk to be more effective than yellow chalk in teaching mathematics may lead a researcher to expect white chalk to be more effective in teaching physics as well, if there are no other findings to the contrary. Similarly, a theory suggesting that the ability to think abstractly is quite different for 10-year-olds than for 15-year-olds may lead a researcher to propose a hypothesis that 10- and 15-year-olds perform differently on tests of abstract reasoning.

Although all hypotheses are based on theory or previous knowledge and are aimed at extending knowledge, they are not all of equal worth. A number of criteria can be, and should be, applied to determine the value of a hypothesis. The following guidelines will help ensure that you develop a good research hypothesis.

1. A hypothesis should be based on a sound rationale. It should derive from previous research or theory and its confirmation or disconfirmation should contribute to educational theory or practice. Therefore, a major characteristic of a good hypothesis is that it is consistent with theory or previous research. The chances are slim that you'll be a Christopher Columbus of educational research who shows that something believed to be flat is really round! Of course, in areas of research where results are conflicting, your hypothesis won't be consistent with every study, but it should follow from the rule, not from the exception.

2. A good hypothesis provides a reasonable explanation for the predicted outcome. If your telephone is out of order, you may hypothesize that butterflies are sitting on your telephone wires, but such a hypothesis does not provide a reasonable explanation. More reasonable hypotheses are that you forgot to pay your bill or that a repair crew is working outside. As another example, a hypothesis suggesting that schoolchildren with freckles attend longer to tasks than schoolchildren without freckles does not provide a reasonable explanation for children's attention behavior. A hypothesis suggesting that children who eat a nutritious

breakfast pay attention longer than children who have no breakfast is more reasonable.

3. A good hypothesis states as clearly and concisely as possible the expected relation (or difference) between variables and defines those variables in operational, measurable terms. A simply but clearly stated hypothesis makes the relation easier for readers to understand, is simpler to test, and facilitates the formulation of conclusions. So the characteristics of a good hypothesis

1. A good hypothesis is based on sound reasoning that is consistent with theory or previous research.
2. A good hypothesis provides a reasonable explanation for the predicted outcome.
3. A good hypothesis clearly states the expected relation or difference between defined variables.
4. A good hypothesis is testable within a reasonable time frame.

Types of Hypotheses

Hypotheses can be classified in terms of how they are derived (i.e., inductive versus deductive hypotheses) or how they are stated (i.e., directional versus null hypotheses).

An inductive hypothesis is a generalization based on specific observations. The researcher observes that certain patterns or associations among variables occur in a number of situations and uses these tentative observations to form an inductive hypothesis.

For example, a researcher observes that, in some eighth-grade classrooms, students who take essay tests appear to show less test anxiety than those who take multiple-choice tests. This observation could become the basis for an inductive hypothesis. A deductive hypothesis, in contrast, is derived from theory and provides evidence that supports, expands, or contradicts the theory.

A research hypothesis states an expected relation or difference between variables. In other words, the quantitative researcher specifies the relation he or she expects to test in the research study. Research hypotheses can be non-directional or directional. A non-directional hypothesis states simply that a relation or difference between variables exists.

A directional hypothesis states the expected direction of the relation or difference. For example, a non-directional hypothesis

may state the following: The achievement of 10th-grade biology students who are instructed using interactive multimedia is significantly different than the achievement of those who receive regular instruction only.

The corresponding directional hypothesis may read:

Tenth-grade biology students who are instructed using interactive multimedia achieve at a higher level than those who receive regular instruction only.

The no directional hypothesis predicts a difference between the groups, whereas the directional hypothesis predicts not only the difference but also that the difference favors interactive media instruction. A directional hypothesis should be stated only if you have a basis for believing that the results will occur in the stated direction. No directional and directional hypotheses involve different types of statistical tests of significance.

Finally, a null hypothesis states that there is no significant relation or difference between variables. For example, a null hypothesis may be:

The achievement level of 10th-grade biology students who are instructed using interactive multimedia is not significantly different than the achievement level of those who receive regular instruction.

The null hypothesis is the hypothesis of choice when a

researcher has little research or theoretical support for a hypothesis. Also, statistical tests for the null hypothesis are more conservative than they are for directional hypotheses.

The disadvantage of null hypotheses is that they rarely express the researcher's true expectations based on literature, insights, and logic. Given that few studies can be designed to test for the nonexistence of a relation, it seems logical that most studies should not be based on a null hypothesis.