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Graduate Research in Education: Learning the Research Story Through the Story of a Slow Cat

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GRADUATE PROJECTS IN RESEARCH

LEARNING THE RESEARCH STORY

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**Through the Story of
the Slow Cat**



Graduate Research in Education: Learning the Research Story

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THROUGH THE STORY OF A SLOW CAT

KIMBERLY CHAPPELL, ED.D. AND GREG VOYKHANSKY, J.D., PH.D.



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Introduction

Welcome to *Graduate Projects in Education: Learning the Research Story*. This book is designed to facilitate understanding of educational research and guide the development and the writing of a research project. Scholarly research follows a basic format, though each discipline has its own variations. The discipline of education is no different. In education, like other social sciences, we are investigating issues directly involving or influencing humans. Research involving humans can be a complex and awkward endeavor. However, if we view this endeavor through the lens of a research story, we find a familiar genre we can relate to and understand.

The book is divided into two parts. Part I – *Research, Forms, Functions, and Skills* explores the fundamental forms and functions of various graduate research projects. These chapters will introduce you to the ways in which we can tell a research story. We will also investigate the essential writing skills required to effectively write your research story. Academic writing rarely comes naturally to students. In these chapters, you will learn to tell your research story while also learning to write the story in a scholarly way.

Part II – *Research Components* of this book is dedicated to exploring each component for developing and writing a research project. We will explain each of the components through the story of a “slow cat.” The story of the slow cat is designed to assist the reader in drawing analogies to their research. As the story develops over the course of the chapters in Part II, you will see how a research project is created, how it progresses, and how it is concluded. Each chapter begins with a segment of the story of the slow cat, followed by an interpretation of the story related to the research component. The chapter continues with explanations, discussions, and information to facilitate your understanding and writing of the research component.

The *Graduate Projects in Education: Learning the Research Story* is written for graduate students engaged in a research project. However, the components of research apply to any level of education research. The hope is this text will make the basics of educational research more accessible to all. Telling the research story is an important pursuit to support educational change and improvements. While most graduate education programs require some form of research, we believe that it does not have to be the “hardest,” “most challenging,” or “most painful thing” encountered. If we can connect students to the research story, perhaps we will see higher-quality projects and some amazing innovations to enhance education for the betterment of all humans!

As a final note, be aware this book does not include a deep dive into research design, nor is contain an exhaustive treatment of the components of educational research. We encourage you to seek other resources that are specifically written about your research design of choice. There are many textbooks available on research. Supplement your learning as needed, is our advice.

PART I

RESEARCH FORMS, FUNCTIONS, AND SKILLS

Research literature reflects a variety of forms and serves several purposes and functions. The first part of this book is devoted to introducing student researchers to a few forms of research. The forms presented here are those typically found in graduate programs, though some may be found in other areas of post-secondary education. Those presented in Part I are not the only research literature forms found in graduation education, just the primary ones encountered.

Understanding the functions of the various forms of research is important for selecting and conducting your research project. Keeping the function in mind ensures the research stays focused and fulfills its purpose in scholarly literature. The function of the research also guides how the work is written. The latter sections of Part I will explore the key skills needed to research and write the forms presented.

Graduate Research Projects

Graduate research projects are generally a requirement for obtaining a graduate degree. You are reading this text, so likely this is the situation in which you now find yourself. The outcomes of most graduate-level programs include some form of research. Higher education has traditionally required research in some form as part of the educational experience. Effective research skills were historically thought of as evidence of advanced learning and training in a discipline. The primary purposes of research in higher education include learning more about a topic in the discipline and expanding the professional body of knowledge.

There are primarily four variations of research projects found in American graduate programs: literature review, thesis, dissertation, and a capstone project. Each variation has a different function within the academic community, but ultimately provides contributions to the greater body of research and knowledge. Understanding the form and function of each type of research is important to complete the project successfully.

The Literature Review

The literature review is a type of research that is typically completed as a course assignment, a stand-alone project, or as part of a thesis, dissertation, or capstone. The literature review functions as a collection of previously published research on a given topic. Published research is called “literature.” In this case, a review is an analysis of the findings. This type of project is a review (discussion of findings) of literature (published research). Therefore, a literature review is a discussion of published research findings. The desired outcome of the literature review analysis is to justify the selection of the frame, purpose, design, and methodology for the research project. A thorough analysis of previous research is critical in developing an argument later in the discussion and conclusions section of the research project.

This type of research is passive in nature, meaning the research activity itself does not directly involve human subjects, such as administering a test, collecting survey data, or observing students in a classroom. Think of passive “researching” as an activity synonymous with searching for information. Research for a literature review is conducted in the form of reading published research articles, identifying and analyzing the findings, synthesizing the

findings by commonalities, and summarizing the results in a way that leads to new understandings about the topic.

A literature review tells a specific “research story.” The narrative explains the details of what is known about a topic. The findings of previous research are grouped and synthesized to systematically explain what has been learned in research previously. New insights about the topic are presented through the connections made among the prior research findings. The story unfolds as, “this is what we know thus far.” The literature review functions as an informative work.

The Thesis

The thesis is a research project completed as part of a graduate degree program. The thesis functions to engage a student in conducting research and publishing findings in the discipline. The thesis is both an active and passive research activity. Active research conducted as part of the thesis includes collecting and analyzing empirical data. The thesis also includes a literature review as we discussed in the previous section.

The form of the thesis generally consists of five chapters: Chapter 1 outlines the research project; Chapter 2 reviews the literature; Chapter 3 discusses the methodology; Chapter 4 presents the findings; and Chapter 5 draws conclusions about the research problem. The components of the thesis incorporate citations of published findings, statistics, and other published data to support the project. Once completed, the thesis is considered a published work.

The thesis is an adventure story. This work details the exploits of the researcher in the quest to solve an educational problem. The thesis explains the setting of the issue, how the journey to answer questions is framed and conducted, and what new things are learned. The story unfolds as, “there is something we need to investigate, here’s how we did it, and what we learned.”

The Dissertation

The dissertation is the research project completed as part of a doctoral program. In education, a doctoral program is either the Doctor of Education (Ed.D.) or the Doctor of Philosophy, (Ph.D.) The dissertation functions to engage a student in conducting research and publishing findings in the discipline. Doctoral students become an expert on the topic explored in the dissertation as a result of the research process involved.

The dissertation has the same basic form as the thesis, only expanded considerably. There are the same five chapters in the dissertation as the thesis. Each chapter in the dissertation has additional headings beyond those in the thesis. The literature review in the dissertation is an almost exhaustive review of the current findings related to the components of the project and is generally the longest chapter. The dissertation is both passive and active as in the thesis. The depth of the research into the topic is greater so, the dissertation is deeper and broader than a thesis.

The dissertation is also an adventure story. The dissertation details the exploits of the researcher in the quest to solve an educational problem. As with the thesis, the dissertation explains the setting of the issue, how the journey to answer questions is framed and conducted, and what new things are learned. The primary difference from the thesis narrative is the depth and extra details in the story. The dissertation journey tends to be a more complex expedition than a thesis, as well. The story unfolds as, “there is something we need to investigate extensively, here’s how we did it, and what we learned.” The dissertation is an epic tale.

The Capstone

The capstone is a research project completed as part of a graduate degree program. The capstone functions to engage the students in conducting research, formulating research-based solutions, and implementing research-based strategies. The capstone incorporates a practical output, known as a product, as part of the research project.

The use of the capstone project has increased in the last decade, especially in education. The practical nature of the product is attractive to educators who are practitioners and developing scholars. Capstone projects vary based on the institution and program. Generally, capstones follow a three to five-chapter format, including a literature review, methodology, analysis, and an application of the findings in some form of a practical product.

The capstone is a different type of adventure story. While the capstone project is a quest to solve an educational problem, it focuses on detailing the product development process and solution. The capstone describes the setting of the issue, how the journey to develop the solution is framed and conducted, and a product to address the issue. The research story focuses on exploring what is needed to include in a solution or product. The story unfolds as, “there is a problem that needs addressing, we need to investigate what is needed, here’s what we created as a potential solution.” The capstone work is more of a product development report.

Research Skills

This chapter will overview the research skills needed for graduate research. The following headings are not an exhaustive list of skills, instead, these are the most common techniques encountered in graduate research projects. Revisiting this chapter throughout the research and writing process is a good idea.

Finding Strong Published Research

The first step in identifying strong published research is to understand the research process. Published research follows a basic writing format. This means that research articles follow the same basic pattern, making them easier to follow and understand. Research articles present an educational problem, review previously published research, explain the methods used in the study, the results and interpretation, and finally the conclusions drawn from the results of the research. If the article does not follow this basic flow, the article may not be a research article.



Adapted from Creswell, J., & Plano Clark, V. (2010). *Understanding research: A consumer's guide*. Upper Saddle River, NJ: Pearson

Using the university's library database is a good way to begin searching and identifying published research. The search engine has a filtering system. It is best to set the filter to return articles from "peer-reviewed" journals. These have been reviewed by multiple researchers in the discipline who approved the article for publication. The peer review process is discussed later in this book.

Additionally, it is important to set the library database to return research published within the last ten years. The value of educational research is related to its timeliness. Some projects may require cited references published in the last five years, especially projects involving technology-related topics. Things in education change over time; what was true several generations ago is not true today. Research is conducted on the problems of today. However, seminal works written by major leaders in the field may be used even though their research is outside of the "timeliness" window. Seminal works such as research by

KEY FEATURES

~ Peer-Reviewed

~ Timely

key theorists like Piaget, Erikson, and Howard Gardner, etc. in education are considered landmark publications and may be used for research projects.

Research articles can also be found via an internet search engine such as, Google Scholar. Google Scholar also has a filtering system to help researchers identify research articles. Unfortunately, the articles returned through Google Scholar may incur a cost to download from the journal. After identifying a good research article in Google Scholar you can search for the article through the university library database. The university library subscribes to many journals and access to the articles is free by signing into the library with a student email account.

A basic internet search will usually return “trade” articles, blogs, or informational websites. Trade articles are those written and published by educational councils, societies, or trade associations. For example, the Educational Leadership magazine is published by the Association of Supervision and Curriculum Development (ASCD). While these trade journals may have some important information or insights, it is important to understand these are not research articles. Citing trade articles, blogs, or internet sites should be minimal in a research project. Trade articles, blogs, and informational websites are great resources for gaining ideas about a research topic, however, these are not considered research upon which to build a scholarly work.

Finding Statistics

STATISTICS MUST...

- ~ be cited
- ~ be obtained from trustworthy sources
- ~ be timely
- ~ have a clear context

Statistics can be found everywhere. Some are trustworthy and others are not. As with identifying strong research articles, identifying trustworthy sources for statistical information is important. The best strategy is to obtain statistics from a .gov website, whether it is federal or state. Most state board of education sites have links to state report cards that provide useful statistics for PK-12 education. The Institute of Education Science (IES.gov) collects education statistics nationally for all levels of education, from PK to higher education. IES.gov is the primary source for trustworthy statistics for education in the United States.

Even when using a trustworthy source, there can be other issues that arise with statistics. One of the more common issues is using out-of-date information. While it may seem a statistic is relevant and important to the current research problem if the statistic was not obtained recently then the results are likely obsolete. Since things change with human beings from year to year, old statistics cannot be applied to current research projects.

Another common issue with statistics is not clarifying the context from which the statistic was taken. The context from which a statistic is measured must be presented. Additionally, the original context of the statistic must match the way it is being used in the research project. Ensure you are not using a statistic about oranges when you are talking about apples.

THE PITFALLS OF STATISTICS

Keys to having valuable stats.

Statistics are valuable
with a FRAME

Using statistics in scholarly writing can be difficult. It is especially difficult to do well. Statistics have an important place. There are a few strategies for using statistics effectively in academic writing.

THREE PITFALLS TO AVOID

QUESTIONABLE SOURCES

Females constitute 76% of the teachers whereas 23% of them were public school superintendents (Edunation, 2012).

OUT-OF-DATE

Viewing the career ranking of public school educators, it indicates that 59% of elementary leaders and 28.5% of secondary leaders were females, but only 24% of females were in the role of the superintendency (Kowalski, et al., 2011).

UNCERTAIN CONTEXT

Kerr and Kerr, (2014) found that there was a decrease of 75.1% of female teachers in public classrooms.

KEYS TO FRAMING STATISTICS



Population Statistics

Must come from government sources



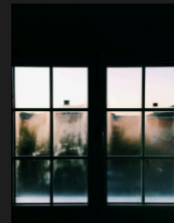
Statistics from Findings

Must come from peer-reviewed research articles



All Statistics

Must be current



The context
must be clear

Identifying Findings

The findings of research articles are the key points of the author's research and are what you need to cite in your research project. The findings of a research project are the conclusions made based on the data analysis conducted. The findings are "what was found out!" The findings reflect what was learned from the research project. Identifying the findings in a research article involves skimming through to the conclusions made by the author after the presentation of the results. Many times the subheading is called *Conclusions* or *Discussion*. This is what the researchers learned from the study: the findings.

The author of a research article reports other authors' findings in the beginning sections of their article to provide background to their research problem and as part of their literature review. These citations refer to other articles that applies to the author's research. It is important not to "re-cite" a finding that an author cited because these are not the author's findings. These reflect the author's paraphrase of the findings of another author. "Re-citing" is known as *secondary sourcing*. Secondary sourcing is problematic in many ways, as it is literally paraphrasing a paraphrase of what someone else wrote. Rather, use the citation referenced to obtain the original article to read and cite as a primary source. This ensures that the paraphrased material is paraphrased correctly from the original source.



Scholarly Writing Skills

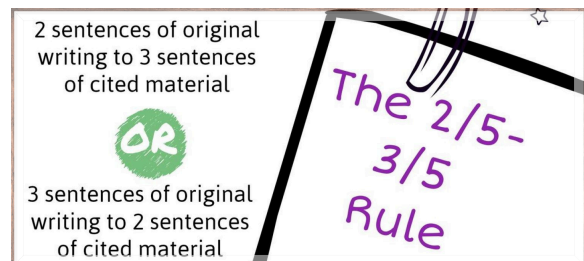
This chapter will overview the writing skills needed for education graduate research. The following is not an exhaustive list of skills instead, these are the most common techniques encountered in graduate research projects. It is a good idea to revisit this chapter throughout the research and writing process.

Scholarly Writing Style

Writing a research document is different from most other types of writing you have likely encountered in the past. Scholarly writing is expected to be objective in nature. As such, the first-person or second-person voice is rarely acceptable. The use of first-person voice often elicits a perception of bias in the reader. It is very difficult for inexperienced scholars to keep objective, and using the first-person voice increases the possibility of introducing bias. It is wise to keep scholarly writing objective. In recent years, many peer-reviewed qualitative studies written in the first-person voice have emerged. In such qualitative studies, there is an expectation the writer will be objective in presenting the data analysis and conclusions. Therefore, you may encounter such articles. However, it is better to write in the third person in a graduate research project.

Scholarly writing styles are robust. Research writing is a detailed and highly specific form of writing that requires lots of words. The writing in each leveled heading of the document includes four to five paragraphs, in most cases. Paragraphs generally have four to five sentences. A recommended pattern to follow in writing is four to five sentences per paragraph and four to five paragraphs per leveled heading.

The content in most headings requires citations to support the writing, much like a lawyer presents evidence to support a case. The support is in the form of statistics or research findings from published articles. As a guide, use the $\frac{2}{5}$ - $\frac{3}{5}$ rule, meaning two cited sentences and three author original sentences or three cited sentences and two author original sentences. While not an absolute requirement, this guide is helpful to ensure the writing is supported.



Writing for educational research projects follows the American Psychological Association (APA) standards. Be sure to obtain a copy of the latest edition. Using an earlier edition of the APA manual will result in considerable errors as each edition has major changes in formatting and style. The APA manual explains writing essentials. The manual details the stylistic, formatting, and citation criteria to effectively develop a strong scholarly work. It is important to read the manual and refer back to it often when writing your research document.

Novice scholars tend to have the same error patterns in their writing. Learning to identify common issues will help develop your effective writing skills. The infographic below describes the top APA issues encountered in scholarly writing. Be mindful of these potential issues in your scholarly writing.

TOP APA ISSUES



Quotation Marks

Quotation marks are used only for direct quotes. Page numbers must be included in the citation for all direct quotes. Direct quotes are rare in APA.



Italics

Italics are used for emphasis instead of quotation marks. Titles of works are also italicized in citation references.



Slang & Idioms

Slang terms and idioms are abbreviated ways of saying an idea. These are colloquial and often misunderstood. Professional writing needs clarity. It is best to use details with specific words to express thoughts.



Contractions

Contractions are abbreviated ways of saying words. These can be vague, especially to non-native English speakers. APA does not use contractions. Avoid these.



Active Voice

Active verbs are important in professional writing. Specific, active verbs bring clarity and detail to thoughts. Search a thesaurus for verbs to say exactly what you intend to say.



