Practical and Applied Research

Writing & Methods for Students

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Chapter 3 Research Methods Overview: Qualitative, Quantitative, Mixed Methods

The Advanced Placement (AP) Research course project should include a research question, and students seek to answer that question using appropriate and ethical research methods, culminating in a paper, as well as an oral defense. (For more information on the course, see https://secure-media.collegeboard.org/digitalServices/pdf/ap/ap-course-overviews/ap-research-course-overview.pdf.)

In this chapter, we provide an overview of the kinds of practical educational research methods teachers might support students in using as part of the AP Research course or any other course where doing hands-on research is a component, methods that broaden out from library research and into more applied forms. Our goal is to focus on those that students can probably employ with fidelity, and to leave aside those that might or should require additional coursework and study (such as meta-analysis and grounded theory).

We begin with an overview of applied educational research methods that paints a broad picture of this mode of research. We then move into descriptions of quantitative (or statistical research methods), qualitative research methods, and mixed methods approaches, again focusing on those that are manageable by both high school students and teachers. Each section will include a review of typical types of research questions, what methods can be used to answer those questions, how to collect and analyze data, and some direction for writing up the results. In addition, we provide examples of studies that high school students might be able to undertake and references to additional resources, both for the methods we review and others that might be of interest. In all of these sections, we offer the "basics"; we suggest to dive more deeply into the different methods that readers look into research methods books (we provide some titles at the end of this chapter).

Applied Educational Research Paradigms

Applied research, in education and in other social sciences, is designed to allow the researcher to collect and analyze empirical data, to answer a research question. The term *empirical data* refers to data that are collected through observation or experimentation. All of us are involved, in our daily lives, in empirical data collection of some kind. When we track our weight, caloric input, and exercise, we are collecting empirical data that allow us to pursue healthy living. When school administrators track high school enrollment trends to determine how many sections are needed of specific courses and when those sections should be offered, they are using empirical data to assist them in their work. When teachers ask students for feedback on books or on particular instructional designs, they are using empirical data to help improve their instruction.

Similarly, researchers use empirical data to answer research questions. The type of data collected and how those data are analyzed will depend on the research question. For example, a few years ago, Leslie wanted to know how frequently teachers used certain instructional strategies in their teaching. She designed a survey that asked teachers to provide information about how many times they had used those strategies in the last six months. By calculating their responses – empirical data collected through the use of a survey and analyzed using descriptive statistics -- she was able to determine how popular those strategies were. When Leslie wanted to know about those teachers' perceptions about those strategies -- how much they liked them, when they chose to use them, and

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how they had learned them – she adopted a qualitative research method, interviewed the teachers, and analyzed the transcripts of the interviews.

When Lisa was completing her dissertation, she wanted to know about how much access and exposure students in Florida had to language arts practices. Because there are a lot of aspects of language arts—reading, writing, speaking, listening, presenting, etc.—and many sub-parts to each, she knew she would need a survey to capture the "how much" she was looking for. Lisa also knew that in order to get a general picture she would need to get information from a lot of different types of students; surveying students from one school would not be enough. She ended up using a 40-item survey with nearly 2,000 students! For her research question, a quantitative approach was the best choice.

In a different study, Lisa wanted to learn about how the first year of teaching went for beginning teachers that she had taught at the university level. In this case, she wanted their stories, so she interviewed them at their schools. Like Leslie's qualitative study, she transcribed what they said and then read, read, and re-read the transcripts to try to identify any patterns (themes) among the teachers.

Quantitative Versus Qualitative Research

Quantitative research methods, those that typically involve researchers in collecting and analyzing numerical data using statistics, are designed to answer questions about prediction and impact. Quantitative research typically involves analysis of numerical data and the adoption of an objective stance. Quantitative researchers may describe the features of the data using simple, *descriptive statistics*, including measures of central tendency and measures of spread. A measure of central tendency – such as mean, median, or mode – provides a single number that can be used to define a large set of data, and to show how the items in that data set cluster around a central position. For example, high school GPA is a measure of central tendency, showing an individual student's average grades across the high school courses taken. Measures of spread – such as range and variance -- help us to understand how variable the data are in a particular data set. Measures of spread and measures of central tendency are often provided together, so that the data set can be more fully understood. See Figure 1 for a visual representation.

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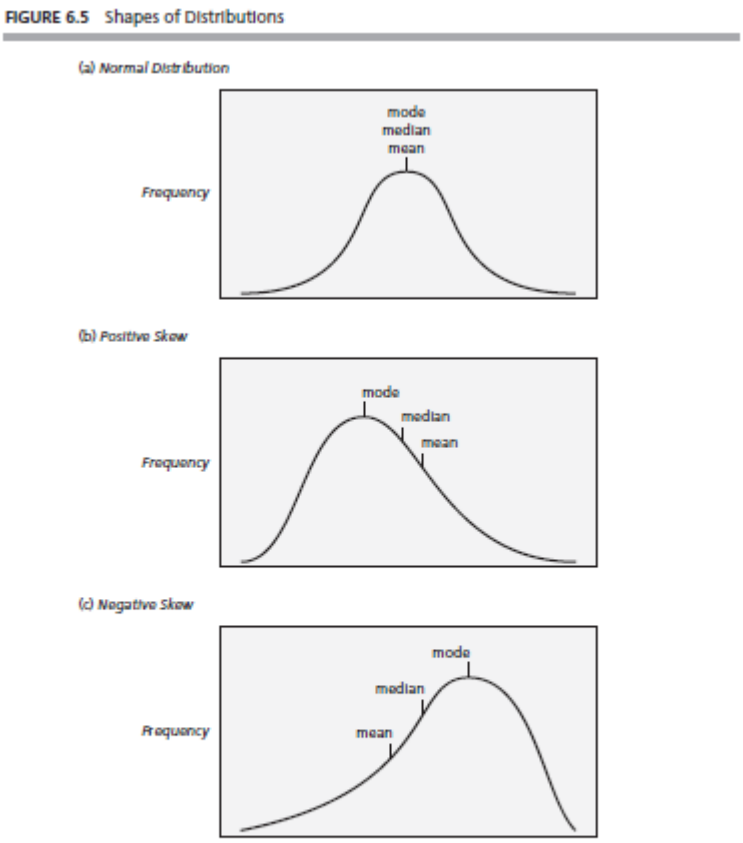

