ECE RESEARCH MANUAL

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Introduction

Welcome to the Cultivate Learning Research Manual. This manual is designed to be a comprehensive guide and resource for researchers seeking to contribute to the field of early learning through diligent inquiry and analysis. Navigating the landscape of educational research can be a complex endeavor, and this manual aims to streamline the process, providing clear guidelines and support at each stage of the research journey.

The manual is structured to cover the essential aspects of conducting research, from the inception of a research idea to its execution and analysis. It begins by demystifying the process of crafting a compelling research question, delving into the nuances of specificity and relevance. A detailed guide on conducting a thorough literature review is also included, offering insights into how to explore and contextualize your research within the existing body of knowledge.

Ethical considerations form a crucial part of any research study, and this manual elucidates how to determine if an Institutional Review Board (IRB) approval is required and guides researchers through the process of obtaining it if necessary. It underscores the importance of ethical research practices and adherence to established guidelines.

Additionally, this manual provides a step-by-step guide on how to apply for access to data from Cultivate Learning. Researchers will find information on how to request specific datasets, ensuring that their research aligns with the data available and that their requests are adequately supported by a robust research proposal and literature review.

By integrating the principles of sound research methodology with practical guidance on utilizing Cultivate Learning data, this manual serves as a holistic resource for researchers. Whether you are embarking on your first research project or are a seasoned researcher looking to contribute to early learning research, this manual is designed to support you in your endeavor to cultivate knowledge and foster innovation in the field.

We hope that this manual facilitates a seamless and enriching

research experience for you at Cultivate Learning. If you have any feedback on how to improve this document, please reach out to hassairi@uw.edu.

How to Formulate a Research Question

Formulating a research question is often perceived as an art, a process driven by intuition and curiosity. However, there is a methodological approach that guides this process, transforming a broad inquiry into a focused, researchable question.

Starting with a Question

Every research endeavor begins with a question, often broad or naive. For example, one might ask, "What does a good preschool program look like?" Such initial questions serve as the foundation upon which more nuanced questions are built.

Refining the Question

Defining Terms

To refine the question, researchers must rigorously define terms and concepts:

- What constitutes a *preschool* program? How is it different from childcare?
- What does *good* mean in this context? Is it about being effective, and if so, effective in achieving what goals?

Identifying Metrics

Identifying measurable outcomes is critical:

- How is child development or program effectiveness measured?

Engaging with the Literature

A literature review helps to contextualize the question:

- Has the question been examined before?

- What methodologies and metrics have been used? Are there gaps or weaknesses in the current approaches?

- What theories guide our understanding of the subject?

Narrowing Down the Focus

Through engagement with the literature and rigorous definition of terms, researchers can identify a niche that appeals to them:

- Are there unexplored aspects or overlooked details in the existing research?

- Are there challenges in measuring certain variables or outcomes?

Arriving at a Research Question

The final research question is the culmination of this iterative process:

- The researcher delves deeper into a specific aspect of the problem, refining and specifying the question.

- The question evolves from a broad inquiry to a focused, researchable question that adds value to the existing body of knowledge.

Cutting-Edge Topics in Early Learning Research

This section aims to highlight the most pressing, yet unanswered, questions in early learning research. It focuses on identifying topics that are at the forefront of child development and early care education studies. These topics not only address current knowledge gaps but also tackle pervasive policy challenges that could significantly benefit from rigorous research.

Early Childhood Mental Health and Emotional Development

1. Description: Investigating the foundations of mental health and emotional regulation in early childhood. Research here can uncover strategies for early intervention and support.

2. Challenges: Identifying markers of mental health issues early in life, understanding the impact of environmental factors, and developing age-appropriate mental health interventions.

The Impact of Technology on Early Learning

1. Description: As digital media becomes increasingly prevalent, understanding its impact on cognitive development, social skills, and educational outcomes in early childhood is crucial.

2. Challenges: Determining the implications of early exposure to digital technology, balancing educational and entertainment content, and understanding the long-term effects.

Early Learning in Diverse and Multilingual Settings

1. Description: Exploring the dynamics of early learning in multilingual and culturally diverse environments. This includes research on bilingual education, cultural inclusivity, and teaching practices in diverse classrooms.

2. Challenges: Developing effective bilingual education models, understanding the role of culture in learning, and addressing educational disparities.

Accessibility and Quality of Early Childhood Education

This area of research focuses on disparities in access to quality early education and the intricate challenge of accurately measuring the quality of early learning environments. Quality assessments are essential for understanding the effectiveness of early childhood education programs and for guiding improvements.

Challenges

- Measuring Quality in Early Learning Settings: One of the central challenges is the development and utilization of reliable and valid tools to measure the quality of early learning environments. Tools like the Early Childhood Environment Rating Scale (ECERS) and Classroom Assessment Scoring System (CLASS) are widely used. However, research has often found null or modest associations between these measures and child development outcomes, raising questions about their effectiveness as quality indicators.

- Complexity of Quality Indicators: The quality of early learning environments is multi-dimensional, encompassing aspects such as teacher-child interactions, curriculum, learning materials, and the physical environment. The challenge lies in creating comprehensive assessment tools that capture all these dimensions accurately.

- Linking Quality to Child Outcomes: Another significant challenge is establishing a clear and consistent link between quality measures and child development outcomes. While high-quality early education is intuitively beneficial, empirically demonstrating this relationship with specific quality indicators remains complex.

- Variability Across Settings: The diversity in early childhood education settings (such as home-based care, preschools, and public pre-K programs) adds another layer of complexity. Quality measures need to be adaptable and relevant across these varied settings.

- Equity in Quality Assessment: Ensuring that quality assessments are equitable and do not disadvantage certain groups of children, particularly those from diverse cultural and linguistic backgrounds, is essential. This involves creating tools and processes that are culturally sensitive and inclusive.

Research Opportunities

- Development of New Assessment Tools: There's a need for research into developing more predictive and comprehensive quality assessment tools. This includes tools that not only measure structural aspects (like class size and teacher qualifications) but also process quality (like teacher-child interactions).

- Studies on the Effectiveness of Current Tools: Empirical studies examining the effectiveness and limitations of current quality assessment tools like ECERS and CLASS can provide insights into how they can be improved or supplemented.

- Longitudinal Research: Long-term studies tracking children over time to understand how different aspects of quality in early learning environments affect their developmental trajectories.

Teacher Training and Professional Development

1. Description: Focusing on the effectiveness of current teacher training programs and the ongoing professional development needs of early childhood educators.

2. Challenges: Identifying key competencies for early childhood educators, ensuring the relevance of professional development programs, and linking teacher training with student outcomes.

Family Engagement and Home Learning Environments

1. Description: Researching the role of families and home environments in early childhood learning and development.
2. Challenges: Understanding the dynamics of parental involvement, developing strategies for effective home-school partnerships, and creating resources for home-based learning.

Policy and Systems-Level Analysis

1. Description: Studying the impact of policy decisions on early childhood education systems, including funding models, regulatory frameworks, and quality rating systems.
2. Challenges: Assessing the effectiveness of current policies, understanding the systemic implications of policy changes, and ensuring that policy developments are informed by empirical research.