Superlatives & Hyperboles

Superlatives and hyperboles overstate value. Words like always and never will be untrue 99.9% of the time. Better to make points with sound reasons and supported research rather than with overstated claims and emotionally charged phrases.



Punctuation

Punctuation is often overlooked, yet it has a major role in properly conveying information. Give careful attention to your use of commas and avoid exclamation points.



Citations

Citations have specific punctuation, capitalization, and italics standards. Additionally, first names are not used and the year goes with the author.

Starting citation: Chappell (2018) stated...
Ending citation: ...(Chappell, 2018)

Writing Content

Writing the content of a research project may seem like a daunting task. The key to writing the content is knowing how research is developed and organized. In APA style writing, leveled headings are used to organize the information. Research works are consistent in many of the leveled headings. The research components outlined in Part II of this book are the common leveled headings used in graduate research projects in education. See Part II for guidelines to write those headings.

Each leveled heading identifies the expected content to follow. Content includes only the information that expounds the heading. Attentiveness to the expected content of the heading is important and is an essential skill in research writing. Avoid adding content that does not match the heading.

REMEMBER

- ~ Write to the leveled heading
- ~ Use the highlighting method to keep like concepts together

There are recommended strategies writers use to improve their research writing. One of the primary strategies used in drafting content is called the “highlighting method.” The highlighting method is useful in developing structured and organized paragraphs within the leveled headings. The use of highlighting during the drafting process allows you to check if like concepts are kept together.

In the highlighting method, the keywords or phrases in each sentence of a paragraph are highlighted. The highlighted words are then reviewed from beginning to end in the paragraph to ensure the concepts are the same or closely related. The method can also

be used within a heading to ensure that “like” paragraphs are kept together. This helps the author arrange and organize the sentences to flow logically. It also assists in identifying when transition sentences are needed to connect thoughts to increase readability and understanding.

There are several error patterns to avoid in writing research projects. Present and past errors that arise are from inconsistencies of time. For example, “Faculty still debate if the curriculum rigor should be assessed throughout the term (Author, 1970).” The statement reads as a research finding cited from 1970, but it refers to the present time (“Faculty still debate...”). The cited finding may have been true at the time of the research, however this does not mean the finding applies to the present time. Instead, your writing should demonstrate how the past finding supports your assertion.

The word choices of an author may contribute to writing ambiguity. Pronouns are vague and should be avoided in scholarly writing. The use of pronouns without a referent in the same sentence is one of the most common errors. Words such as this, that, these, those, etc. should also have a referent to be clear and understood. The overuse of the word “that” is also a common mistake. Using clear and specific nouns will resolve such issues.

There are stylistic patterns some writers employ that hinder effective scholarly writing. One such style is the play-by-play in which the writing is choppy and has one cited sentence after another. This occurs when the concepts and ideas have not been woven together and synthesized logically. To avoid this ineffective style, use the highlighting method described previously.

ERRORS TO AVOID

- ~ Inconsistencies of time
- ~ Pronouns without referents
- ~ Overuse of “that”

THE PLAY-BY-PLAY VS SYNTHESIS

The Play-by-Play is disjointed. This study said this; that study said that...

The first research study focused on 2,000 high school and college students that indicated that mindset was a direct indicator of drug use among high school students. (Laflin, Hirschl, Weis, and Hayes, 2009). The next study involves two separate high schools participating in extracurricular activities for the 1999-2000 school year. It was concluded that taking caution with a drug prevention strategy was necessary (Goldberg, et al., 2003). Another study executed by distributing a questionnaire to all the high schools in the Lorraine region of eastern France that found students who engaged in doping conveyed that their personal relationships suffered due to irritability (Laure, Lecerf, Friser, & Binsinger (2004).

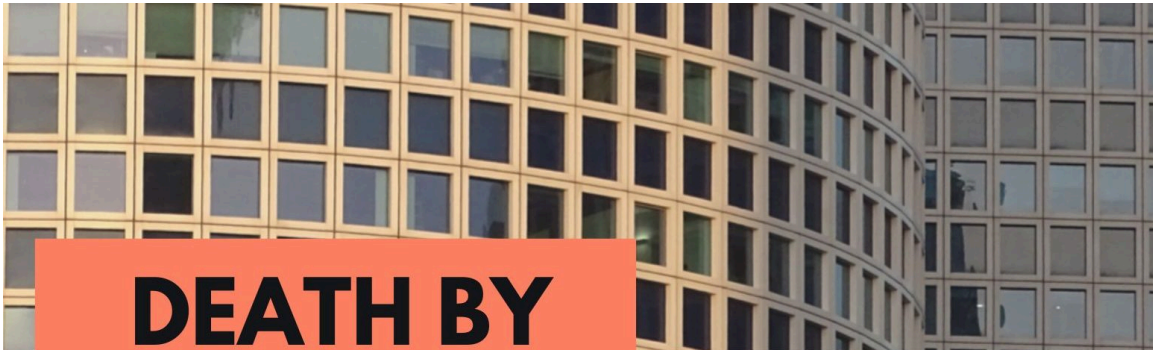


A Synthesis is an integration of similar findings.

It is well documented that females are consistently underrepresented in district administration (Kowalski, McCord, Petersen, Young, & Ellerson, 2011; Mahitivanichcha & Rorrer, 2006; Wallace, 2014; Brunner & Grogan 2007; Kowalski et al., 2011; Wallace, 2014).

Scholarly writing style is characterized by the consistent use of synthesis.

Another common style to avoid is called death by repetition. Death by repetition refers to writing that uses phrases or terms in a repeated fashion that does not add to understanding. This is sometimes known as “fluff.” Scholarly writing is not fluffy. This writing lacks specificity and originality, which can signal the writer is not knowledgeable enough on the topic to explain, detail, and expound the information effectively. The highlighting method help identify repeated phrases.



DEATH BY REPETITION

Killing your writing with repetitive catch phrases and crutch words

Academic writing is often a struggle for many graduate school candidates. One of the most common issues is the overuse of *catch phrases* and *crutch words*. Catch phrases are abbreviated ways of expressing an idea. An example would be an idiom or other colloquial phrase, like *making the grade* or *getting out of hand*.

Crutch words are those relied upon to add more words without adding more meaning. In speaking they serve to give the speaker time to think. Words like *really*, *actually*, and *honestly* often do not have meaning in a sentence. Graduate writers tend to develop a set of catch phrases and crutch words. As the writer improves these tend to disappear. Using a thesaurus is a good strategy for finding more specific words. Academic writing is detailed,

specific, and should be written so that it is interpreted the same by most all readers. Vague words and phrases provide opportunity for the reader to develop misconceptions. Additionally, repetition weakens the writing and detracts from the ideas being presented. It also can appear as an incompetent or incomplete work. Using fresh phrasing and specific words will improve the quality of writing and ensure the work is interpreted as intended.

Using fresh phrasing and specific words is essential for improving writing.

The Peer Review Process

The peer review process is central to research writing. Research projects must undergo peer review before publication. The process requires a review of the project draft by a scholar knowledgeable in the discipline or field. The peer review is conducted and feedback is provided to the author. The author revises the work based on the feedback, submits it for additional review, and the process continues until the project is publication-ready.

The peer review process leads to the acceptance of a research project within the discipline. Essentially, those knowledgeable in the discipline provide approval of the research process and publication. This approval gives the research work credibility and validation as belonging among other published education research literature. Peer reviewers essentially endorse the work, so their reputation is at stake. Reviewers provide feedback to communicate where the work needs revision to be “endorsement worthy.” Researchers respect the process of peer review knowing that their work is legitimized and endorsed by experts in the discipline.

One of the most difficult activities in the peer review process is receiving feedback. Novice researchers often find the feedback harsh and difficult to accept. This is a very common phenomenon, but understanding the role feedback plays in the process can lessen the impact. The feedback provided is intended to focus the author on issues, errors, and how to improve the writing of the research document. Similar to physical therapy, exercises needed to improve a physical malady are rarely enjoyable but are a much needed part of the healing process.

Many researchers have difficulty seeing their writing objectively. The ability of a reviewer to view a work objectively and provide feedback is a valuable part of the peer review process. Think of the process this way, the researcher does not have to write a perfect draft the first time. There is freedom in writing your thoughts without worrying about perfection. This process allows the writer to draft, knowing the reviewer will provide ways to improve the work. However, this does not mean a reviewer will write your document, only facilitate you in improving the writing. Embracing the feedback provided by reviewers is a key skill needed for successful research writing.

Graduate research projects usually have one to three reviewers providing feedback to the student. Literature reviews and thesis projects tend to have one reviewer, which is the instructor for the course. Dissertations generally have three reviewers, known as the dissertation committee. In some institutions, the dissertation committee has five members. Capstone projects typically have one to three reviewers. For all types of research projects, the reviewers provide essential feedback needed by the author to revise the work appropriately to meet discipline and institutional standards.



PART II

RESEARCH COMPONENTS

Most research literature includes the same basic components: Problem, Background, Theoretical Frame, Purpose, Literature Review, Methodology, Discussion, and Conclusions. In Part II, we will discuss these components in detail. The components tell a research story. Like all stories, there are characters, setting, plot, conflict, resolution, point of view, and theme. Additionally, the narrative of a story has background or setup, rising tension, a climax, falling tension, and a resolution. While these elements are common, not all stories include all the elements. Some stories have more complex components than others. So it is with research stories, some include all, some have simple components, and others have a more complex structure.

As we progress through Part II, we will explain how the components of the research story are developed by telling the story of a slow cat. The story of a slow cat will progress through each chapter. An interpretation of the story is provided to help you connect how to think about the story of the slow cat in relationship to the research story. The interpretation is followed by a discussion of the research component including ideas on how to write it. The chapters are presented in the most common order and structure of a research story.

Let's begin with the story ...



Pickles the cat
(Truly, this cat brings pickles, not mice!)



Harry the cat keeper
(Really, could you think of a better name for the guy?)



Physicus the scientist
(Of course, Physicus was born a scientist... naturally!)

THE SLOW CAT

Harry had it. The cheese was gone again! Only the torn plastic wrapper with the inscription, "Six weeks in brine and brandy, Époisses de Bourgogne, France," remained on the floor. This was the smelliest cheese in the world. So much so, no one should ever try to bring it on public transport in France; it is not permissible. Harry loved Époisses cheese. So did the mice that infested his house. Harry did not like mice.

Mourning the loss of his favorite cheese, Harry stood in the middle of the living room, with teary eyes and a trembling voice he screamed loud enough for every mouse in the house to hear.

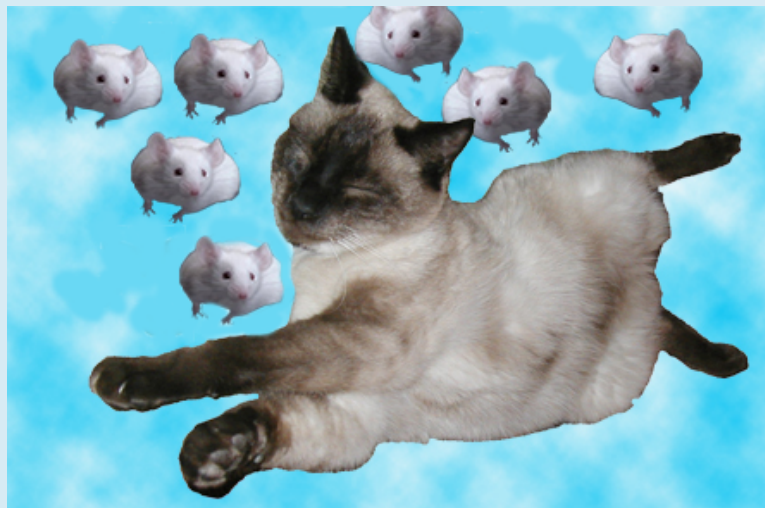
"YO, MICE! This is it! I am through with you all! I am getting a cat!"

Well, this is how it all started.

That very night, Harry returned to his home with a new resident, a blue-eyed Siamese cat he adopted from a local pet shelter. The worker at the shelter told Harry the cat was found locked in a cage, just on the side of a highway, apparently left there to die. Harry felt emotional about the beautiful animal and decided to give him a good life.

When the cat was picked up by the shelter, he was hungry and scared. Two months of the "royal" treatment and dietary fulfillment turned the cat into a perfect ball of fur with healthy deposits of fat here and there. Harry called the cat Pickles.

Now, Pickles' new house was just perfect, with plenty of room, plenty of love, plenty of food, and plenty of mice. Harry's home was infested by mice, which was cat heaven, or so he thought. Siamese cats are known for being vicious mice hunters; they were bred to catch mice and other rodents in the Royal Courts of Thailand, after all. The vendetta on mice was official!



Problems and Problems of Practice

THE STORY CONTINUES...

Harry was getting excited as he observed Pickles checking around the house, clearly paying attention to the cracks in the basement. These mice better are aware now, the cat is in the house.

As Harry was enjoying observing Pickles patrolling and getting accustomed to the surroundings, Harry noticed a mouse, slowly retreating along the wall toward a crack. He saw Pickles charging toward it, but the mouse beat the cat in the race. Before Pickles could catch it, the mouse was gone! Perhaps Pickles would be a better hunter at night, Harry thought.

Evening approached, and Harry was about to turn the lights off. Oh my, he thought, I forgot to close that peanut butter jar on the kitchen table. Oh well, Harry thought. Perhaps it will set a great stage for Pickles' night hunt! Perhaps. That night as he slept, Harry dreamt his house was mouse free, once and for all, his brave superhero cat, Pickles, has caught many mice, and the rest of the mice left for the neighbor's house.

In the morning, Harry woke up and noticed Pickles sleeping comfortably on a pillow in the corner. When Harry went to get breakfast, he found the jar of peanut butter spilled on the kitchen table with mouse prints all over, but no dead mice. The peanut butter clearly served as a jackpot find for rodent residents. A terrible idea crossed Harry's mind: What if Pickles does not catch any of the mice? Maybe he will tomorrow...maybe, Harry thought.

You guessed it, Pickles seems to be too slow to catch mice. So far, Pickles was proving to be a good friend to the mouse colony living in Harry's house. Now what?

Interpreting the Story

Harry has a problem with his new cat. Pickles seems too slow to catch mice. Cats are usually fast and like to eat mice, especially Siamese cats. This is why Harry got Pickles in the first place. Harry has lots of mice in his house who get into his food and eat his favorite cheese. The trouble is, Pickles is not catching the mice, so they are still tenants in Harry's house. Harry's new cat was supposed to solve his problem, but his problem remains.

The issue = Pickles does not catch mice.

The pain/why it is an issue = Harry's house is overrun with mice.

The consequence = The mice eat Harry's favorite cheese.

Problems

Problems abound in education and the social sciences. The Problems and Problems of Practice describe specific challenges in education needing systematic and objective investigation to find a solution, test a theory, determine cause and effect, or find effective strategies that address the issue. The research story begins with a problem.

While finding problems in education is easy, identifying a good research problem in education is not as simple as it may seem. For a problem to be a research problem, the pain it causes and the consequences of the issue must be identifiable. Educational problems cause some form of personal pain, like stress, low self-esteem, lack of belongingness, or missed skills, for some examples. There is also a need to investigate the research problem because there is a greater educational consequence and broader impact, such as low academic achievement, teacher burnout, or increased dropout rates, etc.

A problem is worthy of conducting a research project if there is an issue, a pain it causes, and a resulting educational consequence. If information can be obtained about a problem in education by simply completing an internet search, then it is not a good research problem. For example, if you wish to know if there are some best practices for doing reading circles because you do not like your strategy, an internet or library search can provide you with new information. A research project would not be necessary in this case because it only requires information gathering. There is no issue, no pain, and no educational consequence beyond a desire to improve your practice.

What if you found there was a reading circle strategy that interfered with the reading comprehension of low socio-economic (SES) students? The issue also resulted in low reading assessment scores. Yet, you could not find a best practice that addressed this population of students. Now, there is an educational problem needing to be addressed.

The issue = The reading circle strategy interferes with reading comprehension.

The pain/why it is an issue = Reading comprehension for low SES students is reduced.

The consequence = Low reading assessment scores.

WHAT IT IS

ISSUE

INCONGRUENCE **DISCREPANCY**

STATEMENT OF CONCERN

DIFFICULTY TO ELIMINATE

CONDITION TO IMPROVE

**A CLEAR PROBLEM PUTS
A STUDY ON TRACK**

What it is not

A SOLUTION **SOMETHING OUT OF REACH**

A QUESTION OF MORALITY **OVERLY COMPLEX**

A good problem statement will not side-track your study



Conducting research to address a problem should contribute to educational knowledge or practice. This means the research should have some value beyond the author's specific situation. Research should be shared with the educational community. A research project can contribute to educational knowledge in a variety of ways. The primary criterion to consider is finding a niche in the current research literature where the study fills a void.