Figure 1. Shapes of Distributions

(source: http://researchmethodsx.blogspot.com/search/label/central%20tendency)

In addition to descriptive statistics, *inferential statistics* can be used to predict future results or investigate causal relationships, particularly when data from only a sample of the population are available. Inferential statistical methods allow researchers to make inferences about populations, based on data from only a sample of the full population. We will provide more information about the kinds of descriptive and inferential statistical methods that students and teachers might use in this chapter.

Qualitative research typically is designed to respond to questions that focus on processes (how) or that provide detailed views of a topic (what). In the 4th edition of *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, John Creswell and Cheryl Poth (2018) provide a summary of the distinct characteristics of qualitative forms of research. To help the reader understand the nature of qualitative research, Creswell and Poth note the following about data collection and analysis: "the collection of data in a natural setting sensitive to the people and placed

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under study, and data analysis that is both inductive and deductive and establishes patterns or themes" (p. 8).

Creswell describes some key characteristics of qualitative research (Creswell & Poth, 2018, pp. 42-44). First, qualitative research is typically field-focused, with natural settings providing contexts and sources of data. The researcher is considered the key instrument of data collection, with data collected in the form of words or pictures. Analysis of qualitative data is typically carried out inductively (going back and forth through the data to establish themes), with attention to details, focus on participants' language and meaning.

Mixed methods is as its name implies: it uses more than one method for data gathering and analysis. A typical example is when a researcher uses survey research to learn about a large number of people (quantitative) and then follows up the survey by interviewing selected respondents (qualitative) to learn more about the human element.

Whether your project leads you to choose quantitative, qualitative, or mixed methods, you should choose a similar series of steps, outlined in Chapter 6. In this chapter, we provide information about how to collect and analyze data, using several different research methodologies.

Some Quantitative Methods of Data Collection and Analysis

The most common forms of quantitative research that students might undertake are *survey* and *experimental*.

Survey Research

Survey research provides a numeric (quantitative) "description of trends, attitudes, or opinions of a population by studying a sample of that population" (Fowler, 2009, as cited in Creswell, 2014, p. 13). Surveys are commonly completed face-to-face via paper and pencil or online through tools like SurveyMonkey™ or platforms like Google Forms. Many students lean towards survey research because they think it is easy; however, creating a good survey takes time (graduate students take a semester-long course just to learn how to create survey appropriate for a dissertation or thesis). Survey questions need to be based on the research question and the literature/theory(ies) undergirding the research study. In addition, surveys need to be analyzed, and there are different types of analysis methods.

When using survey research, a researcher needs to think about all the potential answers he or she might want up front, before the survey is written. As an example, one student wanted to survey college students about visible tattoos and their impact on employment (i.e., does having visible tattoos hurt employment chances?). In a peer review session, after looking over the proposed survey questions, the student was asked about people with non-visible tattoos. What might the answer to that question reveal? He added the question, and it turned out to be a valuable source of data for him to include in analysis. If he had not considered the question, then his study would have ignored valuable responses (some people did in fact get non-visible tattoos because of how visible tattoos might impact their employment).

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In some cases, through their research, students will find published surveys in peer-reviewed journals, dissertations, or on websites (such as Pew Internet Research). Students should not use another person's survey exactly as written without permission; to do so is plagiarism. Time needs to be taken to write to the survey creator(s) explaining why and how the original survey will be used and asking for permission to use (or modify) it. In some cases, this might be hard to do, but students need to make the effort.[1] Most published articles include the author's email address and/or phone number. A simple Google search can also yield contact information. Whether used as is or modified, a sentence explaining this and giving credit to the original source should be in the research paper (see Chapter 6 for an explanation of a research study's sections).

The list below offers some questions to consider when designing survey research (refer to Creswell, 2014, pp. 156-157 for the full list).

- What are the purpose and reasons for choosing this design mentioned?
- Are the population and sampling procedures outlined?
- What type of scales will be used?
- What is the timeline for administering the survey?
- What are the variables in the study? Do they cross-reference with the research questions?
- What will data analysis look like? (analyze returns, descriptive analysis, collapse items, inferential statistics, interpretation, etc.)

Types of Sampling.

Ideally, survey research uses random sampling, where each individual in a given population (city, school, etc.) has an equal chance of being selected (Creswell, 2014); however, this is difficult for most high school students. Therefore, they often utilize convenience sampling, where being selected is based on convenience/availability. The main issue for student researchers, in Lisa's experience, is getting enough survey respondents—both in terms of overall numbers and response rate. If a student, for example, hands out 100 surveys and receives 50 back (50% return rate), that might not seem good to some; however, half of 100 is actually pretty good for some survey research. But, what if a student wants to get a broad range of responses and hands out 10 surveys and receives 8 back (80% return rate)? Is that acceptable? We would argue no; seeking broad participation does not mean only handing out 10 surveys.

Types of Survey Questions.

There are several types of survey questions, and survey questions need to be written to elicit the kind of information wanted by a researcher. We focus on a few types here that students might consider writing. First, *dichotomous questions*, have two options (Yes/No, True/False, etc.). These types of questions seem fairly easy to write, but mistakes can be made--like not providing a possible answer that is not listed. For example, many surveys in the past used to have a dichotomous question about gender: What is your gender? male or female? Having only two options excludes people who are might want to write "other" or "prefer not to say." When drafting survey questions, it is a good idea to have someone review the questions to make sure a possible answer is not omitted.