Conclusion

While intuition and curiosity play a role, formulating a research question is a systematic process. By interrogating and refining the initial question, engaging with the literature, and identifying gaps, researchers can craft a question that is both meaningful and ripe for exploration.

Hypothesis Testing: Bridging Theory and Empirical Work

Introduction

This chapter explores the critical aspect of hypothesis testing in research, underscoring the importance of grounding empirical work in theoretical foundations. By weaving together concepts from renowned theorists and methodological pioneers, we delve into the process of formulating and testing hypotheses.

The Theoretical Foundations

Influence of Theorists

In early learning research, theories proposed by stalwarts such as Vygotsky, Piaget, Montessori, Bowlby, and Bronfenbrenner serve as guiding frameworks. These theories propose mechanisms and processes underlying child development.

The Role of Theory

Theories serve as the foundation upon which hypotheses are built. A good theory provides specific and testable predictions about relationships between variables.

Empirical Work as a Test of Theory

Pioneering Approaches

Karl Popper and Milton Friedman revolutionized the approach to empirical work, emphasizing that research should aim to test and possibly falsify theoretical predictions.

Risky Predictions and Testable Implications

Popper introduced the concept of *risky predictions*, while Friedman referred to *testable implications*. Both principles imply that a theory

should make clear, testable predictions that can potentially be invalidated by data.

Hypothesis Testing in Research

Formulating Hypotheses

In well-designed research, hypotheses are conjectures regarding the relationships between variables, often predicting the sign of a regression coefficient based on theoretical expectations.

Testing and Invalidation

Empirical testing seeks to challenge and potentially invalidate these hypotheses. The process of repeated testing fortifies or refutes the theoretical foundation.

Robustness through Repeated Testing

Surviving Invalidation Attempts

While a theory cannot be conclusively proven, its robustness is established when it withstands numerous attempts of invalidation.

Regression Coefficients as Theoretical Parameters

In hypothesis testing, the regression coefficient is interpreted as an estimate of a theoretical parameter. Consistency between the predicted sign and empirical results lends credibility to the theory.

Conclusion

Hypothesis testing is a bridge between theory and empirical work. By grounding research in established theories and rigorously testing the derived hypotheses, researchers contribute to the evolution and validation of theoretical frameworks. This iterative process of conjecture and refutation ensures that theories are continually refined and strengthened.

How to do a literature review

A literature review consists of the following steps.

Define the Research Question

Begin by clearly identifying and articulating the research question or objective you seek to address. This provides direction and scope for your literature review. A well-defined question ensures that your review remains focused and relevant, eliminating the potential of deviating into unrelated areas of study. The following paragraphs provide some examples of research questions in QRIS and learning environment contexts.

Quality Rating and Improvement Systems (QRIS) in early learning research aim to provide clear standards for early childhood education and care settings. Researchers in this field have posed a multitude of questions to better understand, evaluate, and improve these systems. Similarly, the development of tools to measure the quality of learning environments is essential to ensure that young children are receiving optimal education and care. Here are some sample research questions from both contexts:

Research Questions in the Context of QRIS in Early Learning

1. How do different QRIS models impact child outcomes, especially in terms of cognitive and socio-emotional development?

2. What are the primary challenges and barriers that early childhood education centers face when trying to improve their QRIS ratings?

3. How do families perceive and use QRIS ratings when selecting early care and education services for their children?

4. What is the correlation between QRIS ratings and actual classroom quality as observed through other validated observational measures?

5. How do QRIS systems account for the diverse cultural and linguistic needs of children and families they serve?
6. What financial incentives are most effective in encouraging early learning programs to participate and progress in QRIS?
7. How do QRIS ratings relate to teacher qualifications, ongoing professional development, and child-teacher ratios in early learning settings?

Research Questions in the Context of Developing Tools to Measure Quality of Learning Environments

1. How can observational tools be adapted to reflect the quality of early learning environments for children from diverse cultural and linguistic backgrounds?
2. What key indicators of quality are missing from current tools that measure the learning environments of early childhood settings?
3. How do measures of the physical environment correlate with children's cognitive and socio-emotional outcomes?
4. How can new tools account for the rapid advancements in technology and its integration into early learning environments?
5. What is the inter-rater reliability of newly developed observational tools when used by practitioners from diverse educational and cultural backgrounds?
6. How do tools that measure the quality of early learning environments capture the relationships and interactions between educators and children?
7. In the development of new measurement tools, how can researchers ensure they are capturing both the structural (e.g., class size, teacher qualifications) and process (e.g., interactions, teaching methods) aspects of quality?

It's essential to note that while these are example research questions, the specifics will always depend on the context, geography, policy environment, and the particular objectives of the researchers or policymakers.

Integrating Literature Review into QRIS Feature Development

The enhancement of Quality Rating and Improvement Systems (QRIS) through the development of new features is a complex endeavor that necessitates close collaboration between practitioners,

who are the implementers of QRIS, and researchers, who bring expertise in scientific inquiry. This collaborative process is especially important when creating tools to measure qualitative aspects of early learning environments, such as classroom organization.

Bridging the Gap Between Practitioners and Researchers

Practitioners are adept at identifying the practical needs of QRIS, but they may not be trained in formulating research questions that guide the development of new measurement tools. For example, a practitioner may request information on existing tools to measure classroom quality. However, this request, while practical, does not embody the depth of inquiry that a researcher can provide.

From Actionable Requests to Research Inquiries

Researchers have the expertise to translate actionable requests into comprehensive research questions. When practitioners propose a new feature, such as an item evaluating the organization of the entry area in a classroom, it is the researcher's role to dissect this feature into researchable components:

1. **Understanding the Impact**: Researchers should explore the broader question of whether and how classroom environment factors, such as organization, contribute to child development.
2. **Evaluating the Evidence**: The literature review should not only seek tools that measure classroom organization but also scrutinize the evidence supporting the connection between these environmental aspects and learning outcomes.
3. **Defining Quality Metrics**: Researchers should investigate what constitutes a 'well-organized environment' in the literature and how it can be measured effectively and reliably.

Researcher's Role in QRIS Development

The researcher should approach the literature with the following objectives:

- Identify research questions relevant to the proposed QRIS features.
- Review existing literature to find evidence supporting the significance of these features in early learning environments.
- Propose research-backed alternatives if the initial features lack empirical support.

Recommendations and Evidence-Based Revisions

If certain proposed items in the QRIS do not have robust research backing their effectiveness, the researcher should communicate this to the practitioner and suggest alternatives. This process ensures that every component of the QRIS is grounded in evidence and contributes meaningfully to the overarching goal of enhancing early learning environments.

Collaboration for Effective Outcomes

This interplay between practitioner insight and researcher expertise is critical. Practitioners provide the contextual framework and operational objectives, while researchers ensure that these objectives are anchored in scientific evidence. The iterative process of reviewing literature, aligning with QRIS development goals, and revising features based on evidence is essential for creating a robust and effective QRIS.