The goal of situating a research project in a niche in the current research supports its value to the educational community. Identifying the niche for the study can include a variety of strategies for finding a problem that:

- lacks published research;
- replicates a study with different participants or in different settings;
- involves understudied people groups;
- expands a theory;
- informs/improves practice.

A research project must identify an educational problem and study it in a way that expands knowledge or does something new. The idea is moving knowledge forward rather than restating previously published research. Problems are the linchpin of a research project.

Well-crafted and correctly articulated problems are the key in developing a project that expands knowledge and practice in education.

Problems of Practice

Problems of practice are localized issues that may or may not exist in wider educational settings. Issues considered to be a problem of practice are “persistent, contextualized, and specific, embedded in the work of a professional practitioner, the addressing of which has the potential to result in improved understanding, experience, and outcomes” (CPED, n.d., p.2).

Problems of Practice (PoP) often do not yield generalizable results as the context is highly specific, e.g., an issue with low scores on tests rarely administered in schools other than yours, or social/cultural issues involving a small and unique population. Results from studying these problems of practice would be limited in application outside of these educational settings.

FEATURES OF A Problem of Practice

ISSUE

Instructional or Systemic

Instructional or systemic issues are problems that involve the interactions of teachers, students, and content or interactions of system leaders, schools, and communities that relate to system performance and/or community well-being.

EVIDENCE

Directly Observable

A problem of practice must be empirical in nature not theoretical. While theory may be used in the examination of the problem, the problem itself must be directly observable.

EXECUTION

Actionable in Real Time

An actionable problem can be improved in real time. This extends the directly observable feature and defines the potential for executing a solution.

LINK

Connects to Strategy

Problems of practice have a reciprocal relationship with broader system improvement plans. Improvement plans might assist in defining problems of practice, while the study of a particular problem may enable a school or system to realize its stated goals.

IMPACT

Makes a Difference

Solving a problem of practice would make a significant difference for student, institutional, or community learning, processes, and/or health.

Problem Statements

A problem statement articulates the specific issue being addressed in a research project. It is a concise statement of what the issue is right now. What is the problem and why is it a predicament, hindrance, or challenge? A good research problem is an issue or difficulty of some significance, urgency, and priority when investigated will make a useful contribution to the body of knowledge in education.

A good problem statement should express the issue and why it is a problem. The lack of something is not a researchable problem. What is happening because of that lack is what is researchable. A good format to follow for writing problem statements is...

The problem with X is Y, which causes Z.

X = existing issue

Y = pain/why it is an issue

Z = consequence

THE PROBLEM
STATEMENT IS
THE LINCHPIN

WITHOUT A GOOD ONE,
THE STUDY WILL FALL
APART!



Think about our story of Pickles.

The issue = Pickles does not catch mice.

The pain/why it is an issue = Harry's house is overrun with mice.

The consequence = The mice eat Harry's favorite cheese.

The problem statement would read something like:

Harry's cat, Pickles, does not catch the mice resulting in Harry's house being overrun with mice and Harry's favorite cheese being eaten.

Consider the components in this problem statement:

School administrators experience high stress due to the many responsibilities required of them, leading to a shortage in the number of professionals willing to enter and stay in the administrative field.

X = many responsibilities required of school administrators

Y = high stress

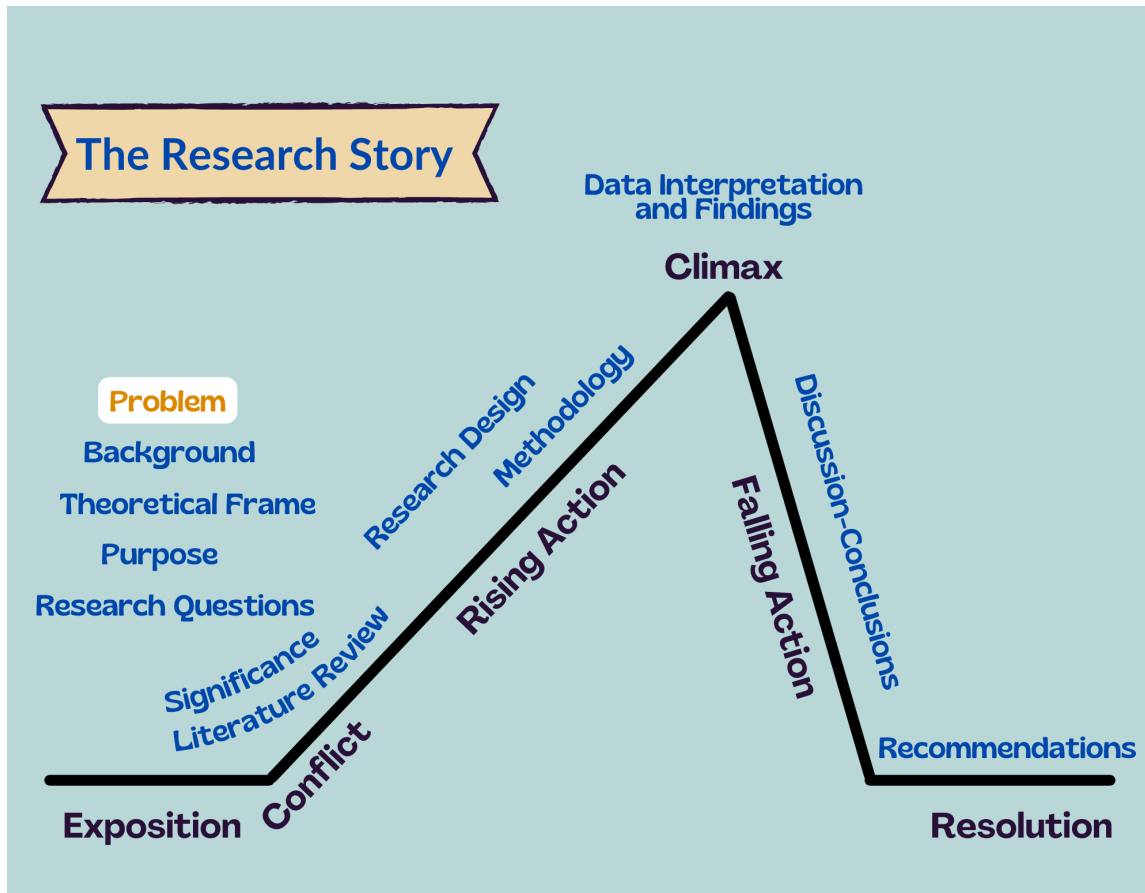
Z = a shortage of administrators

Notice in the problem statement about school administrators. The order of the X, Y, and Z components was different from the format presented. The order of the components of the problem statement is not as important as having all the components. Ensuring clarity in the wording of the statement may require rearranging the components. However, problem statements have an issue, a pain, and a resulting consequence.

TELLING THE RESEARCH STORY

Writing the problem statement is the first step in developing your research story. It is a succinct expression of the conflict in the research story. The problem statement is the topic of educational research; it represents what the story is about and what must be identified before the story can begin. The problem statement is written in the introduction to a literature review. This serves as the thesis or main idea and guides the leveled headings of the findings explained in the rest of the literature review.

The problem statement is found in one of the first headings of a thesis, dissertation, or capstone project along with the background information, usually entitled, "Background and Problem." Depending on how the background is structured, the problem statement is placed at the beginning or the end. The heading may start with the problem statement and then tell the background or it begins with the background information that leads to the problem statement.



Reference

CPED (n.d.). Retrieved from <https://www.cpedinitiative.org/the-framework>

Background to the Problem

THE STORY CONTINUES...

When Harry recognized the predicament he was now in, he turned to the “know it all” friend, Google. Everything Harry found was pointing toward what he already thought: Siamese cats are a “nuclear” option against mice. Harry Googled, “nuclear option.” Google returned “the most drastic or extreme response possible to a particular situation” (Oxford Languages). Well, Harry thought, there must be something wrong with Pickles, or maybe there is something different about my mice, or.... Maybe I should ask Physicus, my very smart neighbor.

Harry’s neighbor, Physicus, taught research to doctoral students at the local university. Whenever Harry would ask Physicus a question, the neighbor would take a quick pause and then reply, “Well, it depends.” For Physicus, there was always more than one answer to any question.

Physicus met Harry in his pajamas with a cup of coffee and something rolled in a Dunkin’ Donuts napkin. Physicus gestured, “Please, Harry, come in. Have a cup of coffee and a pumpkin Munchkin. I have some super sharp cheese for you, too. What’s up?”

“My cat, Pickles, does not catch mice, and the mice ate my favorite cheese again,” replied Harry, “And Pickles is a Siamese!”

“Really?” Physicus sounded excited, “So, why do you think Pickles doesn’t catch mice?”

Harry looked right into Physicus’ eyes and replied, “I guess... it depends.” Since this was Physicus’ answer to any question, Harry wanted to entice his help using his own words. The strategy worked! Physicus grabbed his laptop and pressed the power button.

“I have already searched Google about my problem with Pickles,” said Harry.

“Oh, your good friend Google,” Physicus mumbled, “Let us see what science tells us about your cat!”

Interpreting the Story

Harry recognizes that there is no available answer for explaining why Pickles is not catching the mice. Let's consider some of the facts. Cats catch mice. Siamese cats were bred to catch mice and have done it for centuries. Pickles is distinctly Siamese and there are plenty of mice. What is known about Siamese cats suggests this situation should not be a problem. Systematically reviewing the problem helps to determine the objective facts about it, possible ways to understand it, and possible avenues to solve it.

The Background

The role of the Background component in research projects is to provide the context and history of the research problem. It explains how the problem arose. Educational problems do not appear out of anywhere. The Background narrative provides the history, context, and evidence the problem actually exists. It also defines the features of the problem and factors contributing to the problem and provides evidence to show the problem is current.

The Background narrative details the context of the problem. The context is important in determining later components of the research project. As in writing a fictional story, "setting the stage" is a key element in the research story too. The context includes the educational setting, characters, and circumstances surrounding the problem. The educational setting explains the institution, e.g., community college, elementary school, alternative school, corporation, etc. The setting also details where the problem is occurring, such as in a chemistry classroom, throughout a district, or in online corporate training sessions. The description should be clear and detailed enough that a set designer or prop master could replicate the scene.

The characters in the research story are the students, instructors, administrators, or institutions. A clear description of the characters involved is required. Specificity in describing the characters is essential to understanding the research problem. Identifying the specific features of the characters provides the reader with a picture of who is in the story and how they relate to the problem.

Educating elementary children is quite different from educating adults. The roles and perspectives of instructors and administrators vary from each other, as well. Specifics, such as second-graders in a low SES urban elementary school, first-generation Latinx college students, and new building principals in an affluent district, are important because they impact the context of the research story differently.

The last element in the context is a comprehensive description of the circumstances the characters find themselves in at the current time. An explanation of the situation surrounding the research problem provides an "opening scene" for the research story. Details about how and when the problem occurs are part of the description. Consider when the problem occurs, e.g., yearly testing sessions, weekly board meetings, or reading groups. Identify to what extent or frequency the problem is observed, e.g., 90% dropout rate, exhibiting no motivation, or daily disciplinary visits to the principal.

In addition to the context, the Background narrative includes the history of and contributing factors to the problem. The events or relevant conditions leading up to the problem are explained in this heading. Determining the contributing factors can be a complicated endeavor. There are many variables to consider. The same educational problem can be studied in a variety of ways by investigating different contributing factors. The contributing factors of the problem are identified and supported with cited evidence to show there is a current problem. This evidence may be statistical trends, recent data, or previously published research findings.

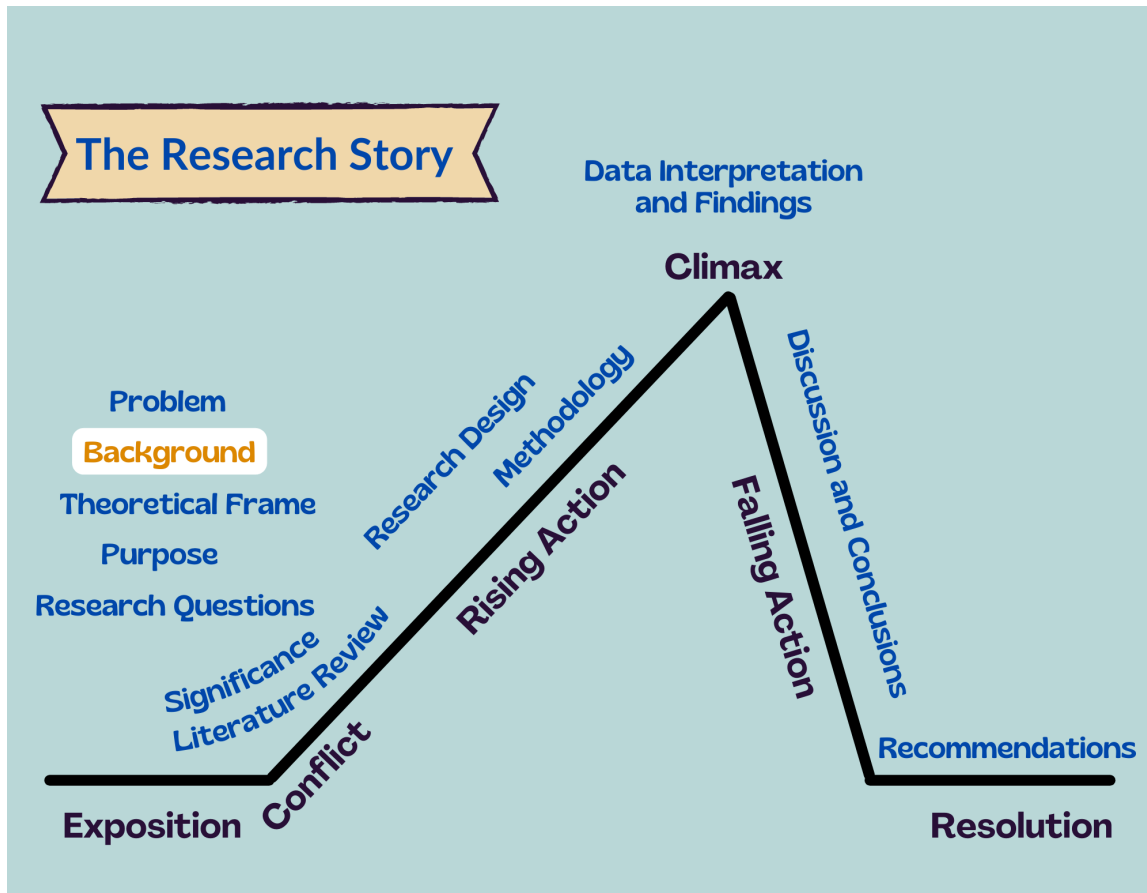
Overall, the Background narrative provides a thorough explanation of why the problem is an educational concern and how it came to be by showing the progression of the problem to the current time. This requires proving there is an educational problem needing attention and demonstrating a gap in research exists. The Background narrative is supported with cited evidence to show the problem has current educational significance, and further, why the problem must be addressed.

TELLING THE RESEARCH STORY

The Background explains the setting (context), the conflict (problem or problem of practice), the history and contributing factors, and the “opening scene.” The Background story can be told in a variety of ways, however, the elements must be there. Often, the Background is written by presenting the problem (conflict in the story) first, followed by the history, contributing factors, context (setting), and then the opening scene (current situation). In other cases, the context and the current situation is presented first, followed by the history and contributing factors, and ending with the problem statement.

The Background heading appears in Chapter 1 of the thesis, dissertation, and capstone projects. The heading tells the beginning of the story including the setting, characters, rising tension, and conflict. The Background sets up the research story. Your writing should draw the reader into the story, and inspire the reader to join your research journey.

A stand-alone literature review usually does not have a Background heading. Instead, the published research findings related to the history and contributing factors are presented within the literature review project. Often the background research is found at the beginning of a literature review as it sets up the research story told within this type of research project.



The Theoretical Frame

THE STORY CONTINUES...

Harry and Physicus spent hours exploring research and finding some fascinating information. Nothing directly explained why a Siamese cat would not have an interest in catching mice. However, Physicus found a study in which researchers concluded that the obesity of small animals was related to their playing and hunting habits. The more overweight the animal, the less they played or hunted.

"This makes sense," argued Physicus. "When an animal is not hungry, it does not need to be very active in hunting food."

Another study interestingly connected the number of prey to the lack of engagement in the hunt. Researchers found that a lizard would hunt for a single cricket placed in its cage. However, the lizard would not hunt any of the crickets when 100 were released simultaneously. Further, researchers noted when 10 crickets were released into the lizard's cage, they were immediately hunted and eaten.

Physicus was so excited. "You see," he exclaimed, "somewhere between 10 and 100 crickets is where the lizard lost interest in the hunt!"

"I wonder if this has anything to do with how Pickles behaves?" Harry said. Possibilities, but no answers, thought Harry.