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A second type of survey question, nominal questions, have more than two answer choices but the answers are not ranked, where one is greater than or better than another. An example of this question might be "What is your hair color?" The survey would then list options such as blonde, black, brown, and gray. Again, researchers need to make sure that all choices are listed. What is missing from our example? What if someone is bald? What if their hair is another color, like purple, which we have seen.

A third type of question is an *ordinal question*, which ranks the answer choices. For example, if a student is learning about why peers choose to apply to certain post-secondary schools, he/she might write an ordinal question like this one: What is most important when choosing a college/university to attend (rank the choices from most to least): location, cost, quality of professors, scholarships available, social life, etc.

The type of question above differs slightly from a similar question, the *interval question* (sometimes called Likert scale questions). With this question, there is an equal difference between the answer choices. For example, a survey might ask how someone felt about the service received at an automobile dealership, and the choices might be very unsatisfied, unsatisfied, neither satisfied nor unsatisfied, satisfied, very satisfied. Notice there is no difference between each answer, and all options from positive to negative were included. If there are positive answer choices, then there need to be negative answer choices.

As a case in point, as reported by various news outlets in 2017, President Trump and the Republican National Committee released a three-question poll regarding his first year in office. The question assessing his first year in office only offered the options of "great," "good," "okay," and "other." Respondents could not offer any non-positive responses--this would skew the data. If only the results were published, then it would not represent a full picture.[2]

Validity and Reliability.

We now turn to two important aspects of survey research: *validity* and *reliability*. Basically, *validity* means that the survey measures what it is supposed to (i.e., the questions ask what they need to). *Reliability* means that the survey can get the same responses each time. The greater the validity and reliability, the more you can trust the data. In Lisa's dissertation, she established content validity by having experts in her field review her survey questions; she established reliability by giving the same survey to the same respondents two days apart to see how consistent their responses were. Most high school students will not have the time or opportunity to run the statistical tests needed to

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measure these. However, if students use a published survey, information for validity and reliability should be published in the original source; students will report these data in their own papers.

Research in Focus

Lisa employed survey research for her dissertation and, because of the nature of her research questions, used both descriptive and inferential statistics. We present one of her research questions below with examples.

How does access and exposure to language arts curriculum and practice (writing, reading, and curriculum) differ among schools?

Using descriptive statistics, Lisa presented the means for writing, reading, and curriculum in tables and figures to compare them. Based on these *descriptive* statistics, the difference looked large. However, to get a sense if the differences between and among schools was significant, she used *inferential* statistics (multi-variate analysis, MANOVA). However, she had enough survey responses (well over 1,500) to do so; if she only had 50 or so surveys per school, that would not have been enough to do anything more complex than descriptive statistics.

Experimental Research

In experimental research, a researcher wants to determine if a particular treatment impacts an outcome (Creswell, 2014). In this type of research, one group gets a treatment (different instructional method, different food, different levels of sunlight, etc.) and another group doesn't; then, at the end of the study's period the researcher tests for differences between the two groups.

For example, if a researcher wants to learn whether a new reading program helps to raise test scores, one class of students would get a new reading curriculum and another would keep the method they have been using. At the end of the school year, students' scores on a reading test would be compared. This is a simplistic example, and there are many other considerations that must be considered with experimental research. This type of research, especially if it involves people, is very hard for students to do because it often involves manipulating conditions in the school (instruction, time for teaching, etc.) and such changes are not feasible given the many state and federal regulations that must be followed. If students want to do experimental research, then working with plants or inanimate objects (wood, metal, etc.) is recommended. In addition, in cases like this, it is wise to bring in a science teacher/professor as an advisor.

Quantitative Data Analysis

When it comes to analyzing quantitative data, unless students have a solid understanding of statistics (some students take AP Statistics while in high school), we encourage running basic descriptive statistics. We will present explanations of some inferential analysis procedures below, but as with every research method described in this chapter, if you or your students need assistance, seek out help from colleagues and/or higher education faculty.

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What is done with survey data once it is collected? It needs to be entered into some sort of database.[3] Most students can get by using an Excel spreadsheet. Figure 2 below reviews types of survey questions and how they might be entered numerically. Word responses have no numerical value on their own, so they have to be assigned numbers in order to do data analysis, but this has be carefully thought out. This is where the type of survey question becomes extremely important. In an earlier section we outlined different types of survey questions; these types are equally important for data analysis because they influence the type of analysis used. Before beginning any analysis, the level of measurement (e.g., nominal, ordinal) associated with the data must be identified.

Nominal data – data has no logical; data is basic classification data

- Example: Male or Female
    - There is no order associated with male nor female
    - Each category is assigned an arbitrary value (male = 0, female = 1)

Ordinal data – data has a logical order, but the differences between values are not constant

- Example: T-shirt size (small=1, medium=2, Extra large=3)

Interval data – data is continuous and has a logical order, data has standardized differences between values, but no natural zero

- Example: Fahrenheit degrees
    - Remember that ratios are meaningless for interval data.
    - You cannot say, for example, that one day is twice as hot as another day.
- Example: Items measured on a Likert scale – rank your satisfaction on scale of 1-5.
    - 1 = Very Dissatisfied
    - 2 = Dissatisfied
    - 3 = Neutral
    - 4 = Satisfied
    - 5 = Very satisfied

http://toolkit.pellinstitute.org/evaluation-guide/analyze/analyze-quantitative-data/

Figure 2. Types of Survey Questions and Data Entry

Notice that nominal and ordinal data, because they have no hierarchical relationship, any number could be assigned to them. It also means that getting the average would not be a goal in analysis (no 0.85 for gender; no 2.45 for shirt size). Students would describe the population (20 males, 25 females) and how many shirts were ordered (5 small, 10 medium, 10 extra large). Likert scale data, however, because of its ranking order, can be analyzed in terms of counts per category and overall average.