Approaching Unexplored Research Questions

When embarking on a research journey where the primary question has not been directly addressed in existing literature, it is crucial to construct a framework that is informed by related studies and theories. This approach not only enriches the research question but also provides a foundation upon which new knowledge can be built.

Consider a scenario where the research question focuses on the well-being of rural early learning providers—a topic not extensively explored. In this case, researchers should look beyond the immediate context and draw from broader research on the well-being of rural populations, well-being determinants in similar professions, and general indicators of job satisfaction and stress factors in educational environments.

Drawing from Related Fields

Analogous research in different but related fields can offer insights and help hypothesize potential outcomes. For instance, literature on the well-being of medical professionals in rural areas might shed light on challenges faced by individuals in such settings, which could similarly affect early learning providers.

Indirect Indicators and Predictors

A review of literature that identifies predictors of well-being in early childhood education providers can be instrumental. By hypothesizing whether these predictors vary between rural and urban settings, a researcher can develop a nuanced understanding of the unique challenges faced in different environments.

Resource Allocation Discrepancies

Investigating the distribution of resources, such as support from local school districts or state and federal funding, can provide evidence of systemic differences that may impact well-being.

Behavioral Dynamics in Rural Settings

Exploring whether there is a difference in child behavior and subsequent challenges faced by providers in rural versus urban settings can be revealing. Such an inquiry can contribute to the understanding of environmental impacts on provider well-being.

Indirect Methodological Pathways

Where direct research is scarce, researchers should be prepared to pave new methodological pathways. This might include developing new tools for measurement or applying existing methodologies in novel contexts. The key is to link the specific research question to a broader theoretical framework, utilizing both empirical and deductive reasoning to build a compelling case for the study.

Develop a Search Strategy

Before diving into the literature, map out a comprehensive search strategy. Identify the main keywords related to your research question and consider synonyms or related terms that might be useful. Determine which databases (e.g., PubMed, ERIC, PsycINFO) will be most relevant for your topic, and plan your search parameters, considering date ranges, language of publication, and other relevant filters.

Google Scholar stands as a freely accessible web-based search engine that indexes the full text or metadata of scholarly literature across an array of publishing formats and disciplines. While databases like PubMed, ERIC, and PsycINFO specialize in specific fields (biomedical sciences, education, and psychology, respectively),

Google Scholar boasts a comprehensive coverage that spans numerous academic disciplines. One of its primary advantages is its intuitive user interface, familiar to those who use Google's main search engine, making it particularly user-friendly for beginners in academic research. Furthermore, Google Scholar often includes conference papers, theses, and other gray literature that might not be readily indexed in more specialized databases. Its "cited by" feature is a useful tool for tracking the influence and reach of a particular work, potentially unveiling newer research that builds upon earlier foundational studies. Additionally, for researchers outside of academic institutions, Google Scholar provides broader access to materials without the paywalls and subscription barriers that can sometimes limit access in other databases. However, it's essential to note that while Google Scholar offers broad inclusivity, the depth and specificity of specialized databases like PubMed, ERIC, and PsycINFO can provide more focused and curated results in their respective fields.

Gather and Organize Sources

As you uncover articles, books, and other resources, utilize tools like Zotero to collect, organize, and cite these sources. It's essential to stay systematic in this step to avoid missing critical studies or duplicating efforts. Extract key information, including authors, publication year, methodologies, and main findings.

In the realm of academic research, sourcing relevant literature is pivotal. One effective technique is reference chasing, which involves both forward and backward tracking of sources. Backward chasing refers to the practice of exploring the reference section of a pertinent article to identify earlier works that the study built upon. This method provides a historical context and ensures a foundational understanding of the topic. Conversely, forward chasing is the process of identifying newer research that cites an initial key source, revealing the latest advancements and discussions in the field. Platforms like Google Scholar amplify this technique with their "Cited by" feature, which lists all subsequent articles that reference a particular work, making it easier to track the influence and trajectory of a study over time. Additionally, systematically harnessing the reference sections of articles already included in a researcher's source list can unveil a web of interconnected studies, ensuring a thorough and comprehensive review of the topic at hand.

Review and Evaluate Sources

In the scholarly realm, not all sources hold equal merit. It's crucial to critically assess each source for its relevance, quality, and credibility. One significant marker of a paper's quality and influence in the field is the number of citations it receives. A high citation count often indicates that the study has made a meaningful contribution, sparking further research or discussions. However, citation count alone shouldn't be the sole criterion. Sometimes, seminal works in niche areas might not amass a vast number of citations.

Peer-reviewed articles generally uphold a higher standard of quality compared to non-peer-reviewed publications. This is because peer-reviewed articles undergo rigorous evaluation by experts in the field, ensuring that the research is sound, relevant, and contributes to the existing body of knowledge. On the other hand, reports from organizations and governments, while valuable, may not have undergone such scrutiny, potentially making them less reliable.

Distinguishing between qualitative and quantitative approaches is crucial. Qualitative studies offer rich, in-depth insights into phenomena, focusing on understanding human experiences and behavior from the perspective of those involved. When evaluating the quality of qualitative studies, consider the depth of data, appropriateness of the analytical approach, and the transparency in describing data collection and analysis processes.

Quantitative studies, on the other hand, rely on numerical data to understand and predict patterns. In assessing their quality:

- Research Design and Causality: Different designs, like experimental, quasi-experimental, and observational, have varying degrees of control over external variables. For instance, randomized controlled trials (RCTs) are considered the gold standard in establishing causality, while observational studies might only point to correlations.

- Sampling: A study's quality hinges on its sample. Representative sampling ensures that the sample mirrors the larger population, enhancing the generalizability of the findings. A non-representative sample might introduce biases.

- Sample Size: A larger sample size increases the statistical power of a study, making it easier to detect meaningful effects. However, very large samples can also detect trivial differences, so the context is crucial.

- Multiple Inference: Running multiple statistical tests increases the chance of finding a significant result by chance alone. Correction

methods, like the Bonferroni correction, are used to counteract this risk.

Lastly, while peer-reviewed journals uphold rigorous standards, it's essential to be aware that even they aren't immune to publishing flawed research occasionally. Therefore, always critically evaluate every source, considering all the factors above, to ensure the reliability and relevance of the studies included in a literature review.

Extract Relevant Information

For each source deemed valuable, extract and summarize the relevant data or information. Tools like Excel can assist in creating a structured database, allowing for the easy categorization of findings, methodologies used, gaps identified, and conclusions drawn. This manual contains chapters describing Cultivate Learning's past use of Excel, Zotero, and Obsidian software solutions for this step.

Synthesize and Analyze Findings

With a curated list of high-quality sources, start synthesizing the information. Identify patterns, trends, contradictions, and gaps in the literature. This step often involves merging different perspectives, comparing results, and drawing preliminary conclusions. Utilize platforms like Obsidian to map out connections, create knowledge graphs, and facilitate the analytical process.

Extracting Information on Significant Predictors from Research Papers

When conducting a literature review, especially in studies aiming to identify controls for your research, it is crucial to understand how to extract and interpret information about statistically significant predictors. This process often involves delving into the details provided in regression tables, which might not be fully discussed in the main text of a paper.