Physicus continued, "Now we have two ways we can use to think about the problem. Maybe Pickles is overweight or overwhelmed."

Interpreting the Story

Physicus and Harry investigated research findings to see what they could learn about the problem. What they discovered were two possible reasons for Pickles' behavior. This information gave Harry and Physicus two ways to think about the problem. Harry and Physicus will choose one of these ways to provide a direction for exploring published theories that are related to the problem. The friends will choose one theory as the basis for their inquiry. The chosen theory guides the development of the research project. This is called a Theoretical Framework.

The Theoretical Frame

The role of the Theoretical Frame is to outline how the problem will be studied. This component details the perspective or angle from which the research story will be viewed. The Theoretical Frame provides the lens for how the researcher will focus their attention on certain features of the problem and disregard others.

The key concept of the Theoretical Frame is the published theory. However, advanced researchers may base their projects on more than one theory, so you may encounter this when reading published articles. In educational research, theories about learning, development, cognition, psychology, teaching, etc., are used to frame how an educational problem is studied. Examples of published theories are Bandura's Social Cognitive Theory, Erikson's Psychosocial Development Theory, Knowles' Adult Learning Theory, and Skinner's Theory of Operant Conditioning. The Theoretical Frame is bounded by your chosen, published theory.

A published theory is chosen by how it connects to the research problem. The connection can be found in the Background of the Problem, such as a feature of the setting or participants, or the theory connects to your hypothesis about how to solve the problem. For example, if the problem occurs in a classroom, a social learning theory might be in order; if the problem occurs in a rural school, we might select the psychology of poverty to frame the study. If we hypothesize that professional development (PD) training is needed to solve the research problem, then we would choose an appropriate theory of PD.

The theory provides the parameters for how a research project is developed. The theory acts as guard rails to keep the methodology focused and to ensure the purpose of the study is realized. Different theoretical frameworks for the same problem will yield very different results. Think about the problem of low test scores, as an example. If a social cognitive learning theory (learner-focused) is used to frame a study of low test scores, the project design will be different from the design of a study of low test scores using a professional development theory (teacher-focused).

The writing of the Theoretical Frame includes a full description of the published theory citing the original theorist's work. The writer must explain why this theory is the best choice to frame your problem. The specific aspects of the theory that relate to your problem are discussed. The discussion details how the theory relates to the background or context of the problem, and how the theory connects to the purpose of the research project.

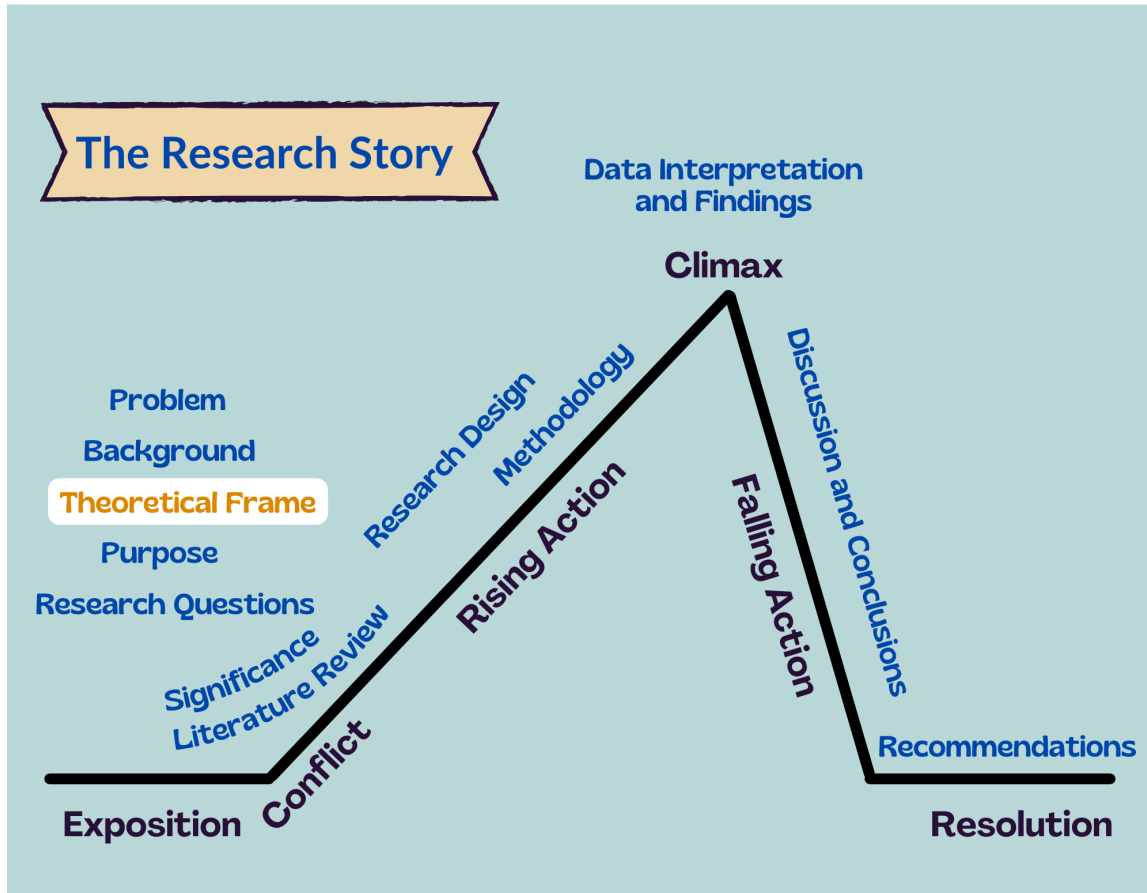
TELLING THE RESEARCH STORY

The Theoretical Frame explains the “point of view” of the research story. It is based on a published theory. In our example problem of low test scores, the point of view was from a social cognitive learning perspective. This point-of-view is focused on how low test scores can be explored by using a student-focused perspective that employs social cognitive strategies.

The elements in this heading can be written in a variety of ways, however, the elements must be there. Often, the Theoretical Frame is written by presenting the theory, how it addresses the problem, and why it is the best choice first. This is followed by how it relates to the background and/or context and then how it connects to the purpose of the study. In other cases, the theory is presented first, followed by how it addresses the problem, is the best choice, relates to the history and current situation, and ends with how the theory supports the purpose of the study.

Since the Theoretical Frame functions as the point of view in the research story, elements of the theory or framing perspective are found throughout the rest of the research project. This means that the other components of the research story are told from this point of view. The perspective of the Theoretical Frame keeps your research story structured and on track.

The Theoretical Frame component appears in Chapter 1 of thesis and dissertation projects. The capstone project includes a Theoretical Framework or Project Framework heading in Chapter 1. The framework used to develop a capstone project can be a theory, or it can be related to the type of practical product the project aims to create or implement. A literature review project does not have a Theoretical Frame heading.



CHAPTER 8

The Purpose

THE STORY CONTINUES...

As Harry walked back home, he thought, interesting, very interesting. Could it be that the number of mice at my house is simply overwhelming for Pickles? If this is the case, how could I control how many mice are within Pickles' area of attention? If I only knew that for a fact, I could have Pickles in one room of the house at a time. There, the number of mice coming out could be reduced, and maybe, Pickles would act differently toward them.

Harry had a vision of the Eiffel Tower, a bottle of wine, and the Époisses cheese making him reminisce about his first bite of Époisses. Époisses was his favorite cheese, and the mice keep eating it! This thought made Harry walk faster thinking, yes, I have got to save my cheese!

The next day, Harry got out his journal and wrote down what he wanted to do to reach his goal. He felt good to now have a direction for his research. Harry's goal was to figure out how to increase Pickles' motivation to hunt the mice and save his cheese. Harry shared his goal and ideas with Physicus.

"So, now that I know my goal, what's next?" Harry asked Physicus.



Interpreting the Story

The goal Harry jotted down gave him direction and helped Harry see what he wanted to do. Wanting to solve the mice problem was not enough. Harry had to decide on a specific hypothesis to try to reach the goal of saving his cheese. In research, we cannot accomplish everything at once. Instead, we must focus on using a theory or hypothesis for the project. Harry formulated a clear goal of what he wanted to accomplish (save the cheese) by using his hypothesis (reducing the mice Pickles encountered).

The Purpose

The Purpose expresses the overall intent of the research project. In this heading, the writer explains what central phenomenon will be explored, tested, or analyzed. The Purpose explains what will be accomplished in the study. It provides a brief overview of the participants and the environment of the study, as well as the Purpose Statement.

The Purpose Statement is a declarative sentence, such as, “This qualitative study will analyze (or study, or explore) ...” The Purpose Statement expresses the point of your research study, the major intent, or the objective. What is the goal? The Purpose Statement is based on the goal to improve, influence, or alleviate the problem. The Purpose Statement is active, not passive.

The basic structure of the Purpose Statement: The purpose of this [type] study is to [action verb] this for/to [action verb] that element of the problem.

EXAMPLE:

The purpose of this qualitative study is to explore the perceptions of instructional coaches to identify effective strategies for mentoring new teachers.

[this]

[that]

problem element

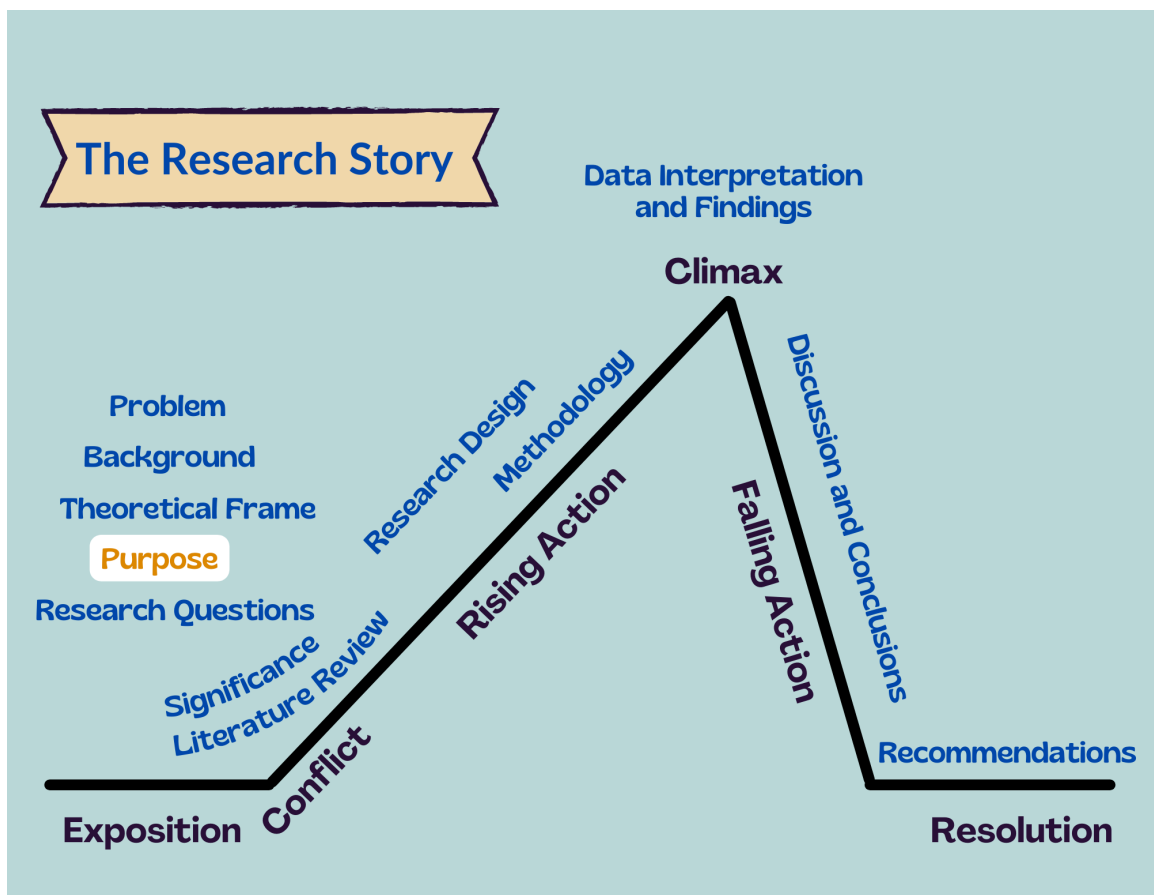
The elements of the Purpose Statement can be in any order, however, the main characteristics shown here should be present. The Purpose Statement is active, descriptive, specific, and relates directly to the problem.

The writing explains how the purpose (goal) will address the problem through the theoretical frame. A description of how the purpose will improve, influence, or solve the problem is included. What will the study accomplish? How will this study add value to the greater body of knowledge in education? The focus of the Purpose is on the future state of the situation after your research is complete.

TELLING THE RESEARCH STORY

The Purpose explains the goals of the research study. It explains what to expect at the end of the story, in a general sense. Your writing details how the conflict is expected to be resolved. The Purpose sets the stage for the closing scene.

The Purpose appears in Chapter 1 of the thesis, dissertation, and capstone projects. The literature review, however, does not have a specific heading for the purpose. Instead, the purpose of the literature review is presented in the introduction of the project.



Research Questions

THE STORY CONTINUES...

Another day, another piece of cheese ... the mice are still in Harry's house and Pickles is still not catching the mice. But now, Harry and Physicus have a hunch about Pickles being overwhelmed by the number of mice.

Physicus asked Harry, "What do you want to know now?"

Harry wanted to test the hypothesis of Pickles being overwhelmed by seeing too many mice at once. "Well," said Harry, "I want to know if Pickles will attack any mice and how many mice causes Pickles not to attack."

Physicus replied, "So, maybe your research questions are something like...How many mice will Pickles attack at one time? How many mice causes Pickles not to attack?"

"Right!" said Harry. "This would tell me how to solve the problem. If I know how many mice will cause Pickles not to attack, then I can control the number of mice Pickles encounters at a time. Then Pickles will get rid of all the mice and solve my problem!"

Interpreting the Story

The friends now form questions they will use to test their hypothesis about Pickles' motivation to attack the mice. The first question about how many mice Pickles will attack is important. This tells Harry that Pickles will attack the mice. Since the number of mice seems to influence Pickles' motivation, then finding the maximum number of mice Pickles will attack at one time provides valuable information. The answers to these research questions will fulfill the purpose of Harry's research project, which was to save his cheese by finding how to get Pickles to hunt the mice.

Harry's research questions:

1. How many mice will Pickles attack at one time?
2. How many mice in the room causes Pickles not to attack?

The Research Questions

The Research Questions express what data you seek in the project. The research questions are precise, cover the problem to be addressed, and indicate whether data are collected qualitatively or quantitatively. Research Questions also connect the problem to the theoretical frame. These are written in such a way that when the questions are answered, the results will fulfill the purpose.

The Research Questions are crafted to obtain a single numerical result or are crafted with open-ended questions. Research questions are never answered with a “yes” or “no” response. Instead, research questions use phrases, such as “to what extent,” “how frequently,” etc. to express the intended result.

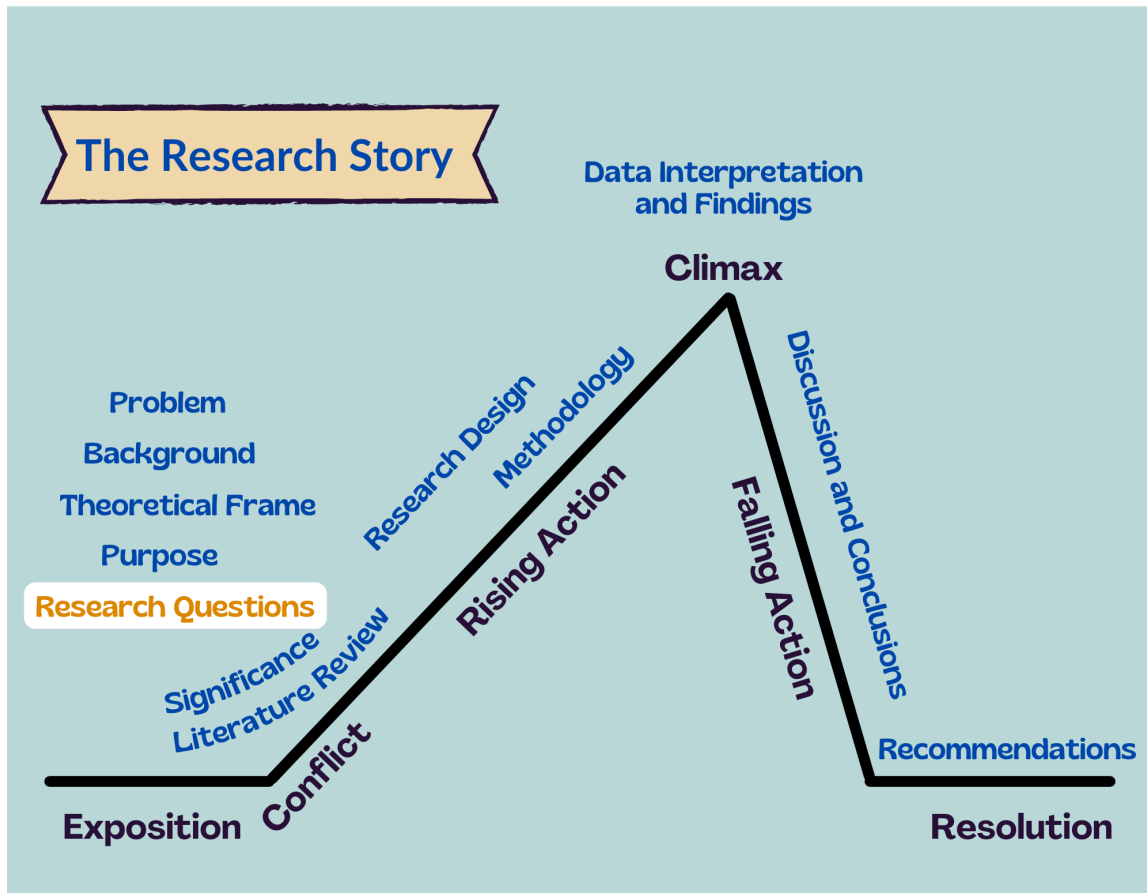
How the research questions are phrased guides how to collect the data to answer the question. If the questions ask how frequently, then the data collected would need to be frequency data. If the question refers to average assessment scores, then the data would be average scores. This is an important consideration in building a research project.