The hypothetical example below (Figure 3) shows how survey responses might be entered. One column is for the respondents' names (in this case, pseudonyms to protect participants' identities--we talk about research ethics at the end of this chapter). Other columns are for the survey questions (the top row has the identifiers for each column). In this case, the survey used a Likert

scale from "not at all (assigned a 1)" to "completely (assigned a 5)." The hypothetical survey questions are

1. Before the review, how confident were you in your ability to pass the test?
2. How engaged were you during the review?
3. How hard was it to take the test after being out for the winter break?

	A	B	C	D	E
1	First Name	1. Before you	2. How mu	3. How hard was it t	
2	Mary	2	5	3	
3	Tim	4	5	1	
4	Brandy	3	4	1	
5	Robin	2	2	2	
6	Julian	2	4	3	
7	Wade	1	4	2	
8	Ann	3	4	2	
9	Connie	4	4	5	
10	Meredith	3	5	1	
11	Cam	5	5	1	
12	Colin	3	4	2	

Figure 3. Excel File for Survey Data

The student conducting this study could compute the frequencies (how many times a respondent selected 1, 2, etc.) and averages for each survey question. This can be done by hand, or the student could use Excel's analysis features to do this. For most students, learning frequencies and averages will be enough (given the sample size and/or research question).

However, what if the student wanted to know if there were differences between how males and females answered. In this case, a statistical procedure called a t-test, compares the averages and shows how different they are and if the difference is significant. A large t-score means the difference is significant. There are many resources, both online and in print, to help with statistical analysis.

Some Qualitative Methods of Data Collection and Analysis

In this section, we provide some more detail about the purpose of qualitative research studies, the types of data collection and analysis methods that high school students might pursue, and some examples of studies that are qualitative in nature, including research questions, data collection and analysis methods, and the structure of a written documentation of such studies. As mentioned previously in this chapter, qualitative research methods are typically designed to answer "how" or "what" types of questions. Students develop questions that they want to find the answers to that are qualitative in focus, including the following examples:

- "To what extent do cultural factors impact young males' masculinity and their ideas of machismo?"
- "What qualities encourage students to audition for All State music ensembles year after year?"

These questions are not easily answered through collection and analysis of numerical data; instead, the students pursued qualitative forms of data to answer these questions. In both cases above, students can use interviews to gather data, then analyze the participants' words for themes that emerge.

There are many modes of data collection and analysis that would be termed qualitative in nature. We encourage teachers to become familiar with these qualitative methods and to examine the theoretical underpinnings for them through continued study. Although there are many types of qualitative research, below we outline some methods we think are feasible for high school students.

Case Study

Case study methods involve the collection and analysis of data around a particular "case," event, program, activity, or individual(s) that might shed light on the research question. For example, with this research question, *How do females who play MMOGs experience sexism?* a student might decide to develop a case study to provide an answer. The boundaries of a case can range from a single individual, a freshman in college, to a larger set of individuals, a group organizing a protest march. Data collection in a case study involves multiple forms of data, such as interviews, observational data, documents (photos, newspapers, e-mails, etc.), and archival data. For example, if a student wanted to do a case study of the student government election (an event bound by time), he or she might collect the candidates' posters, record and transcribe copies of their speeches, interview the candidates (and possibly student voters), and maybe even survey the student body.

Analysis of a case study means making a comprehensive description of the case and its setting (Creswell, 1998). Analysis can and should take several forms depending on the case and the data collected. For example, if interviews are conducted as part of the case study, they will need to be transcribed and read multiple times to establish patterns (called themes) found among the interviewees. Across all data collected the researcher will want to find patterns/commonalities to come up with generalizations to write a rich description of the case. This is sometimes called triangulation, which means that themes within each data source are then verified against each other.

Interview

Interviewing can be a form of data collection within a study (case study, for example) or a research method of its own. However, like survey research, one does not go out and just ask questions. Interview questions are based on the proposed study's foundational theories and literature. In the example annotation below, a student developed ideas for interview questions based on her reading:

> Kaplan, M. L. (2007). Inspiring middle school musicians: An honest approach. *Choral Journal, 48*(2), 55-57.

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This article suggests the steps a teacher should take to encourage students to participate in choir. Although this study focuses on middle school students, it can be applied to high school students as well. I am looking to conduct interviews, so this article gives me insight into the type of questions teachers will be asked. For instance, "establishing teacher/student and student/student trust is one of the key elements to building an enthusiastic middle school choir" (p. 55). With this article, I am able to explore the motivators teachers use to get students to participate in choir, and I am able to formulate some topics of discussion for my interviews.

Interviews can be conducted one-on-one or in small groups, called focus groups. It is important to understand when one is preferred over the other. The first consideration is noise and voice recognition. All interviews need to be recorded and then transcribed (where all words are written down verbatim). In group interviews, unless the researcher can distinguish among voices, it can be very hard to correctly transcribe the speakers' words.

Another consideration is the topic being discussed and the interviewee's comfort level in answering the questions. For example, if a student is researching sexual harassment, asking interview questions in a group setting might not yield as much information as asking in a one-on-one setting. And, if the focus group has males and females, it might prevent someone from speaking as honestly as they would like. Topics that are more sensitive should probably be asked through one-on-one interviews.