Understanding Statistical Concepts

- **Confidence Level vs. Significance Level:**
  - *Confidence Level* refers to the percentage of probability that the range of values (confidence interval) contains the true effect size. For example, a 95% confidence level suggests that if the study were repeated multiple times, 95% of the confidence intervals from those studies would contain the true effect.

  - *Significance Level* (denoted as alpha, α), is a threshold set by the researcher to determine statistical significance. Commonly, α is set at 0.05. If the p-value is less than α, the results are deemed statistically significant.

- **Percentages vs. Decimals in Statistical Reporting:**

  - Percentages and decimals are often used interchangeably in statistical reporting. A confidence level of 95% is equivalent to 0.95, and a significance level of 5% is the same as 0.05. The choice between using percentages or decimals depends on convention and clarity in communication. In general, decimals are more common in reporting p-values and alpha levels, while percentages are frequently used for confidence levels.

Reviewing Regression Tables

- **Identifying Predictors:** Regression tables typically list variables (predictors) along with coefficients that indicate the strength and direction of their relationship with the outcome variable.

- **Understanding Coefficients:** A positive coefficient suggests a positive relationship, while a negative coefficient indicates an inverse relationship.

- **Examining Significance Levels:** Look for markers (e.g., *, **, ***) or p-values that indicate the statistical significance of each predictor.

Regression vs. Correlation

- **Advantages of Regression:** Regression analysis, unlike simple correlation, can control for multiple variables simultaneously, providing a clearer picture of each predictor's unique contribution to the outcome.

- **Accounting for Confounders:** Regression helps in isolating the effect of each predictor, adjusting for potential confounding variables.

Interpreting Statistical Significance and P-values

- **P-value:** The p-value indicates the probability of obtaining an effect at least as extreme as the one observed, assuming the null hypothesis is true. A lower p-value suggests a higher level of statistical significance.

- **Common Thresholds:** P-values are often compared against a significance level (e.g., 0.05). If the p-value is below this threshold, the result is typically considered statistically significant.
- **Confidence in Predictors:** A statistically significant p-value implies a higher level of confidence that the variable is indeed a predictor of the outcome, though this does not necessarily imply causation.

Documenting Findings In your literature review, record the predictors identified as significant, along with their coefficients and p-values. This practice will aid in forming a robust set of control variables for your research, grounded in existing empirical evidence.

Drafting the Literature Review and Incorporating Citations

Constructing a literature review requires presenting a synthesized and coherent narrative. Initiate with an introduction that brings forth the primary research question and justifies the need for the review. The main body should articulate existing research, methodologies, findings, and noticeable gaps. Summarize with potential implications for the field, emphasizing areas where further research might be beneficial.

Citation Best Practices

1. **Direct Support**: Ensure that every citation directly supports or relates to the claim made in the sentence. Do not resort to using second-hand citations; always refer directly to the primary source of the information.
2. **Selection of Citations**:
   - *Criteria-Based Selection*: Decide on the basis for including a citation:
     - **Influence**: Seminal works or those that have shaped discussions in the field.
     - **Novelty**: Studies that introduced a novel finding or perspective.
     - **Recency**: The latest research that provides contemporary insights.
     - **Methodological Rigor**: Studies that employ particularly robust or innovative methodologies.
     - **Sample Size**: Research with larger and representative samples often provides more reliable and generalizable findings.

- *Avoid Broad Generalizations*: Eschew phrases like 'wealth of evidence' or 'large base of research'. Instead, substantiate such claims with a comprehensive list of references.

3. **Explicitness Over Implicitness**: Clarify the reason a particular study is cited. This minimizes confusion and establishes the context of the citation.

4. **Variety and Breadth**: A diverse range of citations indicates thoroughness and reduces potential biases.

5. **Guidelines for Inclusion**: Set guidelines on citation inclusion:

   - Decide on the number of citations you'll include for widely accepted facts.
   - Determine criteria for 'influence'.
   - Address contradictory evidence in the literature transparently.

6. **Stay Objective**: Prioritize the quality and relevance of the citation over other considerations. Avoid cherry-picking studies to fit a narrative.

7. **Clarity and Conciseness**: Ambiguous or vague phrasing can mask a lack of understanding. It's paramount that your writing reflects a clear grasp of the literature. Ambiguity is not a substitute for depth.

By incorporating these best practices and maintaining a rigorous standard of clarity and precision, your literature review becomes not only a representation of the existing research but also a guiding light for future explorations in the field.

Review, Refine, and Update

A literature review is a dynamic document, especially in rapidly evolving fields. Once your initial draft is complete, review it to ensure clarity, coherence, and comprehensiveness. Seek feedback from peers or experts in the field. Additionally, as new studies and findings emerge, it's beneficial to periodically update the review to maintain its relevance and accuracy.

Procedure for extracting information from articles using an Excel spreadsheet

In the dynamic landscape of early childhood research at Cultivate Learning, we've cultivated a systematic approach to literature reviews that hinges on clarity, consistency, and comprehensive analysis. Recognizing the myriad of studies that each literature review entails, our methodology begins with the creation of a structured Excel spreadsheet, serving as the backbone of our review process. Each study is meticulously entered as a row in this spreadsheet, ensuring a uniform record that can be easily navigated and synthesized. The columns of the spreadsheet capture key details of every study, including the APA citation, geographical context, participant information for empirical studies, the core research question addressed, and the research design. This meticulous data entry, in the first phase, acts as a foundational database. As we transition to the second phase, this spreadsheet becomes an invaluable tool, guiding our understanding of the literature landscape and acting as a reference during the write-up of the literature review. This operationalized approach ensures that our reviews are not just thorough but also organized, paving the way for clear insights and informed conclusions.

The American Psychological Association suggests that research articles have a standardized format. They have title, abstract, introduction, method section, results section, discussion section, and a conclusion. This standardized structure will help us locate the information relevant for the matrix. The matrix is in a file called 'Consolidated Literature Review Matrix.xlsx' in the same folder as this file. This file already has records ordered by APA citation (column A) for ease of locating specific articles. We want to surgically extract the relevant information. We do not want the information to be drowned in a pile of other text that is not relevant. So sometimes copy-and-paste works but other times it'd be useful to quickly scroll to the relevant section, read a couple of sentences, think on them for a while and then write a sentence in your own words that provides the information we need while discarding the rest. Brevity is of value in this effort. Make sure your writing communicates the idea clearly. Confusing information necessitates going back to the paper and slows down our progress. If you are not sure about the correct classification of fields such as 'Research design', leave question mark in the field and contact a researcher at CERE who may be able to advise.

Some of the records already contained in the matrix do not align with this procedure and are highlighted in yellow.

1. Column A (APA citation): Google Scholar provides an APA citation in its search results. Simply and copy and paste into the right

cell.