The Research Questions heading is written as a list of numbered questions. Generally, there are four or five questions. The heading does not need a narrative unless required by an instructor or institution. Simply stating, “The following questions will guide the project:” is usually sufficient.

TELLING THE RESEARCH STORY

The Research Questions heading asks the questions that guide the research story. The questions address the conflict, relate to the point of view, and guide the plot of the story (methodology). The questions are answered in the climax of the research story and guide how the story will resolve in the end. The questions also increase the tension and anticipation in the story.

The Research Questions heading appears in Chapter 1 of the thesis, dissertation, and capstone projects. The literature review does not have this heading. The capstone project uses the term “Guiding Questions” instead of “Research Questions” for the heading. The guiding questions in a capstone project may be answered by data collected from empirical research or published research findings found in the literature review.



The Significance

THE STORY CONTINUES...

If only Physicus and Harry could answer their research questions. Harry and Physicus decided to sleep on it. The next morning, Harry called Physicus with the thoughts he had. Harry explained that perhaps finding out how to get Pickles to catch mice could help other cat owners with a similar problem. Harry also said that they might learn something new about Siamese cats.

After Physicus listened to Harry, he replied, "This warrants an investigation, and it is my scientific responsibility to help."

"We need to get answers to help solve my problem, and to make the world a better place by keeping cheese safe from mice," Harry said.

Physicus laughed. "Harry, you just presented the merit for our investigation. Knowledge is power and knowing how to apply the knowledge is even more powerful! Think of how much cheese could be saved for cheese lovers like you. Who knows what else we will find out as we explore this I am so excited! I will think about how to do it and get back to you shortly. Very shortly!"

Before Harry could say anything, Physicus hung up the phone. Clearly, Physicus' mind was racing and he was excited. Harry felt excited too. He felt he was on the verge of bringing something of significance into the lives of others as well as himself. Harry looked forward to enjoying his cheese again someday soon.



Interpreting the Story

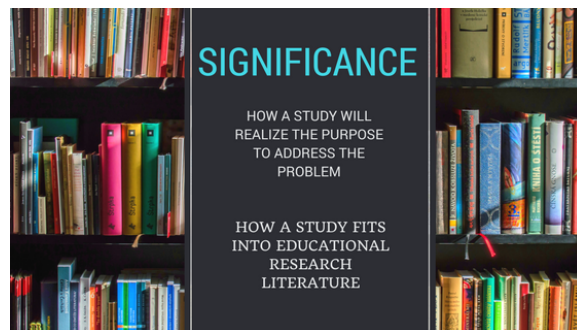
Harry determined that investigating the problem could produce information others would find useful. Education research should be applicable to practice. Finding out something nice to know, has little value in the daily life of an educator. Educators need tested, founded, and significant information to guide their practice. Harry discovered the merit, or significance, of his investigation and its usefulness beyond his current problem.

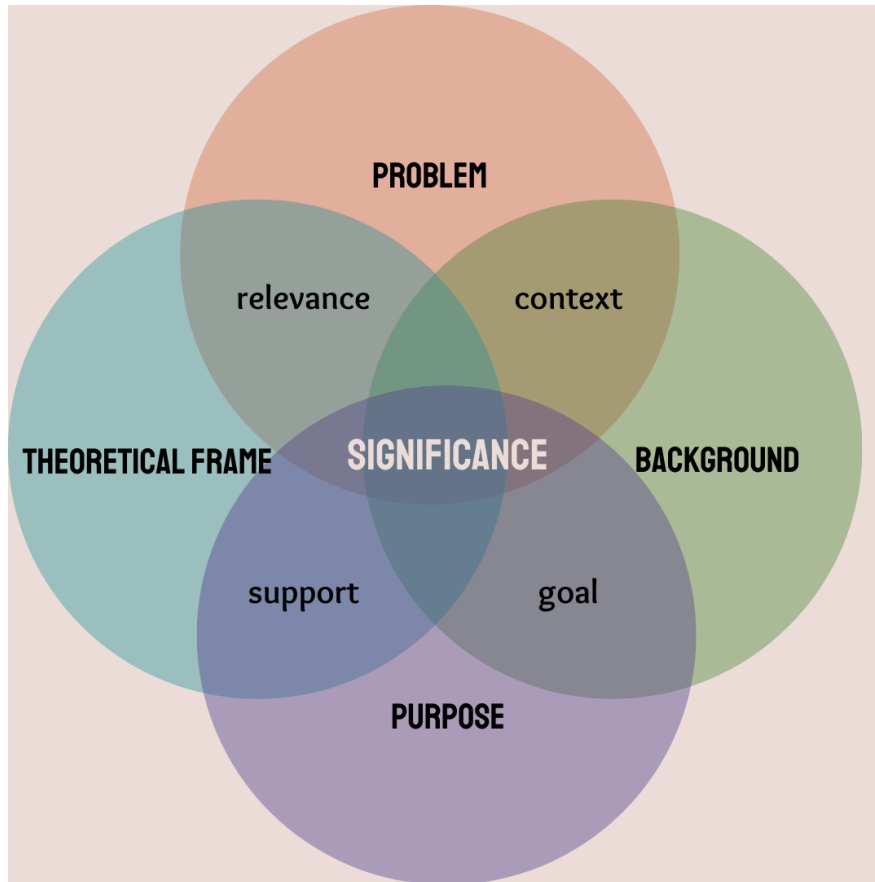
The Significance

The Significance heading explains the importance of the study for select audiences and within the context of research literature. The writing answers the question: “Why is this research project important? The writing should:

- describe the benefits of the project and explain how it will realize the Purpose;
- provide reasons as to how the project adds to the published research, improves practice or policy;
- discuss the expected impact on the field of education.

The Significance heading shows how the project is supported by current statistics and the major findings from the research literature. It is often easier to write this section after completing the Literature Review because key research findings to support your project will emerge during your review. The Significance builds the case to warrant an investigation of the problem using the theoretical frame to fulfill the purpose of the project. The statistics and research findings cited must prove to the reader your research project was worthy of investigation and benefits the field of education.





In the Venn diagram above, consider how the Problem, Background, Theoretical Frame, and Purpose relate to each other. Four themes emerge in the overlap of these components: relevance, context, support, and goal. The writing in this heading includes a discussion of the four themes (relevance, context, support, and goal) to help build the case for significance. The order of the presentation of the themes in your writing can vary, but all must be included in the heading in a logical way.

It is important to develop knowledge through your research that can be applied by others. Simply finding out interesting facts can be engaging, but educational research is much more. Since research is time-consuming and may also be expensive, your efforts must be limited to what can be applied by others in the field. This is what makes research significant. Another factor that adds to significance is the possibility of identifying areas of future research.

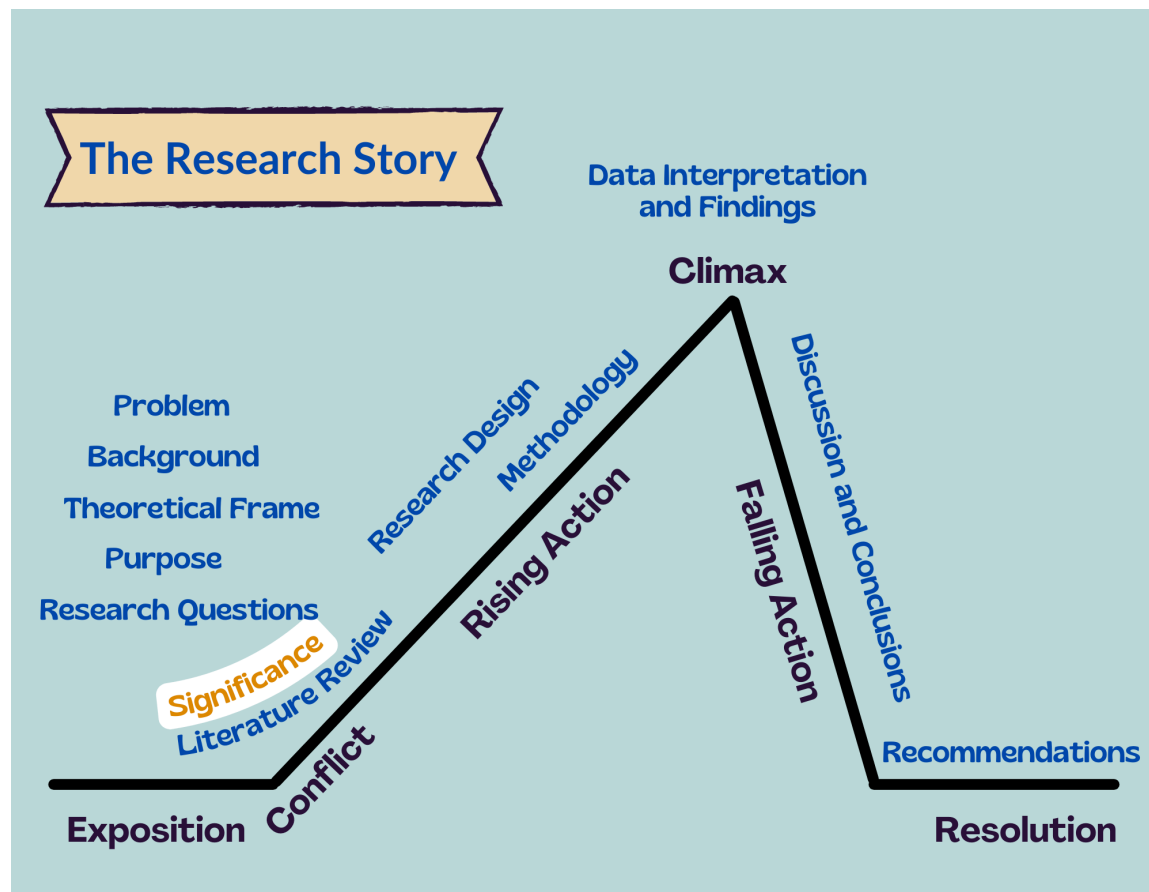
The Significance heading must address the question of merit thoroughly. How the project will contribute to current practice and how the project connects to other research are presented. The evidence provides the reader with compelling evidence of the value of the research project and creates a sense of urgency for the investigation.

TELLING THE RESEARCH STORY

The Significance is part of the rising tension in the research story. It conveys to the reader the value and urgency of conducting the research. Most authors find this to be one of the easiest parts of the story to tell because it provides opportunities for articulating the need. The narrative expresses why the story has a place in the research literature.

At times, the author's passion surrounding the issue comes through the writing of the Significance. However, passionate statements without cited support convey a biased and personal story rather than a research story. Caution is required when making emotive statements even when properly supported. The key to telling the value of the project is supporting your story with evidence from current statistics and published literature.

The Significance heading appears in Chapter 1 of the thesis and dissertation. The Significance heading is included in Chapter 2 of a capstone project. Theses and dissertations share the Significance part of the story in the context of education broadly, while a capstone project is concerned with conveying importance for a more local educational context. The literature review does not have this heading, though the value and importance of the topic are conveyed in the introduction and conclusion headings.



Literature Reviews

THE STORY CONTINUES...

“So, how do we find out the answers to our questions?” asked Harry while Physicus was searching for something on his computer.

“Hmm, hmm, this is interesting... no not this... hmm... what?” asked Physicus. “Oh yes, first we need to ensure that these questions were not answered already by other researchers. We also need to see if our hypothesis about the number of mice influencing Pickles to disengage holds water,” Physicus said.

“What do you mean holds water?” asked Harry. “We found a study about the number of prey affecting how animals hunt,” Harry said.

“We did, but that was only one research article,” Physicus explained. “We need to make sure that this is a strong finding connected to a theory that relates to our project. You see, Harry, since we are going to do all this research, we must be sure that our theory is valid and directly relates. Remember the theoretical frame we discussed?”

“But I thought since we had an article, it was enough,” said Harry.

“Well, Harry, when you did not know why Pickles would not go after the mice, what did you do?” Physicus questioned.

“I went to talk with you,” Harry replied.

“Yes, and what did I do?” asked Physicus.

“Well, you searched on Google Scholar,” said Harry.

Physicus smiled. “Yes, and did you search Google before that?”

“I did,” replied Harry, not understanding where this conversation was going.

“You see,” said Physicus, “we had to put together many pieces of information to get the hunch or hypothesis. Now, if we analyze the information formally, we can determine if our choice is the best to frame our research project to solve the problem. Framing our research with a strong theory gives others, who may want to apply our findings, confidence in what we find.”

“But how can we do that? Isn’t it enough to simply explain our thinking?” Harry asked.

Physicus thought a little and then replied, “Harry, if you had any questions about the article we found, can you talk to the author?”

Harry sensed a trick question. Harry chuckled and said, “As my friend, Physicus says, ‘It depends!’ Maybe the author will not pick up the phone.”

“That’s right. So how do we then learn about the author’s logic in designing the research project that we want to rely on?” Physicus asked.

“I do not know,” answered Harry.

“It is easy,” replied Physicus. “See, research articles have what is called a literature review. This is the section of the article where the author analyzes research findings in the published literature to justify the selection and application of their theory. Analyzing existing research is how we justify our decisions on which theory we will use and how we will investigate our problem. If we want others to benefit from what we learn, we must be able to justify our project!”

Harry and Physicus were hungry, so they ordered a pie from George’s Pizza. Harry exclaimed, “Seriously if you have not had a George’s Pizza, you cannot say that you have ever had a real pizza!”

“I have a theory; a good pizza will put our lit review writing on steroids!” said Physicus.



Interpreting the Story

As Harry learned, there are two reasons for the literature review. First, literature reviews justify the selection of the components for the research project, like the theory in the theoretical frame. Second, it builds the foundation for the argument after the data are collected. The foundation justifies the conclusions based on what is already known. The author presents the cited evidence logically to show how their research project fits into the existing literature.

Literature Reviews

Literature Reviews identify what is known from published research about a topic. It is a survey of scholarly articles, books, dissertations, conference proceedings, and other relevant resources. Sometimes referred to as “research of research”, the review synthesizes known research findings and facts to provide background information and context for a research project. See Chapter 1 for additional information on the Literature Review.

The writing in the Literature Review:

- Identifies gaps in current knowledge
- Avoids duplicating research already conducted on a topic
- Sets the background on what has been explored on a topic so far
- Increases the breadth of knowledge in the topic area
- Presents seminal works in the topic area
- Provides the intellectual context for the work
- Positions the study with other related research
- Provides opposing viewpoints in the topic area

Adapted from Greenfield, T. (2002). *Research methods for postgraduates*. 2nd ed. London: Arnold.

Conducting passive research using keyword searches on topics, concepts, and theories associated with your research project comes first. This means you will search for research articles, published statistics, etc. through your university or college databases, on Google Scholar, or government sites. Refer to Chapter 2 for details on locating research findings and statistics. Essential information and findings are collected along with the references. The goal is to locate all the relevant and current findings with appropriate background information to write an exhaustive survey of published research. In reality, it will be difficult to truly write an exhaustive review, none the less, this is the goal.

As you read through collected resources, essential information, statistics, and research findings are paraphrased and cited. APA style requires you to avoid direct quotes. It is a good idea to write the cited findings as separate sentences. The cited sentences can then be collected and arranged. You may wish to write each cited sentence on a separate notecard to manipulate manually to organize your findings.

The collected findings, information, and statistics are analyzed and grouped based on a commonality or theme. The common theme is written as a phrase and used as a heading in the Literature Review. The cited sentences are organized logically within the themed headings. Transition sentences and original writing are integrated to expand and connect the ideas into paragraphs.