With interviews, the researcher also needs to determine what type of questions will be asked: structured, semi-structured, or open-ended (unstructured). In structured interviews, each interviewee is asked the same questions in the same order. This is to ensure more reliable comparison among responses. In semi-structured interviews, the researcher creates a list of questions that need to be covered. However, the interviewer allows for the conversation to go deeper in some areas or in another direction if that comes up during the interview. Open-ended interview questions allow speakers to talk about what they think is most important. An example of an open-ended question is "Would you tell me about how this school year went?"

In terms of analysis, structured interviews will be easiest as each question provides a frame for responses; thus, finding patterns/themes will be much easier than when asking open-ended questions. Our suggestion is to look to published examples of studies that have incorporated interviews. Analyzing interviews takes much longer than students think. It can take from 5-10 hours to transcribe one hour of audio, depending on the number of speakers talking and background noise. We do not want this to scare students! Interview studies can be completed by high school students with potential to earn AP Research credit. Students just need to plan their time accordingly.

Research in Focus

In a study (Rush, 2013) on instructional coaches in middle schools and high schools, Leslie was interested in finding out from instructional coaches what they did on a day-to-day basis, what their roles in the schools were, and what they saw as their responsibilities. She used semi-structured interviews (Kvale, 1996), so that the study participants could provide information about their job descriptions and roles, successes and problems they had experienced in their work, and

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descriptions of how they work with administrators and teachers. Because she expected that the job descriptions would vary across different individuals, Leslie chose to do individual interviews instead of focus group interviews.

To analyze the data, Leslie read the interview transcripts multiple times, keeping the research questions in mind. She developed codes in the form of words and phrases that related to activities, successes, and relationship issues that the instructional coaches mentioned repeatedly. To write up the results of this part of the study, Leslie developed a table that included the code names, examples from the data for each code, and definitions that she developed for each code. When Leslie wrote the article, she provided a fuller set of information about the results of the analysis but referred back to the information in the table to help the reader understand her findings.

Content Analysis

Students typically enjoy using content analysis to examine patterns in a variety of types of texts. Content analysis involves analyzing texts in an objective and systematic manner (Neuendorf, 2017). What does this mean in practice? In content analysis, researchers choose a form of text to analyze. The "text" can be written texts (such as might be seen in an English class, analysis of poetry) or it can include songs, videos, commercials, blogs, tweets, Snapchats, or other forms of media that show up in our lives. Researchers who are carrying out content analysis will then take a research-focused lens to the texts they are working with.

One way to conduct a content analysis is to first identify what the target for analysis in particular types of texts, using a information gained from reading about the topic, or a theoretical framework. For example, one student examined how eating disorders were portrayed in young adult fiction. This student first read articles about eating disorders and from those articles she developed codes that represented what she learned about eating disorders. She then read several young adult novels and applied those codes.

To use theoretical frameworks as their lens in content analysis, students would need to study specific theoretical frameworks and then apply them to the texts under study. For example, one master's student wrote a thesis on the themes expressed by Carrie Underwood in "Before He Cheats" and Miranda Lambert in "Gunpowder and Lead." This researcher used feminist theory as well as other tools to guide his analysis of these two texts/songs, finding that both artists are simultaneously challenging dominant gender roles while also reinforcing them. This thesis is available on PQDT Open, a free dissertation/thesis site: https://pqdtopen.proquest.com/doc/1269521696.html?FMT=ABS.

Depending on the research questions, the results of the analysis could be presented in several different ways. In terms of organizing structures for writing the results of the study, students could use chronological organization, order of importance, most to least represented theme, etc. We encourage you and your students to look to published articles as models for the structure of presenting the results. This is the way that we learned to carry out research in graduate school!

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Mixed Methods Research

Here, we offer a cautionary note about mixed methods as we have both come across studies that claim to use mixed methods but do not. Mixed methods is as the name implies: it mixes methods. One part of the study is quantitative, and a second part is qualitative. This means there needs to be two separate forms of data collection and analysis. Below in Figure 4 we offer real-life examples of the correct and incorrect use of mixed methods.

Correct	Incorrect
A study includes a 15-item Likert scale survey of 100 students and follow-up semi-structured interviews with 10 students. This is the correct use of mixed methods because the researcher used quantitative methods (survey research) and then followed up the survey by interviewing a portion of the 100 students (interviews are qualitative and will be analyzed for patterns and themes).	A study used a 10-item open-ended survey and the researcher analyzed the answers. This is not mixed methods; if a researcher uses open ended questions on paper, it is actually a questionnaire. Because the answers will all be open-ended, this means qualitative analysis will be used (one method only).

Figure 4. Correct and Incorrect Use of Mixed Methods Research

Final Thoughts: Ethics and Human Participants

Any research that students undertake involving human (or animal) participants needs to consider the ethics involved: there are standards for recruiting, interacting with, and reporting data on. At the university level (and in courses like AP Research), all research proposals must undergo what is called the Institutional Review Board (IRB) process. This is where a researcher submits a proposal outlining the entire research study, including any surveys or interview questions to be asked. Consent forms for study participants also need to be created and approved by the IRB before ANY research takes place. We highly recommend the resources below for readers and their students. We strongly recommend, as well, that students take, and pass, the National Institute of Health human subjects training module (the third link).

https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html
https://cirt.gcu.edu/research/developmentresources/research_ready/quasiexperimental/ethics
https://phrp.nihtraining.com/index.php#!/

Notes

1. One of Lisa's AP Research students found a survey she wanted to modify to use in her study. However, the article was nearly 30 years old. After exhaustive searches, the student could not locate the authors. She (and Lisa) agreed that the authors were most likely retired

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from university teaching. In this instance, the student wrote explicitly in her research paper that she modified the survey and provided readers with a full citation for the original article.

2. Respondents were also asked the same question of former President Obama's first year in office, but that question only provided "poor" as an additional option. https://www.cbsnews.com/news/trump-approval-poll-offers-no-negative-options/
3. Any missing data (for example, survey questions that were skipped) will need to be addressed. Missing data cannot be averaged in, for example. We recommend working with a statistician for instances like this.