2. Column B (Location): For the sake of generalizability (or understanding the limitations with respect to it), it is important to know where research subjects originated from. If for example, participants were from New Zealand and New Zealand has different education policies pertinent to the object of the study, this may influence the extent to which such study is applicable to our context. Hence, column B will contain information on the locale where research subjects live. This could be either city, state combination if study is done in the US or the name of the country if the study is done abroad. We do not care where the researchers are from, the important consideration is the subjects of the study because they are providing the insights of the study and we want to be able to put those insights into a geographical context. This field applies to studies that either perform their own data analysis (including qualitative analysis) or rigorous literature review articles if it is possible to identify which geographies the underlying reviewed articles sourced their subjects from. In all other cases, this field should read 'N/A' for 'Not available.'

3. Column C (Participants): The information entered in this column is regarding the subjects of the study. The primary purpose of this column is to distinguish the type of the subjects: parents, children, educators, leaders, etc. Secondary purpose is to provide some additional detail that may be useful in contextualizing the studies in question. For example, if children were the subjects the following information may be useful. Were they children from a state program, family childcare, center-based care, Montessori, or a combination? Were they only children aged 3-5 or were other children also part of the study? This information would likely be located in the 'Methods' section of a paper or the 'Results' section or in 'Data' if not in the abstract/introduction. Similarly, if parents were participants, it may be useful to know their sociodemographic status. This field applies to studies that either perform their own data analysis (including qualitative analysis) or rigorous literature review articles if it is possible to identify which geographies the underlying reviewed articles sourced their subjects from. In all other cases, this field should read 'N/A' for 'Not available.'

4. Column D (Research questions):

   what is a research question: There are two types of research studies – descriptive and inferential. Some inferential questions are exploratory in a sense that a hypothesis has not been stated prior to data collection and are also colloquially referred to as

'fishing expeditions' or 'data mining'. In such cases, the question will have rather general character such as 'How do district grantees foster quality preschool programming?' A descriptive study merely attempts to describe 'what is', whereas an inferential study attempts to describe a mechanism of action, studying an interplay of two or more variables in the process. An inferential research question is a grammatical question ending with a question mark. It contains a subject (subjects of the research study) and a verb (intervention or mechanism of action). It may also contain an adverbial specifying that a given phenomenon is being studied in a specific geographical or other context. A descriptive research question is rather similar, except that the verb phrase is usually based on the verb 'to be' – for example 'What is the quality of preschools across the five quality areas measured on the GGA?' or 'Is there a difference in quality between private and government preschools?' A specific inferential question with hypothesis stated in advance reads like the following: 'Do the levels of teachers' receptive vocabulary skills predict their usage of language facilitation strategies?'

where to find the information: Read the title and try to extract as much relevant information. There is a good chance that the title may provide information about what the research question was or what was the answer (finding). If the title is not helpful, we move on to the Conclusion, which is where the purpose and contribution of the whole paper are summarized in a language aimed at broad audience. If conclusion is not helpful, we move on to the abstract. Abstract has a format that mirrors the whole paper, it's really a mini-paper inside of the paper. The first sentence is usually an introduction, the last sentence a conclusion and the content in the middle could provide details on methodology and other information. It is very unlikely that one would have to keep on reading to find out what the purpose of the paper, the research question and the findings are after these steps. Still, introduction would be the natural next step.

5. Column E (Methods/Research Design): Research design speaks to the generalizability of the results and is also related to the type of research question asked. Same as sampling procedures below or research question, good research design speaks volumes to the quality/value/contribution of the paper/article. The world is very complicated and careless study design obscures it more than illuminate. Relationships that don't exist (spurious relationships) come out of low-quality research designs. The best research design is one where cause and effect can be identified and distinguished

from each other. The reason for this is that in such a scenario the cause could be used as a policy lever and a policy designed to emulate this cause would then be assumed to have the original effect identified in the paper. Causal designs offer the best fit for needs of policymakers. Best research design for identifying causal relationships is an experiment (input text 'RCT' into the relevant cell). Experiments are expensive and sometimes ethical considerations prevent their implementation (it involves an involuntary application of an untested – experimental – intervention). The whole point of an experiment is to assign treatment regardless of what the subjects want (to avoid selection-on-unobservables issues). For these reasons, approaches were developed that mimic experimental procedures in their ability to reveal the causal relationship in question without the ethical issues involved. These are called 'quasi-experimental' approaches and there is a great number of them:

- Regression discontinuity design (enter 'RDD' into the cell). The paper that uses this method will explicitly state so. Hence, keywords that will likely appear in the paper include 'regression discontinuity design', 'RDD', 'regression discontinuity'. This method is rare so if it is used by the paper, it might in fact be featured in the title. If not, the Methods section should provide the relevant information.
- Instrumental variables regression (enter 'IV' into the cell). The paper that uses this method will explicitly state so. Hence, keywords or phrases that will likely appear in the paper include 'instrumental variables', 'IV', 'instruments', 'instrument for', 'valid instrument', etc. This method is rare so if it is used by the paper, it might in fact be featured in the title. If not, the Methods section should provide the relevant information.
- Propensity score matching (enter 'PSM' into the cell). The paper that uses this method will explicitly state so. Hence, keywords that will likely appear in the paper include 'propensity score matching', 'propensity scores', 'matching'. The method involves creating a control group artificially by finding a population similar to the 'treatment' group so they can be compared together the same way they would be in an experiment. Hence the Methods section will contain some analysis demonstrating that this matching was done properly. This method is more common than RDD or IV. If it is used by the paper, Methods section or Introduction should indicate this.
- Fixed-effects regression (enter 'FE' into the matrix). The paper that uses this method will explicitly state so. Hence, keywords

that will likely appear in the paper include 'fixed effects regression', 'fixed effects', 'least squares dummy variable (LSDV) regression', 'within estimator', 'first-difference (FD) estimator', etc. This method is extremely rare in the Education scientific literature so if it is used by the paper, it might in fact be featured in the title. If not, the Methods section should provide the relevant information. This method is not to be confused with HLM.

- Granger causality (enter 'Granger' into the matrix). The paper that uses this method will explicitly state so. Hence, keywords that will likely appear in the paper include 'Granger', 'Granger causality'. This method is extremely rare in the Education scientific literature (it requires time series or longitudinal data) so if it is used by the paper, it might in fact be featured in the title. If not, the Methods section should provide the relevant information.
- Longitudinal analysis. This is not actually a specific model but rather type of data and a broad group of models. The fixed-effects regression above is one such model. Hence, if you encounter the keyword 'longitudinal', keep looking for indications of what specific model was used to investigate the research question. While HLM can in principle be used for longitudinal analysis, it does not provide the ability to identify causal relationships in such data.