The themed headings and paragraphs are arranged so that the Literature Review flows logically. Literature Reviews are structured from broad concepts to specific concepts or chronologically from past to present. The heading is written in a way that leads to new understandings of the topic. New insights about the topic are presented through the connections made among the prior research findings.

Novice writers tend to avoid presenting findings from research that seem contrary to what they think or where they want the project to go. However, the function of the Literature Review is to summarize all the findings known, which includes opposing results. Consideration must be given to all findings, which provide the whole research story.

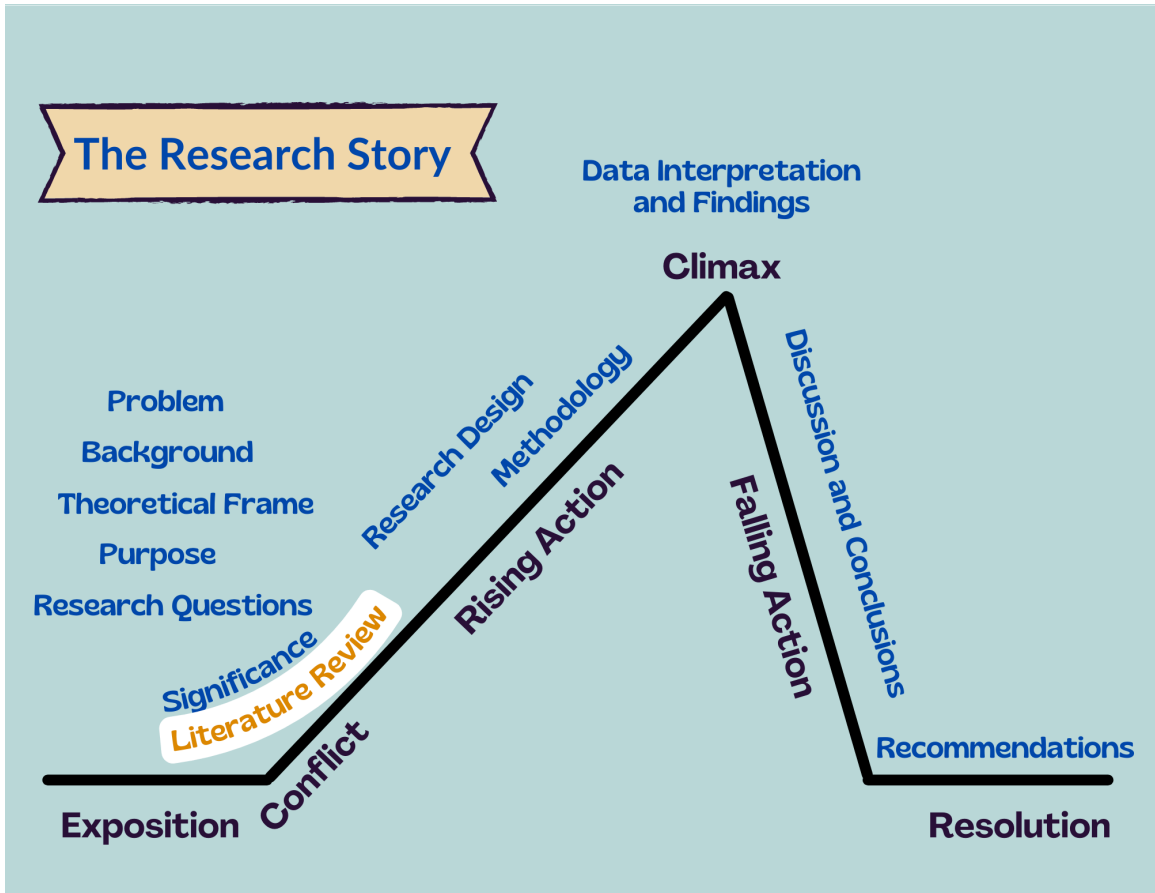
Additionally, the Literature Review must show how your research project fills a niche or gap in what is known. The purpose of formal research is to advance knowledge, rather than investigate what is already known. Writing in the Literature Review explains how the research project advances knowledge.

TELLING THE RESEARCH STORY

The Literature Review tells a story of what was known before, what has been found out recently, and where we are currently in the broader story on the issue or topic. The Literature Review works like a montage in a movie to bring the reader up to date with the current story. It first expands the background story, supporting the conflict, and then contributes to the rising action of the story.

The Literature Review is highly cited, synthesizing research findings and facts to accurately place your research story in current educational history. The past research story must be told first to show where your research story fits into the overall narrative. The heading ends with how your project fills a void in known research.

The Literature Review is found in Chapter 2 of a thesis, dissertation, and capstone project. A stand-alone literature review functions the same as it does in other research projects. It provides information about what is known about a topic. The heading explains the history, context, and an exhaustive survey of the findings and facts to support the need for conducting the research project.



Research Design

THE STORY CONTINUES...

The next morning, as Harry and Physicus finished the last cold slice of George's pizza, they had also finished collecting their literature to conduct a review. The friends concluded their theory about the number of mice influencing Pickles' behavior had considerable support in the research literature. After writing the Literature Review, their research questions will be fully grounded, justified, and worthwhile to be answered.

"So, how do we go about answering our research questions?" asked Harry.

Physicus explained that they will have to analyze their research questions to see what types of answers are required. Knowing this will guide their decisions about how to design the project to answer their questions.

"There are two basic types of answers to research questions, quantitative and qualitative. The types of answers the research questions require tell us what type of research design we need," said Physicus.

"I guess if I ask how we decide which type of research design we should choose, you will say, 'It depends?'" uttered Harry.

Physicus' face brightened as he blurted out, "Absolutely not! Negative!" Physicus continued, "If the research questions are stated well, there will only be two ways in which they can be answered. The research questions are king; they make all the decisions."

"How come?" Harry appeared confused.

"Well, let us see. Think about our first question. How many mice will Pickles attack at one time? What type of answer does this question require? It requires a numeric answer, correct?" Physicus asked.

"Yes, that is correct," Harry said.

Physicus continued, "Good. So, does our second question also require a numeric answer?"

"The second question is also answered with a number," replied Harry

Physicus blurted, "Correct! This means we need to use a quantitative research design!"

Physicus continued, "Now if we had research questions that could not be answered with numbers, we would need to use a qualitative research design to answer our questions with words or phrases instead."

Harry now appeared relieved, "I get it. So in designing a research project, we simply look for a way to answer the research questions. That's easy!"

"Well, it depends," answered Physicus smiling.

Interpreting the Story

There are qualitative, quantitative, mixed methods, and applied research designs. Based on the research questions, the research design will be obvious. Physicus led Harry in determining their study would need a quantitative design, because they only needed numerical data to answer their research questions. If Harry's questions could only be answered with words or phrases, then a qualitative design would be needed. If the friends had questions needing to be answered with numbers and phrases, then either a mixed methods or an applied research design would have been the choice.

Research Design

The Research Design explains what type of research is being conducted. The writing in this heading also explains why this type of research is needed to obtain the answers to the research or guiding questions for the project. The design provides a blueprint for the methodology. Articulating the nature of the research design is critical for explaining the Methodology (see the next chapter).

There are four categories of research designs used in educational research and a variety of specific research designs in each category. The first step in determining which category to use is to identify what type of data will answer the research questions. As in our story, Harry and Physicus had research questions that required quantitative answers, so the category of their research design is quantitative.

The next step in finding the specific research design is to consider the purpose (goal) of the research project. The research design must support the purpose. In our story, Harry and Physicus need a quantitative research design that supports their goal of determining the effect of the number of mice Pickles encounters at one time on his behavior. A causal-comparative or quasi-experimental research design is the best choice for the friends because these are specific quantitative designs used to find a cause-and-effect relationship.

Quantitative Research Designs

Quantitative research designs seek results based on statistical analyses of the collected numerical data. The primary quantitative designs used in educational research include descriptive, correlational, causal-comparative, and quasi-experimental designs. Numerical data are collected and analyzed using statistical calculations appropriate for the design. For

example, analyses like mean, median, mode, range, etc. are used to describe or explain a phenomenon observed in a descriptive research design. A correlational research design uses statistics, such as correlation coefficient or regression analyses to explain how two phenomena are related. Causal-comparative and quasi-experimental designs use analyses needed to establish causal relationships, such as pre-post testing, or behavior change (like in our story).

The use of numerical data guides both the methodology and the analysis protocols. The design also guides and limits how the results are interpreted. Examples of quantitative data found in educational research include test scores, grade point averages, and dropout rates.

Quantitative

Purposes	Designs
identify, what is/are	Descriptive
relationship, association, prediction	Correlational
cause - effect	Causal-Comparative
between group difference	Quasi-Experimental

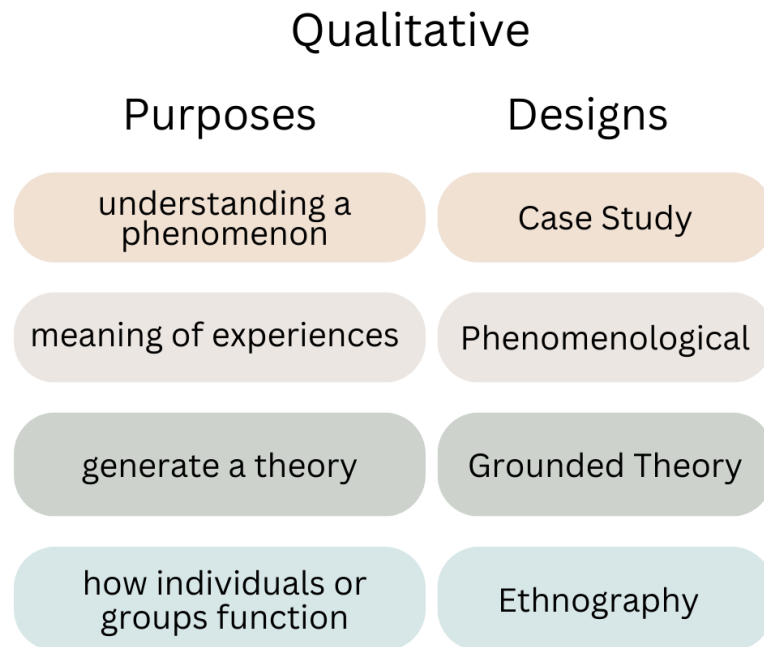
Qualitative Research Designs

Qualitative research designs involve obtaining verbal, perspective, and/or visual results using code-based analyses of collected data. Typical qualitative designs used in educational research include the case study, phenomenological, grounded theory, and ethnography. These designs involve exploring behaviors, perceptions/feelings, and social/cultural phenomena found in educational settings.

Qualitative designs result in a written description of the findings. Data collection strategies include observations, interviews, focus groups, surveys, and documentation reviews. The data are recorded as words, phrases, sentences, and paragraphs. Data are then grouped together to form themes. The process of grouping data to form themes is called coding. The labeled themes become the “code” used to interpret the data. The coding can be determined ahead of time before data are collected, or the coding emerges from the collected data. Data

collection strategies often include media such as video and audio recordings. These recordings are transcribed into words to allow for the coding analysis.

The use of qualitative data guides both the methodology and the analysis protocols. The “squishy” nature of qualitative data (words vs. numbers) and the data coding analysis limits the interpretation and conclusions made from the results. It is important to explain the coding analysis used to provide clear reasoning for the themes and how these relate to the research questions.



Mixed Method Designs

Mixed Methods research designs are used when the research questions must be answered with results that are both quantitative and qualitative. These designs integrate the data results to arrive at conclusions. A mixed method design is used when there are greater benefits to using multiple data types, sources, and analyses. Examples of typical mixed methods design approaches in education include convergent, explanatory, exploratory, and embedded designs. Using mixed methods approaches in educational research allows the researcher to triangulate, complement, or expand understanding using multiple types of data.

The use of mixed methods data guides the methodology, analysis, and interpretation of the results. Using both qualitative (qual) and quantitative (quant) data analyses provides a clearer or more balanced picture of the results. Data are analyzed sequentially or concurrently depending on the design. While the quantitative and qualitative data are analyzed independently, the results are interpreted integratively. The findings are a synthesis of the quantitative and qualitative analyses.

Mixed Methods

Purposes	Designs
comparing quant & qual to understand	Convergent
quant followed by qual to explain	Explanatory
qual followed by quant to confirm/explore	Exploratory
quant & qual - one supports the other	Embedded

Applied Research Designs

Applied research designs seek both quantitative and qualitative results to address issues of educational practice. Applied research designs include evaluation, design and development, and action research. The purposes of applied research are to identify best practices, to innovate or improve current practices or policies, to test pedagogy, and to evaluate effectiveness. The results of applied research designs provide practical solutions to problems in educational practice.

Applied designs use both theoretical and empirical data. Theoretical data are collected from published theories or other research. Empirical data are obtained by conducting a needs assessment or other data collection methods. Data analyses include both quantitative and qualitative procedures. The findings are interpreted integratively as in mixed methods approaches, and then “applied” to the problem to form a solution.

Applied Research

Purposes

informed decision-making

finding new or improving current

finding practical solutions

Designs

Evaluation

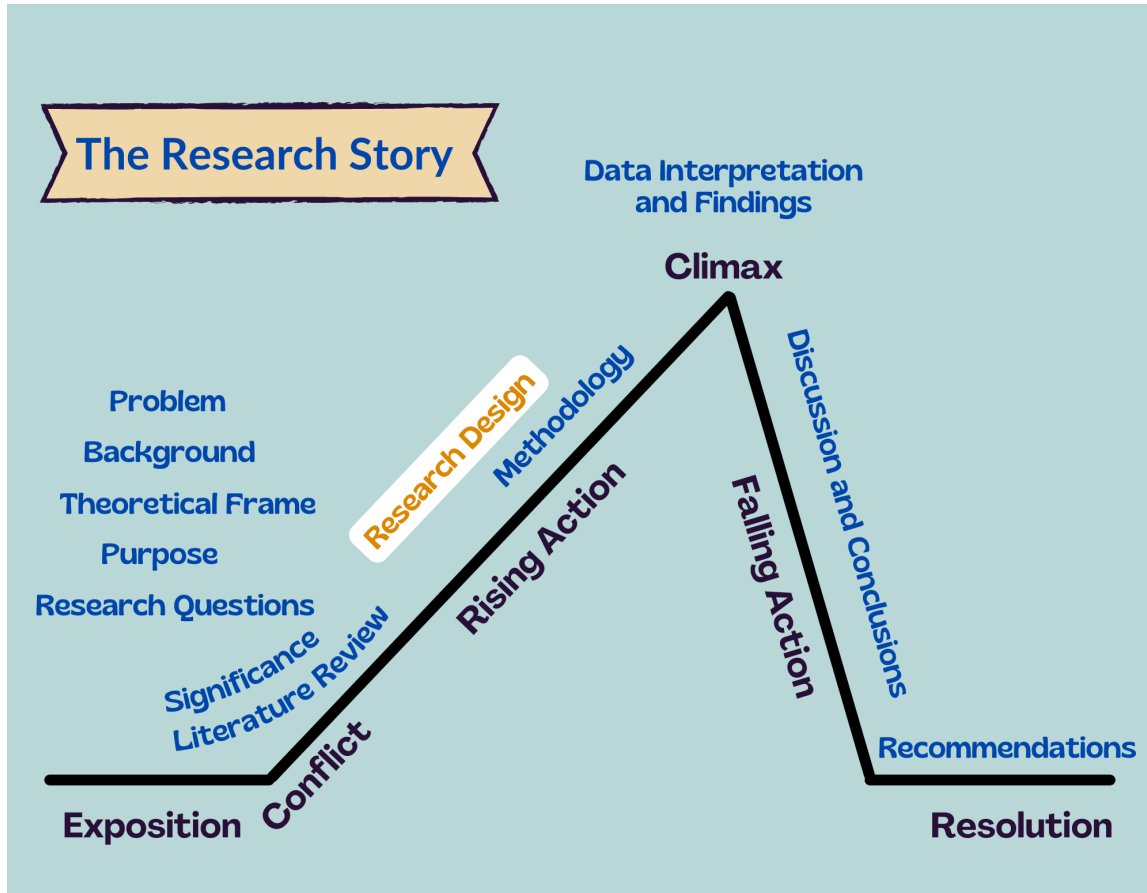
Design & Development

Action Research

TELLING THE RESEARCH STORY

The Research Design in a research project tells the story of what direction the plot of the story will take. The writing in this heading sets the stage for the rising action of the plot in the research story. The Research Design describes the journey that is about to take place. It functions to guide the reader in understanding the type of path the story will follow. The Research Design is the overall direction of the research story and is determined before deciding on the specific steps to take in obtaining and analyzing the data.