Research Methods Resources

Quantitative
Survey Research:
https://psr.iq.harvard.edu/files/psr/files/PSRQuestionnaireTipSheet_0.pdf
https://oqi.wisc.edu/resourcelibrary/uploads/resources/Survey_Guide.pdf
https://cirt.gcu.edu/research/developmentresources/research_ready/quantresearch/analyze_data
https://www.youtube.com/playlist?list=PL8dPuuaLjXtNM_Y-bUAhblSAdWRnmBUcr
(crash course statistics series)

Qualitative
http://psc.dss.ucdavis.edu/sommerb/sommerdemo/content/intro.htm
https://measuringu.com/qual-methods/

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Chapter 6: Research in Practice

This chapter is about hands-on research, in particular the type of academic paper that is required in the AP Research class, a relatively new class offered as part of the AP Capstone program. In this course, students design and carry out a study (which includes writing a literature review about their study's background, related theories, and past research associated with their study), gather and analyze data, and then write up their findings in a 4,000-5,000 word academic paper (and orally defend it in front of a panel).

Though we use the AP Research paper to frame this chapter, the content is applicable to any applied research that students undertake. Our hope is that teachers will be able to use the ideas in this chapter (along with the research guide in Chapter 3) with students at all grade and academic levels. We provide examples from a 12th grade class and from our own research studies, including scaffolding tools created for students. (For more information on the AP Research course, see https://secure-media.collegeboard.org/digitalServices/pdf/ap/ap-course-overviews/ap-research-course-overview.pdf.)

What is "Research"?

One of the toughest aspects of teaching the AP Research class is the applied research piece. We are defining applied research as any study that uses and analyzes "data." Data can be numbers, people, images, videos, etc. Students may struggle with the difference between a research paper and *doing* research. How do you take students from looking up and writing about what others say (which is one form of research) to collecting and analyzing data, which is another?

In our experience, most English teachers have not conducted a research study, and most students—unless they participated in a science fair—have not conducted a research study either. Switching from synthesizing research to doing research is the first hurdle. Synthesizing research comprises the literature review in a "research" study. Thus, one of the first things to cover is what a research study is and is not. This can take quite a bit of time, so one way to approach it (and this is what we suggest) is to assign a research design text for summer reading and have students take notes/write questions they have as they read. Then, the first week of class can be devoted to a review and discussion. This can help clear up some misconceptions up front. There are many good resources out there, but our favorite is Creswell's (2014) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*; it is one we have used with college students at different levels, and in our experience, high school students have no problems understanding it.

As students discuss the different research approaches, teachers can provide them with published examples of each approach. Some teachers begin with prior AP students' papers. Because peer-reviewed journal articles are what students should use in their papers, we recommend using them to expose students to these texts from the beginning. This was also a valuable opportunity to review how to use databases and the Internet to find sources for papers.

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We do want to caution teachers to be careful when it comes to selecting exemplar articles: be sure that they are not too advanced or too lengthy for students. The text box/ to the right offers some free, open-source journals that might be appropriate.

Ideas for Finding Exemplar Articles

--The ALAN Review
http://www.alan-ya.org/publications/the-alan-review/
(peer-reviewed journal of topics related to young adult literature; good model most research methods students can use with written and visual text)

BJPsych Bulletin
http://pb.rcpsych.org/

BMJ Open Sport & Exercise Medicine
http://bmjopensem.bmj.com/

Directory of Open Access Journals
https://doaj.org/

PQDT Open
https://pqdtopen.proquest.com/search.html
(This site has dissertations, which—although long—provide wonderful examples for what should be in each section of a research study and explanations of research methods)

Other Resources:

Google Scholar

Using the "Arrow" for Well-Designed Research

One advantage that Lisa had in teaching AP Research (and prior to that the Cambridge Global Perspectives course) is that she had designed, completed, written up, and presented numerous qualitative, quantitative, and mixed-methods studies. So, she had a solid foundation from which to guide students.

We recommend using and referring to often, and having students use in their own work, what we are calling the arrow (see Figure 6.1). When doing research, to have a "tight" study—essentially, one that is well-designed and makes sense from start to finish—means to stay on the arrow. That simply denotes that the research question focuses the literature review, directs the research method (which includes data collection and analysis), informs how the results are presented, directly influences how data are interpreted and analyzed, and refers to what implications might be drawn from the study. Even though the arrow goes from left to right, the process does not stop at each arrow: throughout any research study one returns to each stage as they keep reading and analyzing and synthesizing texts (books, book chapters, research articles, etc.) to fine-tune their thinking.

Figure 6.1. The Research Arrow

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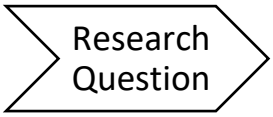
In the sections that follow, we will use examples from our own research to show the importance of staying on the arrow. We offer these as examples that teachers can use in their classes.



How to come up with a good research question?

As discussed in Chapter 2, coming up with a good research question is key to any research-based paper. However, when it comes to applied research, one may have several questions or a main question with related sub-questions. Students need to understand when and how to do this in their own papers. For those unfamiliar with writing research questions, the easiest and best technique is to look to published examples and how, by research method, the questions look different (also, see Chapter 3 for more information).

When doing research, the research question drives everything. So, it is imperative that students (and teachers) understand the difference between questions worded for a quantitative design and those worded for a qualitative design.

Lisa became interested in how policies like high-stakes assessments affected Florida high school students' experiences in English classes. She knew from experience that testing impacted some students more than others, and she wanted to find out if there was a theory or term that represented these ideas. Through her reading through books and journal articles, she discovered the concept of *opportunity to learn*, which became the foundation for her study. Once she had a concept to guide her work, she located other studies (mostly quantitative) that used this same idea.