Another useful indication that causal/experimental/quasi-experimental models are used by a given paper is 'causality'. For if researchers are not concerned with causality, they most likely are not using experimental or quasi-experimental approaches. Hence frequent appearance of the word 'cause' in the description of the findings in abstract and conclusion would indicate that either experimental or quasi-experimental approach was used. The word 'association' is a strong hint that they were not used. The word would also appear as a verb, as in 'child outcomes associated with classroom quality'. This concludes the causal modeling category. The following models will be at best able to identify associations:

- The workhorse of education research is the 'pre-post' design (enter 'Pre-post' into the matrix). Sometimes it is regarded as a 'quasi-experimental' as well, however, it is weaker than the others in methodology (any unobserved variable that appeared within the same time frame as the intervention is a possible confounder). The notion is that intervention happens in the middle of the study period and outcomes are collected before

and after intervention. The weakness of the pre-post approach is that anything that happens during the study could be masking the effect of the intervention. Strong hints that this approach is the one being used are the appearance of the prefix 'pre-' and 'post-' in the text (Methods section, Abstract, Title, Conclusion).

- If simple correlation/association is studied without any effort to discern causality, fill in 'Correlational study' in the matrix. This includes situations where demographic controls are used.

All the above research designs use quantitative data (numbers). Sometimes those are not available or more qualitative insight (variables difficult to measure) is being sought. When this is the case, we're dealing with a 'case study' (single observation – enter 'Case study' into the matrix) or a 'qualitative' (somewhere between 5 and 30 participants – enter 'Qualitative' into the matrix) study. These keywords will appear in them ('qualitative', 'case study'). Finally, some studies are not using novel data at all, but rather summarize existing knowledge. This knowledge is either a body of already published papers (literature review – enter 'Review') or data extracted from expert humans (committee – enter 'Researcher survey'). The literature reviews coded under the 'Review' code could be both formal meta-analyses that estimate average effect by collecting standard deviations, sample sizes, regression coefficients from studies being summarized as well as more informal 'narrative' or 'qualitative' literature reviews that do not attempt to distill an average effect but rather provide a 'walk-through' of existing studies. If unsure, leave '?' and contact a colleague. Another type of study is a psychometric study (enter 'Psychometric' into the matrix). This type of study is concerned with identifying ways to measure difficult-to-measure qualitative phenomena using quantitative survey data. Some studies simply summarize the state of a certain situation, they are called descriptive studies (enter 'Descriptive' into the matrix). Some studies combine quantitative and qualitative approaches into a mixed-methods study (enter 'Mixed methods' into the matrix). Some studies have a very small sample (1-10 individuals), yet attempt a quantitative analysis with such data. A multiple baseline design (enter 'MBD' into the matrix) is an example of such approach. This would be explicitly stated in the paper with keywords 'multiple baseline design'. Another hint is an attempt at graphing data, looking at 'pre' and 'post' values of the data, all the while having a very small sample size. In summary, RCT, RDD, IV, PSM, FE, Granger, Pre-post, Correlational study, Qualitative, Review, Researcher Survey, Psychometric, Descriptive, Mixed methods, MBD are the categories to be entered

into the matrix.

6. Columns F, G, H (major findings): These should appear along with the hypothesis or research question. The usual suspects are title, conclusion, abstract, discussion section of the paper. A finding is a grammatical sentence that has a subject (the participants of the study), a verb phrase (mechanism of action), and some possible adverbials (context). The structure of the findings question is very similar to the research question since the finding is effectively an answer to the research question and often times it is very similar to the research question without the question mark. Avoid describing merely what the study 'was doing' and focus on what the actual finding was. A finding is a piece of insight, a piece of new information, a piece of new knowledge. 'Head Start teachers participated in an intervention focused on improving language facilitation skills' (cell F5) is not a finding but rather a not every informative description of the research design. We are also not interested in vague phrases such as 'shows promise' ('..which demonstrated that feedback with the addition of self-monitoring shows promise as a strategy to change teachers' instructional practices', cell F5). Cell F5 should ideally read in the following way: 'Feedback (self-reported graphed or delayed performance) with the addition of self-monitoring was found to improve teachers' instructional practices as measured by CLASS [or some other tool] among a sample of Head Start teachers. The size of the effect was moderate [or whatever it was].'

7. Column I (sampling procedures): When researchers follow proper sampling procedures, the results are generalizable to the whole population. What is a population? Population are all the subjects in the known universe. If one is to study a statewide preschool program, the population are all the children enrolled in it (at a given time). If one is to obtain data on all these children and base a study on this, this would be called universe sampling (enter 'Universe' into the matrix). This is, however, an obviously expensive proposition, so most paper study only a sample of a given population, a subset. This is where the value of the paper is decided. If the subset is chosen haphazardly, there is a good chance that the subset studied is on average different than the population. This would imply that any conclusion obtained by studying such a special group of subjects does not apply to the population as a whole. Such a haphazard collection is called a 'convenience sample' (enter 'Convenience' into the matrix). We should search for the keyword 'convenience' in the Method section of the paper. An ideal approach would be to collect a 'representative sample'

(enter 'Representative' into the matrix). There are various types of representative samples. Keywords to look for are 'simple random sample', 'stratified random sample', 'clustered random sample'. It is reasonable to assume that if none of these phrases appear in the paper and the paper does not describe in much detail how subjects were obtained for the study that the paper in fact is a convenience sample (code as 1). If unsure, leave '?' and ask a colleague. This one is not easy.

8. Column J (Measures): In the early childhood education, measures are mostly child outcome measure and classroom quality measures (CLASS, ECERS). One would reasonably expect to find these in the Method section. Use search feature in your browser and search for 'measure', 'tool', 'child outcome', 'outcome', 'classroom quality' and try to locate the measure. Very likely it is going to be an acronym like the quality measures above. Quite often, the measure appear in the title if the research question revolves specifically around them.

Using Zotero for Literature Reviews at Cultivate Learning

Zotero is a powerful tool for managing bibliographic data, and it has been integral to the research processes at Cultivate Learning. Here's a step-by-step guide on how to utilize Zotero effectively for conducting literature reviews:

1. **Setting Up & Logging In:**
   Begin by installing the Zotero desktop application, along with the browser connector for easy citation collection. Once installed, log into the `cultivate_learning` Zotero account, which houses the existing records of literature reviews for various projects, including Early Achievers, EarlyEdU, Head Start DTL, PPI, and more.

2. **Accessing Existing Collections:**
   Upon logging in, you'll find collections pertaining to different projects. These collections have been meticulously curated and represent the extensive research history of Cultivate Learning. Browse through them to familiarize yourself with existing literature.

3. **Adding New Sources:**
   When conducting new literature reviews or adding to existing ones, use the browser connector to save articles, papers, and other resources directly to the relevant Zotero collection. Zotero will automatically extract citation details, abstracts, and, when possible, full-text PDFs.

4. **Organizing and Tagging:**
   Make use of Zotero's tagging feature to categorize sources. This can be particularly useful for thematically organizing literature or for distinguishing between methodologies, study populations, or other key aspects of the research.

5. **Taking Notes:**
   Zotero allows for note-taking directly within the platform. For each entry, you can add notes which might include summaries, key findings, or personal reflections on the material. This feature can be invaluable when synthesizing information for the review.

6. **Generating Bibliographies:**
   When writing, you can utilize Zotero's capability to generate citations and bibliographies in a variety of styles. Whether you're drafting a report, a research paper, or an internal document, Zotero ensures your references are consistent and correctly formatted.