The Research Design heading appears in Chapter 3 of the thesis and dissertation projects under the Methodology heading. The Research Design is included as part of Chapter 2 of capstone projects. The heading content is included in Chapter 2 of a capstone project. In the capstone project, the Research Design explains the type of design used for conducting a needs assessment. The literature review does not have this heading.



CHAPTER 13

Methodology

THE STORY CONTINUES...

The following morning, Harry went over to Physicus' house.

"Here are our research questions," said Physicus, "1 – How many mice will Pickles attack at one time? and 2 – How many mice in the room cause Pickles not to attack?"

Harry exclaimed excitedly. "Since we need to count the number of mice when Pickles attacks, and when he does not, we know we have a quantitative research design! I'm ready to answer our questions."

"Hold on a minute, Harry," Physicus chuckled. "We have to write out our steps first. Our methodology has to be written out like a recipe, step by step. This way, someone else could copy what we did to study their cat. Let's start writing down exactly what we want to do."

So, Harry and Physicus went to work writing down the steps they would take to gather data.

Like my favorite lasagna recipe, thought Harry, step by step. I can definitely do this!



Interpreting the Story

The friends were quickly able to determine how they will collect the data. Since both research questions involved number of mice, their questions are answered by counting mice. All they need to do now is list the steps the friends will take to collect the data and analyze the results. The steps and sequence for how the data are collected and analyzed are called the methodology.

Methodology

The Methodology heading explains the specific steps followed in collecting the data and analyzing it. The writing describes each stage of data collection and data analysis and justifies the procedures in terms of validity (soundness) and reliability (consistency). The writing is descriptive, explanatory, and highly specific. This heading must be written in such a way that any researcher could duplicate the collection and analysis of the data. Specificity is the key to writing the Methodology.

The Methodology heading can be compared to a recipe, a sequence of steps that if followed will produce the same outcome. Hence, in the research project, the Methodology functions as a roadmap for conducting active research to answer the research or guiding questions. It is written in such a way that another researcher can replicate the process and achieve the same results, thereby making the process verifiable. By presenting and justifying a sound methodology, the conclusions are considered sound. Illogical, unsound, unacceptable, or unreliable methodologies result in unreliable conclusions. The writing explains how and why the procedures effectively answer the questions and fulfill the purpose.

Participants and Environment

The participants are described in a heading in the Methodology. In this heading, the characteristics of the participants are clearly defined, and any unique characteristics are highlighted. For example, the participants are fourth-grade teachers with at least two years of experience. The reason for having fourth-grade teachers with at least two years of experience as participants must be explained. The writing also notes any characteristics of the participants that are excluded and explains why.

The heading also explains the specific research environment. The research environment refers to the specific setting in which the data are collected. The research environment does not refer to the setting of the overall research story, like “elementary school.” For example, if a study was conducted with elementary school teachers via a focus group that met in the library, a description of the library setting during the focus group would be explained. As with the description of the participants, the research environment is written in such a way that another researcher could replicate the environment. This means that any key or unique features are identified.

Data Collection

The data collection procedures are detailed in a heading in the Methodology. Each step in the process is described including, when, where, and how the data were collected. The writing explains the role of the researcher and the participants including any ethical concerns or limitations of the process. The procedures are written in the order in which they were carried out to ensure the procedures can be replicated.

Quantitative data are collected from a variety of sources, including surveys, observations, interviews, and documents. Numerical data are collected by counting or measuring. Data

may be collected by the researcher, like counting the number of mice from our story. Data may also be obtained from documents, such as grades, district graduation rates, or ACT scores. The numeric data are entered into a spreadsheet or statistical software package for analysis.

Qualitative data are collected by the researcher through surveys, observations, interviews, focus groups, and documents. Data are collected in the form of words, phrases, or paragraphs from sources including media or interview transcriptions, anecdotal or observational records, archived documents, and surveys. Collected data are coded by the researcher or entered into a qualitative software package for analysis.

Data Analysis

The data analysis procedures are explained in a separate heading in the Methodology. The procedures for categorizing, manipulating, and evaluating the collected data are explained in this heading. Each statistical analysis and coding procedure is detailed. The writing also explains the relevance and the need for the procedures used to answer the research or guiding questions.

Quantitative data analysis methods include descriptive and inferential statistics as well as other counting and measuring calculations. Descriptive analyses produce results that summarize and describe the data collected, such as frequency of observed behaviors, number of mice encountered, mean GPA, or median test score. Inferential analyses produce results that predict or explain the association of two variables. For example, regression statistics can predict college success, or correlational statistics can calculate how closely test scores are related to the amount of time spent studying.

Content and thematic analyses are common for qualitative data analysis in educational research. Content analysis is used to identify patterns in documents or other sources of communication, like speeches. Words, phrases, images, etc. are coded (categorized) with words or phrases and then analyzed by finding the frequency of those codes in the content. Thematic analysis is similar to content analysis, but the goal is to identify patterns of meaning. Thematic analysis is best for interviews or focus group transcripts, where the meaning of what was communicated is the important feature. Content and thematic analyses help researchers find patterns and deeper meanings in specific educational contexts.

Strategies for **RIGOROUS DATA ANALYSIS**

Select Available & Relevant Data Sources



- Assessment results
- Community demographics
- Student and teacher attendance
- Behavior referrals
- Data from classroom observations
- After school or summer school program data
- Surveys, interviews, or focus groups
- Relevant policies, plans, and budgets
- Stakeholder perceptions

Collect a Mix of Data



- Contextual information
- Multiple years of data to identify trends over time
- Multiple data points derived from multiple sources
- Data that highlights student outcomes
- Data that describes contributing factors
- Qualitative data from multiple voices

Disaggregate Data Wherever Possible



- Demographics (e.g., race, ethnicity, gender)
- Exceptional students (e.g., students with disabilities, gifted students, low-achieving students)
- Additional needs (e.g., students in foster care; those who are homeless or migratory; and/or those whose families are highly mobile, such as military families)
- Stakeholder, grade levels, activities, etc.

Data Analysis



- Allow for reflection without assuming cause
- Aggregate data
- Triangulate when possible
- Use statistical software or spreadsheets
- Create visuals (charts, tables, graphs) to help digest information and get a visual picture
- Identify relevant themes
- Ensure validity and reliability

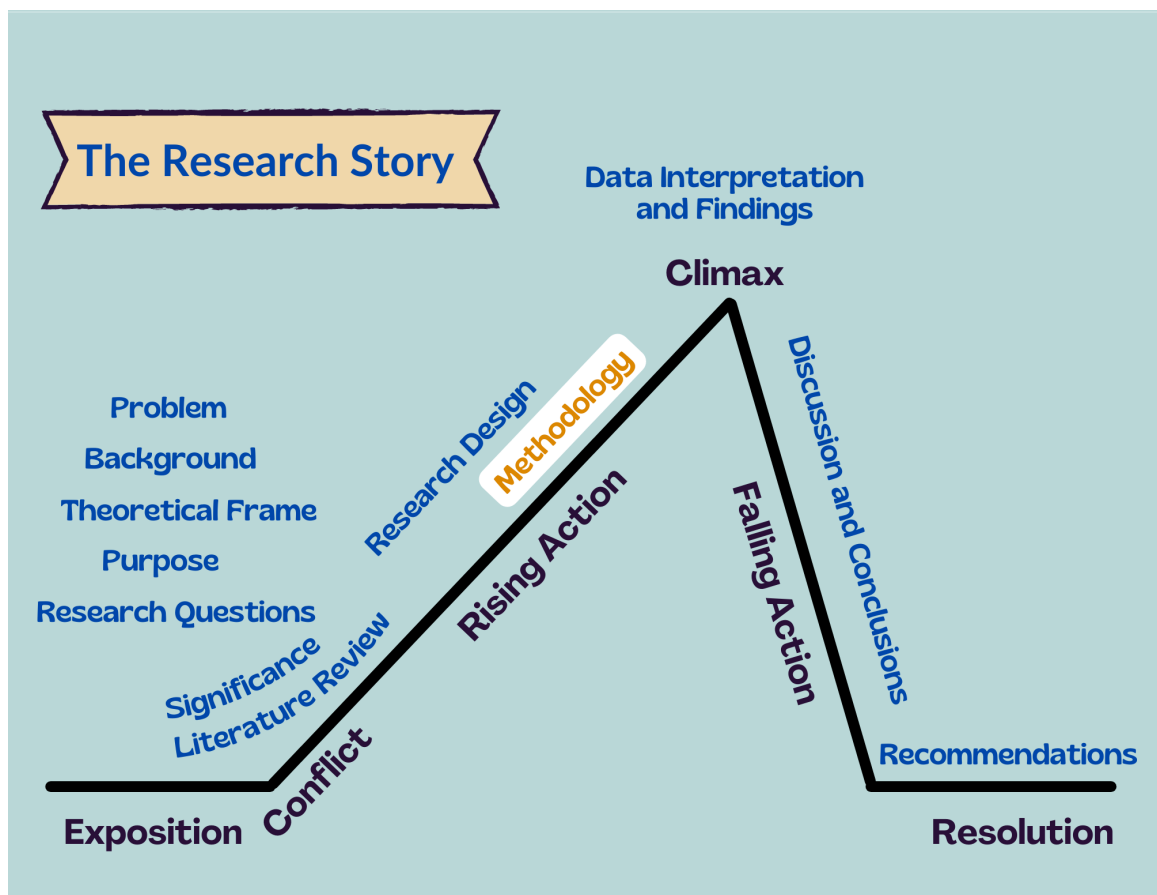
RIGOROUS ANALYSIS IS SUPPORTED BY STRONG DATA!

TELLING THE RESEARCH STORY

The Methodology is a play-by-play recollection of how data were obtained, who was involved and where, and what was done with the data. The setting and characters that are part of this expedition are depicted and the actions taken are explained. It tells what happened to the characters in the setting and details the journey in search of answers to the questions. The story chronicles the quest, describing every detail.

The heading continues the rising action of the research story. The writer details the quest and explains the choices behind the paths taken. The anticipation builds in this part of the story as the reader is enticed to find out the results, which is the climax of the research story.

The Methodology is Chapter 3 of the thesis and dissertation. The Methodology is included as part of Chapter 2 of capstone projects. The heading content is included in Chapter 2 of a capstone project under the heading of Empirical Evidence. In the capstone project, the Methodology details the procedures used in conducting a needs assessment. The literature review does not have this heading.



Data Interpretation and Findings

THE STORY CONTINUES...

It was so exciting to have the step-by-step recipe for collecting data completed. Harry visualized one day soon when he would find his beloved cheese on the kitchen table untouched by mice. Harry and Physicus went to work observing, counting and collecting data.

After days of experiments, the friends found that when Pickles was in a room with less than four mice, he would charge toward them and catch them all before the mice could escape through a tiny crack in the wall. When there were four mice in the room, Pickles would still attack the mice but only if he had skipped a meal. However, the friends learned that when there were five mice or more in the room, Pickles would hesitate and remain composed, observing the mice but not attacking them.

Physicus questioned Harry, "So what do you think, Harry? What did we learn? What are the facts we now know?"

"Hmm, well, for certain we know Pickles does not catch mice when there are five mice or more in the room because he does not attack. However, when there are fewer than four, Pickles will attack and catch all of the mice. And when he's hungry he will even catch four mice," Harry said. "This is good news, right, Physicus?"

"Right, Harry!" said Physicus. "This is good news! The results tell us that as long as Pickles is exposed to three or fewer mice at one time, he should catch them all. We now have information to draw conclusions about how to solve your problem."

Interpreting the Story

The friends learned the number of mice determined when Pickles would attack. Specifically, they found that when Pickles was exposed to less than four mice, he would catch them all. If Pickles was hungry, he would catch up to four mice in the room. If there were five or more mice in the room, Pickles would not attack at all. The friends have data to support their hypothesis that Pickles becomes overwhelmed with too many mice in the room, causing him not to catch the mice. Harry and Physicus interpreted their findings to mean that if Pickles was exposed to three or fewer mice, he would attack and catch all of the mice. The friends also know that if they want him to attack four mice at once, Pickles had better be hungry!

Data Interpretation and Findings

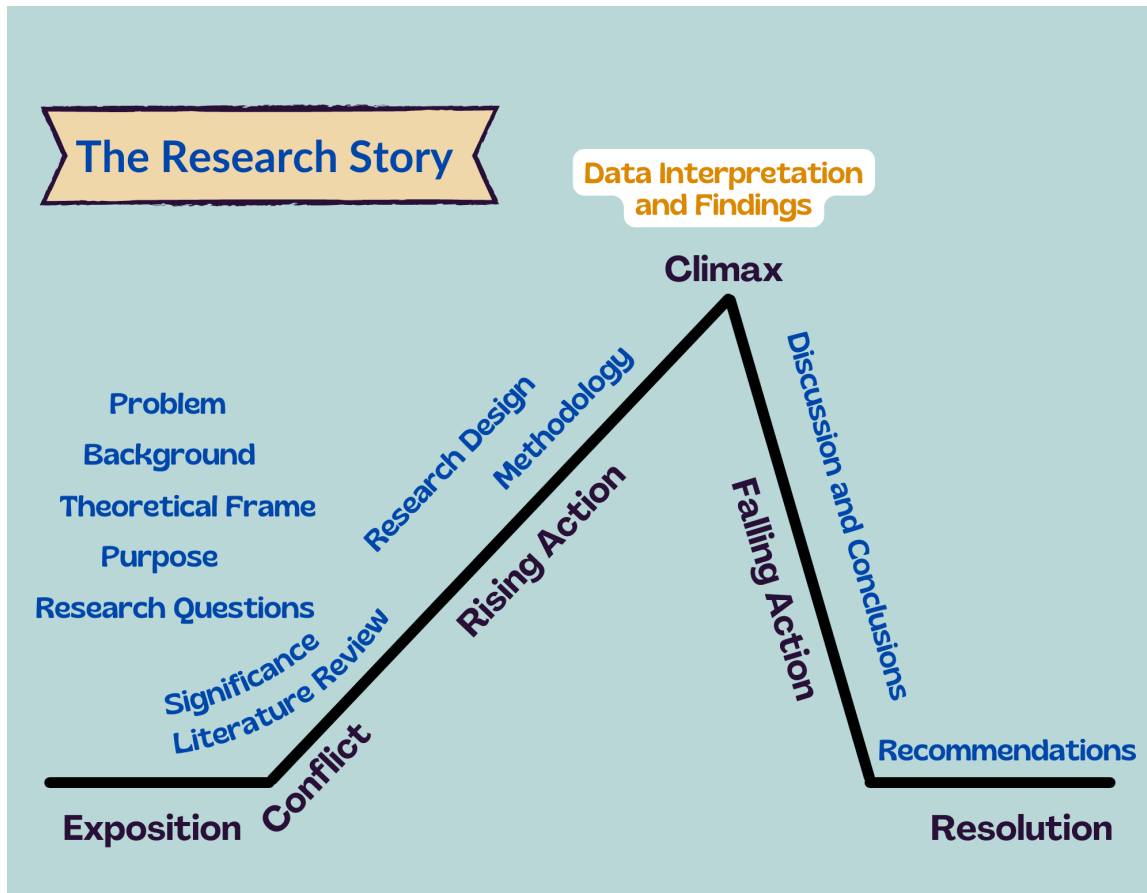
The Data Interpretation and Findings heading conveys the results and meaning of the data analyses. The writing in the heading reflects specific statements about the outcome of each analysis. It is a report of the results without researcher comments or conclusions. Quantitative analyses are reported numerically, while qualitative analyses are presented in words, phrases, or sentences. The heading includes tables and figures, such as graphs, to convey the results.

The Data Interpretation and Findings heading is organized by the research or guiding questions. The results are presented for the first question and then the results are interpreted appropriately. The interpretation is an explanation of what the results represent and how the results answer each question. The heading is written as a report of the “facts” and an objective interpretation of what was found. This pattern of writing is repeated for each of the remaining research or guiding questions.

TELLING THE RESEARCH STORY

The Data Interpretation and Findings heading is the climax of the research story. The findings are the decisive moment in the quest for answers. The outcome of the quest is revealed, and the questions are answered. The story not only reports the facts of what resulted but also the meaning of the results as it relates to the quest. The heading indicates that the quest is over and there are answers to resolve the conflict of the research story.

The Data Interpretation and Findings heading appears in Chapter 4 of the thesis and dissertation. The heading content is included in Chapter 2 of a capstone project under the heading of Empirical Evidence. The literature review does not have this heading.



Discussion and Conclusions

THE STORY CONTINUES...

Physicus inquired, "What would you conclude based on our findings, Harry?"

"Well," Harry replied, "our results show that Pickles will catch mice, but apparently he feels overwhelmed by too many mice in my house. Well, Pickles is not alone. I feel overwhelmed too!"

"Okay," Physicus agreed, "what evidence supported these conclusions?"

Harry replied. "When the count of mice is less than four, Pickles gets them every time and quickly! If Pickles is hungry he will even attack four mice."