Lisa knew that studying students at the high school where she taught would not provide enough information to make any claims about the overall impact of testing; she would need to get data from many students to arrive at a better general understanding (i.e., generalization) about students across the state. Therefore, Lisa decided that survey (quantitative) research was the best method to answer her research questions. We will discuss this more below, but because ones' chosen research method also needs to be explained to readers, we review this below under the next two arrows.

Based on her reading and her own experience, Lisa also realized that students' opportunities were also impacted by how they were tracked and by what school they attended. She would need more than one research question in order to get a fuller picture of how opportunity to learn impacted students. Lisa settled on three research questions:

1. How does access and exposure to language arts curriculum and practice differ among schools?
2. How does access and exposure to language arts curriculum and practice differ among grades?
3. How does access and exposure to language arts curriculum and practice differ among academic tracks?

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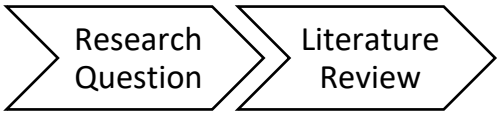
Notice that her questions, by using the word "how," assume that students' experiences were different; that came from the research that she collected and read (and her experience). So, she was testing an idea or theory about the extent to which students were affected.

In some cases, students will come up with a research question that is not feasible, usually due to lack of time but in other cases because of lack of access to data. In most cases, working with classmates and the teacher, the question can be modified to fit the limitations. For example, a student wanted to study the correlation between standardized test scores and students' motivation. Because such test scores are private, he could not pursue this line of research. However, he modified the study to have students complete a survey where they indicated the extent to which they felt certain tests (end of course exams, graduation exams, etc.) positively or negatively affected their educational experiences and their motivation in school.



From research question to literature review

Research questions often emerge from students' initial reading, but they also drive reading in order to write the literature review. The literature review is an important part of the research paper as it provides the reader with a range of necessary information—need for the study, background/context, key definitions, prior research related to the project, theories/theoretical models, and, oftentimes, a description of the research method.

Returning to Lisa's dissertation, three research questions guided her study:

1. How does access and exposure to language arts curriculum and practice differ among schools?
2. How does access and exposure to language arts curriculum and practice differ among grades?
3. How does access and exposure to language arts curriculum and practice differ among academic tracks?

To stay on the arrow, meant that, beyond asserting the need for her study and providing key definitions that readers might need to understand the scope of her project, Lisa needed to provide readers with information on the primary framework guiding her study—**opportunity to learn** (i.e., access and exposure) and the **language arts curriculum**, including the **different instructional aspects** (Qs 1-3). She also needed to discuss both of these in terms of **how they impact and are enacted at the school** (Q1), **grade** (Q2), and **academic track** (Q3) level. She also devoted space **to how others have studied similar questions through survey research and other methods.** You can see from the text in bold that Lisa had a literature review that included multiple sections, each addressing aspects of her research question.

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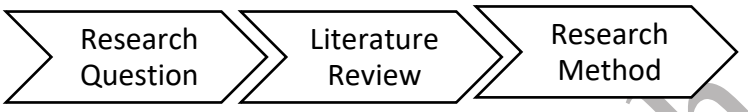
Of course, this was a dissertation of more than 100 pages. How might this look in a high school class? One AP Research student investigated the following research question: *Do teens of African descent associate positive or negative adjectives with black women who have natural hair?* In planning her literature review, the student mapped out the subsequent areas to explain to the reader: the history of black people's hair, especially women; natural versus processed hair; how hair is tied to cultural conceptions of beauty; hair and self-esteem; and, her chosen research method and past studies in this area. Another student was interested in students' views on transgender bathrooms in school; her literature review included sections on the difference between transgender and cross-dressing, recent cases in the news and legal system, other studies in this area, and her chosen research method, survey research.

If students are taking good notes and writing an annotated bibliography (see Chapter 1), then they are pulling together material to synthesize in their literature review (see Chapter 1 a how-to on synthesizing).



Research Approach: Don't call it what it's not

We offer a word of caution here: What sometimes happens as students read sample articles is that they fall in love with a certain research method (for example, ethnography, which takes at least a year to complete). Then, they want to use that method—even if it doesn't fit their timeframe (a few months) and/or the research question(s) they hope to answer. We read one AP paper that claimed to use five research methods, qualitative and quantitative, concurrently—it can't be done!

We recommend that teachers keep stressing one thing: Like other AP courses, such as AP Language and AP Literature, namedropping jargon and technical terms is not as important as explaining why certain choices were made and doing the actual analysis and interpretation. This is why having a thorough understanding of the many types of research methods is critical to doing and reporting research well.[1]

A helpful technique for students is to have them use a table or graphic organizer to plan their intended research study. By planning out potential research questions, students can think about the "what" and "how" of research before diving in. Two examples from Lisa's published research are below in Figure 1. As these examples show, the research question drives the proposed method used which, in turn, directly influences the types of data collected and how that data is analyzed.

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Research Question	What data will be needed?	How will data need to be analyzed? What approach might be best?	Other considerations?
How can prior work on frames and reframing be applied to online communities? (Scherff & Singer, 2008)	Postings from online discussion boards from class? Class Wiki?	Qualitatively; "constant comparative" method Maybe typological analysis?	How many weeks? # of participants?
How do preservice teachers frame and reframe classroom events? (Scherff & Singer, 2011)	Online postings from participants (discussion board? Wiki?)	Qualitative; modified version of typological analysis (using pre-existing frames/lenses for analysis)	How to group the students? Certain frames may not apply to some online discussions.