7. **Collaboration:**
   Collaborative work is streamlined in Zotero. Team members can add to, edit, or review entries in shared collections. This promotes consistency in the literature review process and ensures everyone has access to the same resources.

8. **Backup and Sync:**
   Ensure the `cultivate_learning` account is regularly synced. This not only safeguards the data but also ensures that all team members have access to the latest additions and edits.

In conclusion, Zotero offers a comprehensive suite of tools tailored for an efficient literature review process. By leveraging its capabilities and the resources already available in the `cultivate_learning` account, Cultivate Learning researchers are well-equipped to maintain the high standards of research the organization is known for.

Using Obsidian for Literature Reviews with the Zettelkasten Framework

Obsidian is not just a note-taking app; it's a powerful tool that, when used with the Zettelkasten method, can transform the way researchers approach literature reviews. At its core, the Zettelkasten method involves creating individual notes (or "zettels") for every piece of knowledge or idea you come across. In the context of literature reviews, this means every significant insight, finding, or concept from a paper gets its own note. Obsidian's unique bidirectional linking capability allows users to connect these notes in a meaningful way. By linking related zettels, researchers can trace the development of ideas, see patterns, and understand the broader context in which individual pieces of information sit.

In addition to linking notes, Obsidian's tagging feature enhances the Zettelkasten approach, especially when reviewing vast amounts of literature. By tagging notes with keywords or themes, users can categorize information and easily retrieve groups of related notes. For example, while reviewing studies on early childhood education, one might use tags such as `#pedagogy`, `#developmental-psychology`, or `#curriculum-design`. Over time, as the database of notes grows, these tags can serve as guideposts, leading researchers to clusters of relevant information on particular topics.

Perhaps one of Obsidian's most visually captivating features is its graph view (see Figure 1), which displays a network of all notes and their interconnections. For those implementing the Zettelkasten method, this view provides a bird's-eye perspective of their knowledge base. In the context of a literature review, it's a dynamic map of the landscape of research, showcasing how various studies, ideas, and concepts interrelate. By examining the network of tags and notes, researchers can identify central themes, notice gaps in their understanding, or even discover unexpected connections between seemingly disparate areas of research. In essence, Obsidian, when paired with the Zettelkasten framework, becomes a powerful ally in the pursuit of comprehensive and insightful literature reviews.

The following procedure was implemented at Cultivate Learning:

1. Create a folder called Literature within your Obsidian vault (see Figure 2).

2. Import existing references. Right click on the Literature folder and select the option 'Reveal in Find' (the Windows version should say something similar like 'Reveal in File Explorer') – see Figure 3.

3. Now that you know where the notes are physically located, note

Figure 1: Obsidian Graph view.

this location. Every note is represented by a physical file with an .md suffix (see Figure 4).

4. Navigate to Literature folder on Teams to download the references already recorded in prior literature review efforts. Download these references into the folder you noted in Step 4. These notes should now show up in your Obsidian vault (check that they do).

5. Now that you have already existing references, you can continue (build on) this work (see Figure 5). Since you have the existing references already collected, you will not accidently do work that has already been done. Note the format of the notes. There is a title, followed by the APA reference (from Google Scholar), number of citations (from Google Scholar), and an abstract of the paper. Remember this template and use it in your own work. The title follows somewhat loosely the APA style in that it does not use the '&' symbol (it tends to break things because it is a special charater). In the title, we use 'and' instead if a references has been authored by two researchers such as 'Blair and Razza (2015)' and 'et al' if more than two researcher participated 'Blair et al (2015)'. If more than one citation fits the pattern, we will start lettering the references ('Blair et al (2015b)', 'Blair et al (2015c)'.

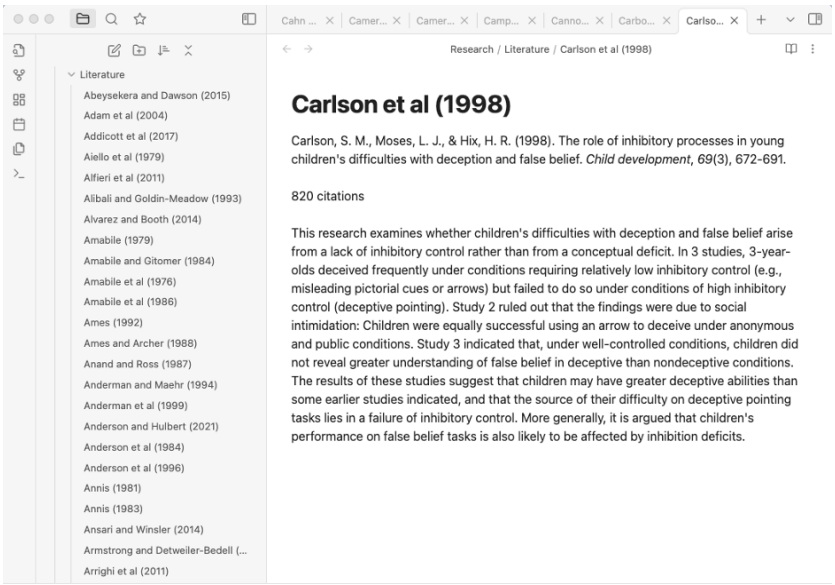

Figure 2: Create a folder called Literature within your Obsidian vault.

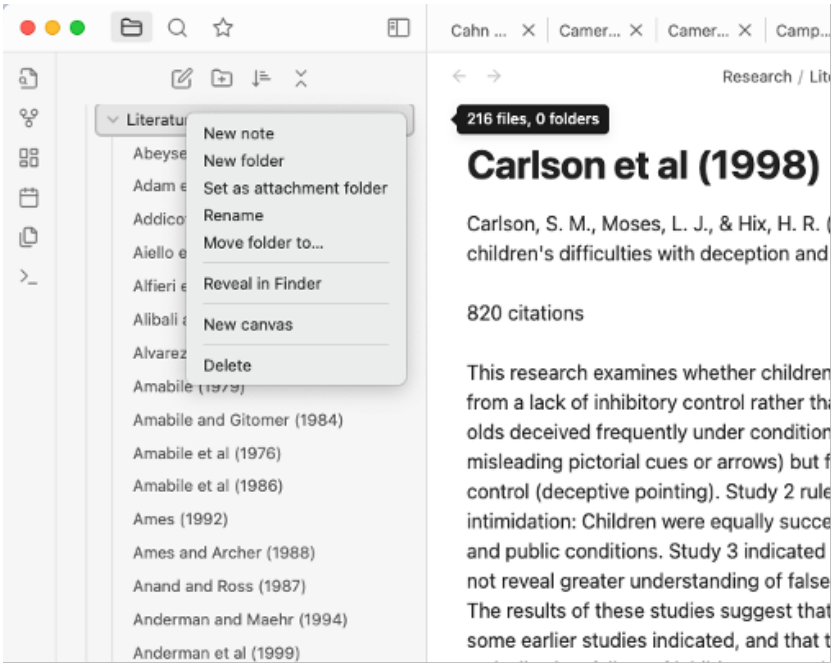

Figure 3: Import existing references. Right click on the Literature folder and select the option 'Reveal in Find' (the Windows version should say something similar like 'Reveal in File Explorer')