"Great," said Physicus, his face shining with happiness.

"I think we can find a way to limit the number of mice Pickles encounters, then he will attack," said Harry, "What do you think?"

Physicus exclaimed, "I'm sure we can do this! But first, Harry, what else did we learn?"

"Well, we learned that if there are five or more mice in the room, Pickles did not attack. This supports the conclusion that he becomes overwhelmed by the number of mice."

"On the money, Harry," Physicus said and gave Harry a high-five! Physicus continued, "I agree, Pickles becomes overwhelmed and unmotivated to catch more than three mice at a time. These are important conclusions that other cat owners would like to know!"

"Awesome!" exclaimed Harry, "How do we share this information?"

"Well," Physicus replied, "we can look into submitting an article to a research journal."

"This sounds amazing, but first can we get rid of the mice in my house?" asked Harry.

Physicus and Harry set to work on a plan to get rid of all the mice in Harry's house.

Interpreting the Story

The friends reviewed their findings and discussed their conclusions. Based on their research they concluded that Pickles did indeed become overwhelmed by exposure to too many mice at once. The friends found the maximum number of mice Pickles would attack. This conclusion provided a clear solution to solve Harry's problem. The friends simply needed to limit the number of mice in the room and Pickles would catch them all. As the friends discovered, cats can become overwhelmed by the number of mice they encounter. Sharing this information with other cat owners adds to the body of knowledge.

Discussion and Conclusions

The Discussion and Conclusions heading(s) present assertions and suppositions about the findings of the research project. These are separate headings in some projects, and in other projects, the discussion and conclusions are presented under the same heading. The heading details the claims the researcher makes based on the findings. The claims are supported by the findings of the project and by previously published research from your Literature Review. The heading reads similar to a persuasive work in that there is a presentation of an assertion and an argument detailing the reasoning to support the assertion.

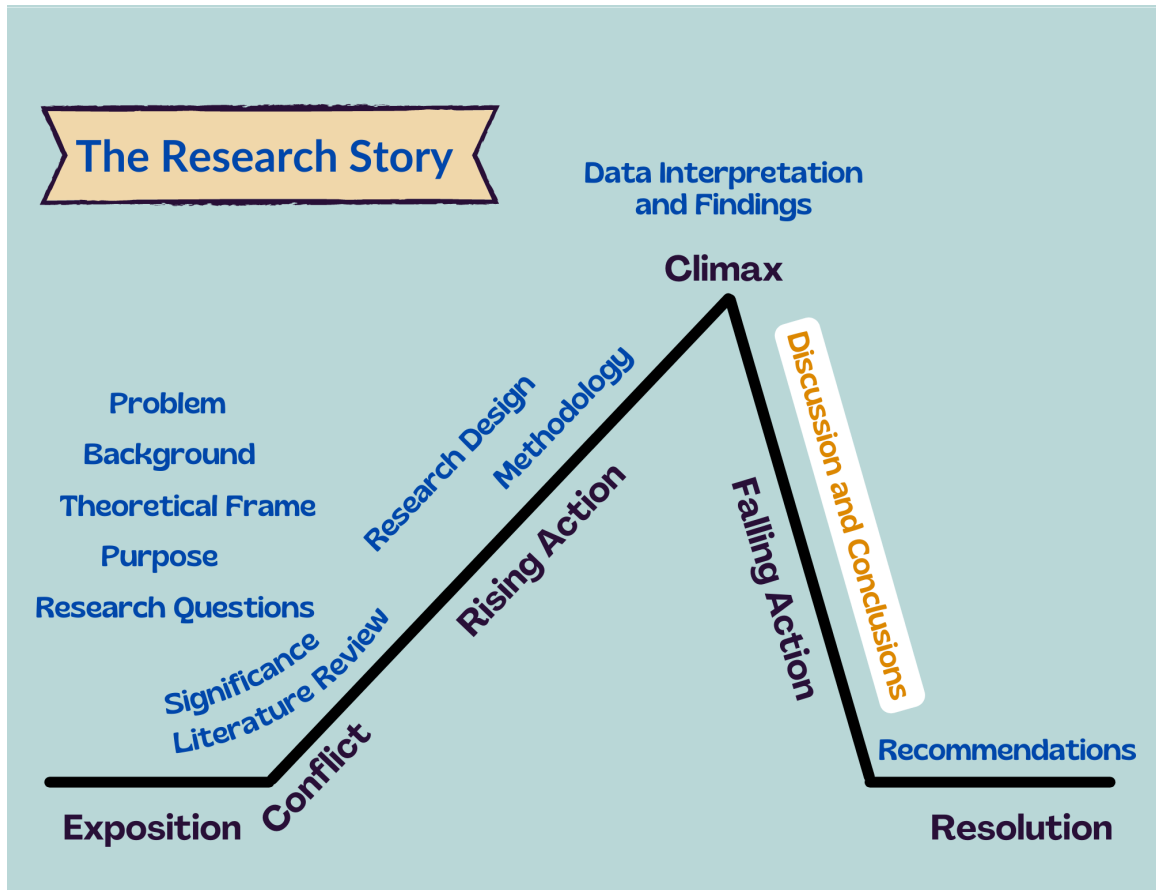
The Discussion is written to explain the relationship between the specific findings of your research and the purpose of the project. The significance of the results and how the results fulfill the purpose of the project are conveyed. The significance of the results in relation to the greater body of knowledge is also presented. This part of the Discussion notes where your findings are either consistent or inconsistent with published research.

The Conclusions heading presents your suppositions made about the results. These suppositions emphasize what was learned in the research project. The writing then argues to what extent the purpose of the research project was realized and the best application of the findings. The argument also emphasizes how the findings demonstrate the value of the research project and how it filled the niche in the research literature.

TELLING THE RESEARCH STORY

The Discussion and Conclusions heading(s) are the falling action leading to the resolution of the research story. These explain "what we now know." This part of the story argues the value of what was found and makes claims about the knowledge that was acquired from the quest. The writing tells what the climax means for the characters in the story and how "what we now know" influences the world of education.

The Discussion and Conclusions heading(s) are in Chapter 5 of the thesis and dissertation. The heading(s) content is included in Chapter 2 of a capstone project under the heading of Significance. The literature review does not have this heading.



Recommendations

THE STORY CONTINUES...

The friends' theory matched up with what was happening in reality. Pickles could probably take care of three, maybe even four, mice at a time in Harry's home. Harry is happy that Pickles should finally have fun catching the mice if he does his job of limiting the number of mice Pickles encounters. Harry is also happy he can finally protect his favorite cheese. Yet, for Physicus, a simple application of research findings is only a part of the victory.

While munching on a fresh slice of George's Pizza, Physicus said, "You know Harry, each research project should not only contribute toward a solution that can be applied, but it also should provide recommendations for future research."

"Again Physicus, I do not get what you mean. I am happy now. Pickles caught three mice this morning." said Harry.

"Your cheese is safe! Terrific! However, we learned that Pickles will catch four mice if he is hungry. What if Pickles were on a special mice-catching diet? This could be an area we explore. We also learned that Pickles is overwhelmed with five or more mice. Would you be interested to know if Pickles would be less overwhelmed if there were a second cat?" Physicus questioned Harry.

"I do not know," answered Harry. "So far, Pickles is catching the mice, but those are interesting ideas. Perhaps these other methods will get rid of mice even faster!"

"Exactly. Research is how we find strategies to mitigate our problems. More research provides more strategies. We need to share what we learned with other cat owners, but we also need to share our ideas of what to explore next. Then again, maybe, we do some more research on Pickles before we share our findings." said Physicus.

"I guess it depends!" laughed Harry.

Interpreting the Story

Physicus' point about providing ideas to explore in research is a very important one. The friends learned some valuable information to share with other cat owners. However, Harry and Physicus also have valuable ideas about other ways their problem can be researched. The friends learned that when Pickles was hungry, he would catch up to four mice at once. The influence of Pickles' hunger on his behavior is a topic that could be investigated next, like a special diet. Another area to research could be the effect of another cat on Pickles' mouse catching-behavior.

Recommendations

The Recommendations heading provides the reader with suggestions for the next steps to explore the problem or a related problem. Suggestions for alternative frameworks and methodologies are presented based on the conclusions of your research project. The suggestions are argued and supported by your findings, as well as previously published research documented in your Literature Review.

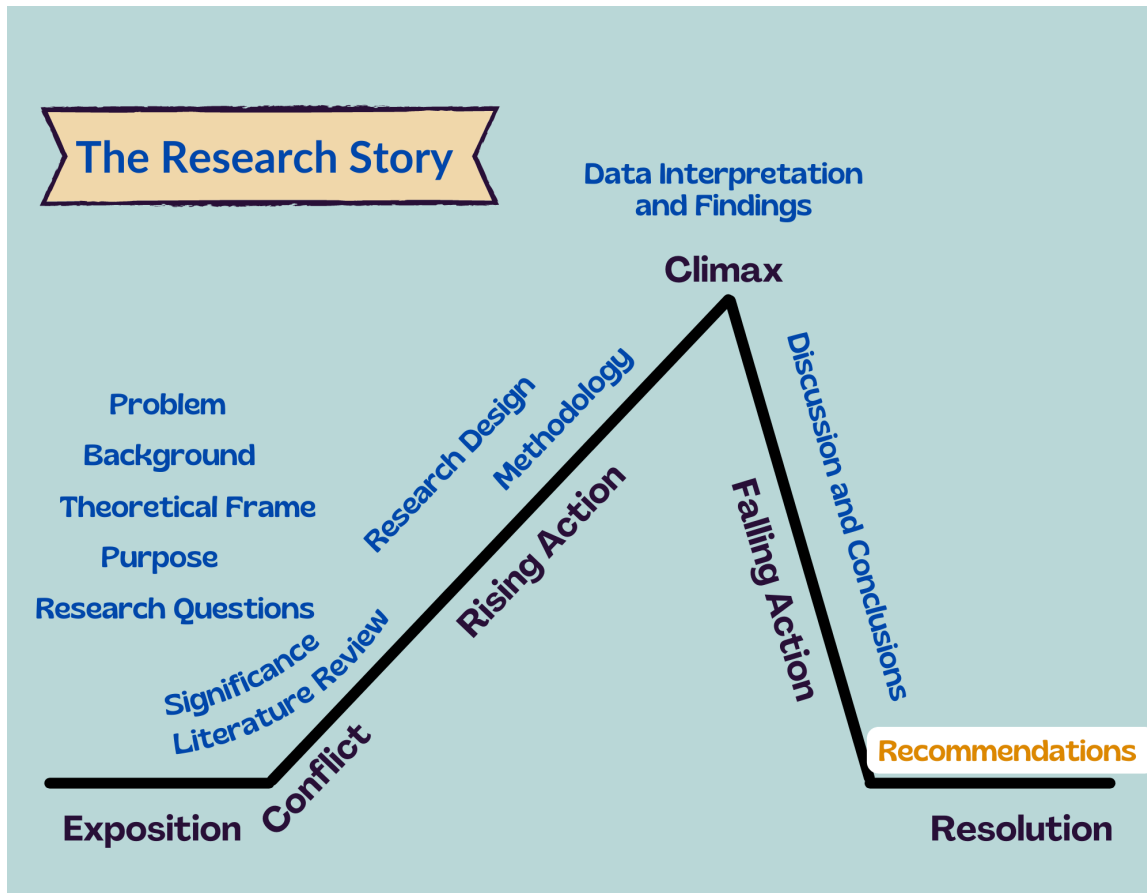
The heading is sequenced in order of priority, with the most important recommendations written first. The importance of a recommendation is based on how directly it is related to your findings. For example, in our story, when Pickles was hungry, he would catch four mice. Therefore, the recommendation to explore a special diet is directly related to that finding. Whereas the recommendation for exploring Pickles' behavior by adding a cat is not directly related to the finding of Pickles becoming overwhelmed. Instead, this suggests an alternative method for studying Pickles' mouse-catching behavior. Since this is less directly related to the findings, it is a lower priority.

Recommendations should provide ideas for the development of new research projects. The heading explains how the findings and conclusions of your research project indicate aspects that warrant further study. The heading also describes the next avenues of investigation, more specifically, alternative frameworks. The Recommendations heading brings closure to the research project.

TELLING THE RESEARCH STORY

The Recommendations heading concludes the research story and provides a preview of the next research stories. It tells the reader here's what was learned in this quest that needs to be explored next. It provides a happy ending, in a sense, because the characters are left hopeful for the next adventure. While this story is over and the problem is resolved, for now, the heading points to the next saga the educational research story.

The Recommendations heading is in Chapter 5 of the thesis and dissertation. The heading content is included in Chapter 3 of a capstone project under the heading of Conclusions. The literature review does not have this heading.



Capstone Components and Products

Capstone Components and Products

The capstone is a distinctive type of research project. The capstone focuses on a localized educational problem, whereas the thesis and dissertation focus on a problem in a broader educational context. The capstone project uses the findings to build a product that can be applied to the local educational context where the research was conducted. Normally, the findings of the thesis or dissertation are generalizable across educational settings.

The capstone project has many components that are the same as the thesis and dissertation. However, several components are unique to the capstone. These unique components support the development of the capstone product. The product is designed to address the problem being researched. Product examples include professional development presentations; teacher's toolkit; faculty handbook; training videos; leadership manual, new institutional policies, etc.

The guidelines for the capstone components are specific to the degree program and will vary. Some capstone projects have a structure similar to a thesis or dissertation. While others are considerably different in organizational structure and have additional components. The following headings are generally included in most capstone projects.

Needs Assessment

The Needs Assessment heading explains how the empirical evidence obtained supports the development of the capstone product. The heading functions the same as both the Methodology and Data Interpretation and Findings headings. The heading occurs in Chapter 2 of the capstone project document because it details the methodology and presents the results and interpretations from a needs assessment conducted early in the project.

A needs assessment is conducted to determine what is "needed" to solve the problem. The needs assessment involves active research to collect and analyze data to answer the guiding questions. For example, a survey of specific strategies teachers desire can provide important information for creating a professional development series. The writing explains the applied research methodology used in the needs assessment, the findings, and the conclusions. The findings of the needs assessment are the empirical evidence used to support the design of

the product. The Needs Assessment and the Literature Review are used to support the significance of the capstone project.

Essential Elements and Outcomes

The Essential Elements and Outcomes heading is found in Chapter 3 of the capstone project. It functions as an overview of the product. The writing explains the elements that must be included in the product. The essential elements are determined from both the needs assessment findings and findings presented in the Literature Review from Chapter 2. The writing also explains why the essential elements effectively address the problem.

The outcomes of the product are also detailed in the heading. The outcomes specify what is achieved by implementing the product. Outcomes are observable results or changes that provide a solution to the problem. The writing explains how the outcomes fulfill the purpose of the capstone project. The outcomes also guide the evaluation methods used to measure the success of the implemented product.

Product Development

The Product Development heading delineates the specific steps used in developing the product. The writing identifies who is involved in the process, what and how each step is carried out, and the timeline for completion. The heading also describes the resources needed to complete each step of the plan. A chart may or may not be used to convey the basic information.

The Product Development heading explains how the steps of the development process are supported by specific empirical evidence from Chapter 2 of the capstone project. The writing references the findings of the Needs Assessment and explains how the product addresses those needs. Additionally, an argument is presented for how the product is structured to meet the essential elements and to reach the intended outcomes of the product.

Implementation Strategy

The Implementation Strategy heading discusses how the product development plan is executed in the local educational context. The writing explains the specific leadership strategies necessary to implement the product in this context. Effective communication, developing buy-in, facilitating collaboration, modeling, etc. are examples of leadership strategies. The heading explains how these implementation strategies are employed to ensure the success of the product when implemented. The focus is on techniques the author uses to lead the execution of the product plan.

Evaluation Methods

The Evaluation Methods heading details the measures used to determine the success or effectiveness of the product when implemented. This heading reads similar to the Methodology heading. The quantitative or qualitative measures are discussed in detail. The

goal and function of each measure are explained in relation to the intended outcomes of the product. For example, if the product was a professional development series designed to improve the teaching and learning of X content, then the evaluation methods might include observations of teaching and student exam scores on X content. The writing communicates how the reader will know the product worked as intended.

Limitations and Barriers

The Limitations and Barriers heading details the potential challenges in the local context that affect the implementation of the product. Limitations are specific hurdles or complications that hinder the successful implementation of the product. Limitations may be large obstacles or small but are within the control of the author. For example, times available to deliver the product of professional development training may be a limitation, however, the author can work within the local context to find times that do not hinder the success of the training.

The heading also presents the barriers to implementing the product in the local context. Barriers are obstacles outside the control of the author that hinder the successful implementation of the product. For example, an institutional policy that requires professional development training sessions to be voluntary may be a barrier to having enough participants for a training session product. The writing in the heading explains both the potential limitations and barriers and how the implementation strategies or the product plan are designed in ways to avoid these.

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