Figure 1. Research Planning Table

We recommend caution for students, including doctoral students, that doing an aspect of a research method and stating that upfront is better than claiming to do a method when it cannot be done 100% to fidelity. *The key to a well-written methods section is that any reader should be able to read it, understand it, and replicate it.*

Notice the two examples below from an AP Research class. In Example 1, the student could identify exactly why she was using a mixed methods approach—incorporating both quantitative and qualitative methods. Therefore, she could claim to use the term "mixed methods." In Example 2, the student was not doing "phenomenology" (she did not have the time, resources, or research participants to do it according to its definition); however, she could acceptably claim to use phenomenological methods since she used some tenets of it in her study.

EXAMPLE 1: This study used the methodological approach of mixed methods. Within mixed methods, I was using surveys and interviews to collect my data, with the addition of in-game observational field notes to see what occurred in the game's chat, and what sort of interesting avatars I could find.

EXAMPLE 2: Using a qualitative methodology was the best approach for this study because it allowed for the exploration of the thoughts and feelings of participants through interviews. This study utilized phenomenological methods in that I was attempting to "understand people's perceptions and perspectives relative to a particular situation" (Leedy & Ormrod, 2016, p. 255).

Both students used appropriate analysis methods to fit their research design. In the case of Example 1, the student collected data quantitatively using surveys—which she analyzed in terms of averages—and qualitatively through surveys—which she read for common themes. Then, she qualitatively analyzed her field notes (notes she collected while watching participants play the online games), looking for patterns (i.e., themes) in what she saw. In Example 2, the student used one-on-

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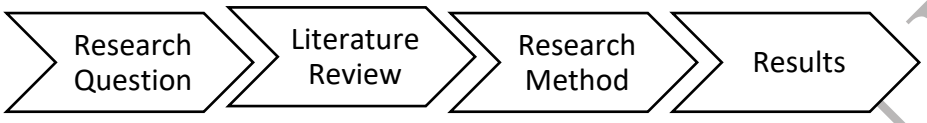
one interviews as her main source of data, which she later transcribed, read through multiple times, and analyzed for patterns related to participants' thoughts and perceptions.

If you are still struggling with the different research methods, reach out to your local college or university. Every college/department within it will have faculty who conduct research and have research methods they specialize in. Invite them to come in and do mini-lessons on research with your students. If you do not have access to anyone locally, reach out to authors of articles you are using in class, and invite them to skype in with your class. Many faculty from all over the country are willing to give mini-lessons and answer questions from students.



Results

Just like the research question drives the method, including data collection and analysis, it also guides how the analysis is presented (i.e., the results section). Many students struggle with "what" to put in the results section. In simple terms, results are the answers to the research question(s). An effective technique to use when drafting the results section is to use the research question(s) as subheadings in order to make sure that nothing is omitted, which Lisa did in her dissertation.

Returning to Lisa's study, she had three driving questions:

1. How does access and exposure to language arts curriculum and practice differ among schools?
2. How does access and exposure to language arts curriculum and practice differ among grades?
3. How does access and exposure to language arts curriculum and practice differ among academic tracks?

Each question was analyzed separately and then the findings were presented in words, tables, and figures (appropriate for quantitative studies) under it. Once Lisa had drafted a complete results section, then she could remove the questions as framing headings. (Note: Research questions could be turned into shorter subheadings, such as "Differences by Schools," in order to provide a roadmap for the reader.)

Revisiting two of the research questions from students in the AP Research class shown earlier, let's look at how they presented their results. In the case of the question *Do teens of African descent associate positive or negative adjectives with black women who have natural hair*, the student presented her results by gender, using words, tables, and figures (appropriate for survey research). In the second example of the qualitative study pulling from phenomenology, the student used words to explain the

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major categories of feelings that emerged from the interviews (words only were acceptable in this case).

Interpretation, discussion, and implications

The final section(s) of an applied research paper should include the interpretation of the data, a discussion or explanation of the data, and implications of that data. This is the "so what" of the research study and is critical to the paper. Returning to our analogy earlier: Think poetry or literary analysis. It's not enough to find and list all of the literary devices an author uses (the results)—you need to explain their importance and relationship to the text (interpretation and discussion).

In drafting this section, as with the results section, one technique to employ is to use the research questions as frames, as with drafting the results section. Another way to organize is by frequency of finding (i.e., most prevalent theme first). Again, refer to published research articles to see how authors choose to present their interpretation and analysis.

Coming up with implications can be difficult for high school students as they lack real-world and life experience to see the potential impacts of their research. This is where peer review sessions can be helpful, along with having outsiders (those not in the class) read this section for potential avenues to discuss. As students read each other's papers, have them pose questions such as *What type of research study could follow this one? What changes could your study lead to?*

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Instructional Idea

One helpful technique is to create a three-column table to draft the Interpretation, Discussion, and Implications sections. List the results in the left-hand column. Then, in the middle column, explain the significance of the results (i.e., interpret and discuss). Finally, in the right-hand column, generate some "so what" statements about the results/interpretations(s).

Below is an example from Lisa's dissertation.

Results	Interpretation	Discussion/Implications
Students in the lower performing schools completed more writing than those in the higher ranked schools.	They completed more writing, but for students in 9th and 10th grade that writing correlated with the type of writing on the FCAT.	More writing is not always better. If students' experiences with writing was just for test preparation, then they missed opportunities for other kinds of writing (creative, narrative, etc.).
Students in the upper tracks read more novels than students in the lower tracks.	This is not a surprising finding, overall. The difference in number of novels read was surprising, though. Some lower track students only read one novel over the entire year.	Novels might have been seen as not helpful in terms of preparing lower-track students to do well on the state test. Novels are good for building stamina as readers, and a lot of instruction can be done with them. Sadly, many students missed out on this experience.

Note

1. In courses like AP Research, students can have outside advisors/consultants to assist them with their research. See the Appendix for sample letters to send out to potential mentors.

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