Motivation and context

The benefit of having the references in Obsidian in this form, is that later when leadership/client/funder asks us to do a project for example related to executive function, we simply left-click on the tag and this will reveal all references in Obsidian that have been marked

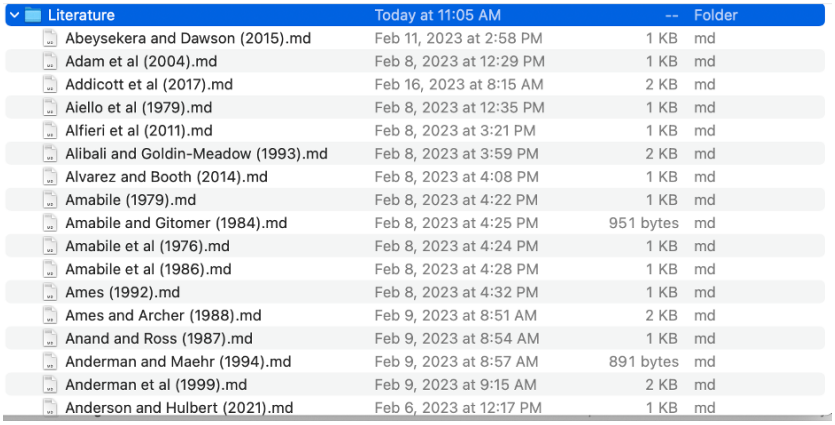

Figure 4: Now that you know where the notes are physically located, note this location. Every note is represented by a physical file with an .md suffix.

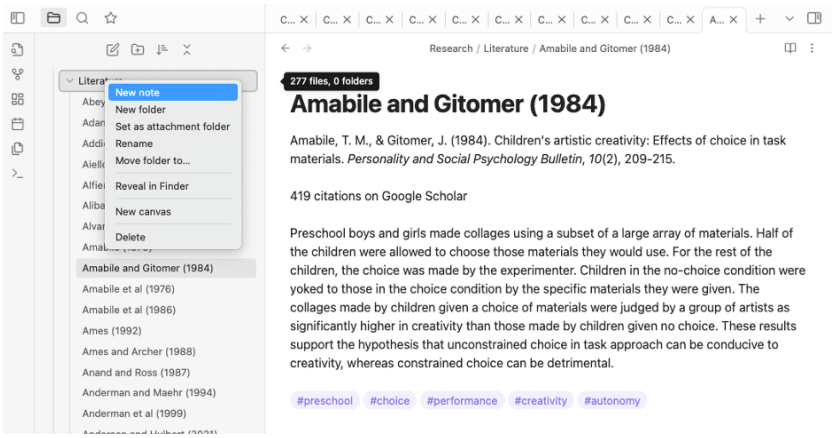

Figure 5: Now that you have already existing references, you can continue (build on) this work.

with this tag (see Figure 6). Multiple tags can be entered and so if for example we fielded a question regarding the relationship between mathematics knowledge and executive function, we can enter both tags into the search and we will see all references that have both tags attached to them (see Figure 7).

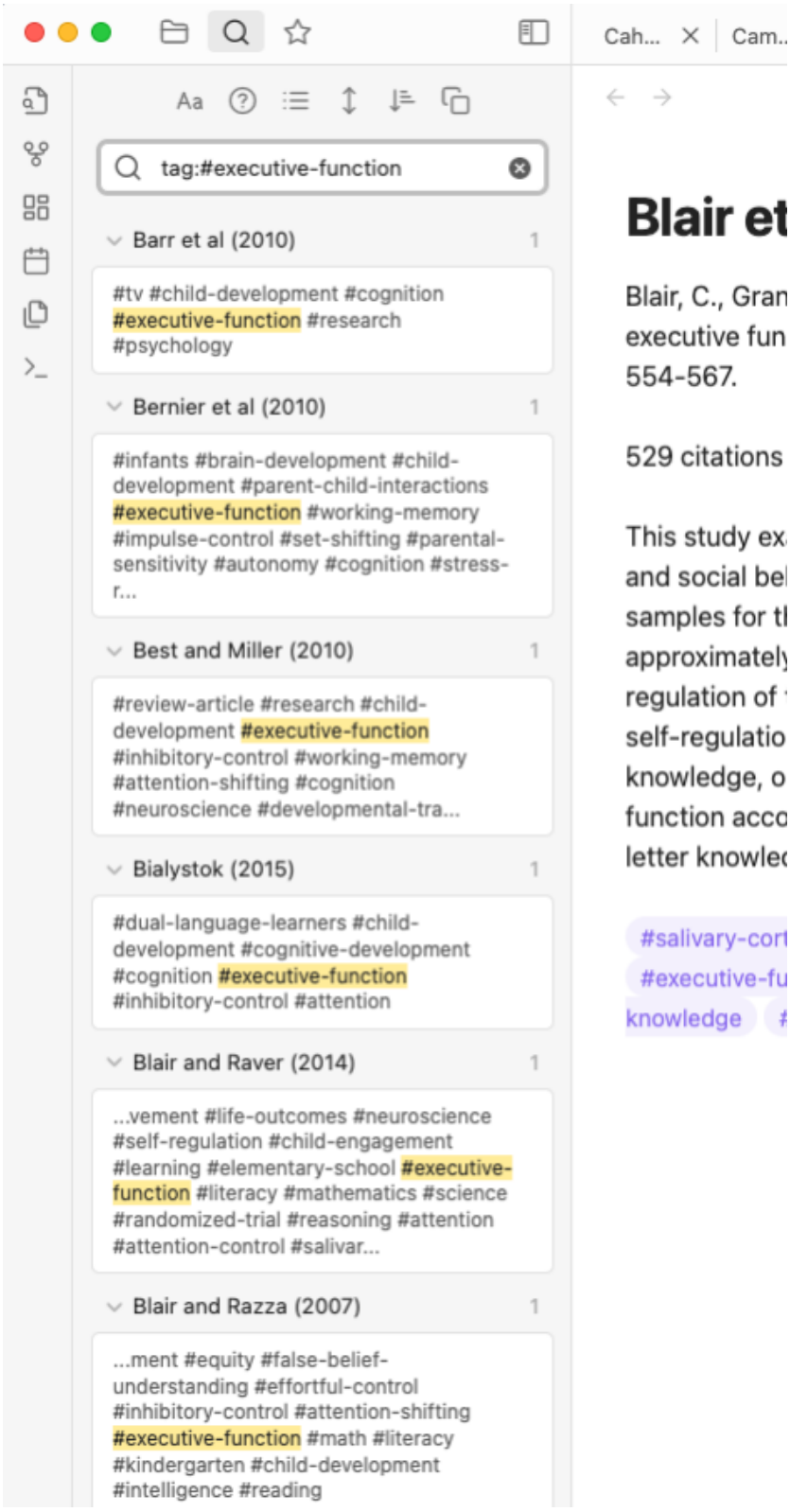

Figure 6: Identifying all references with a specific tag.

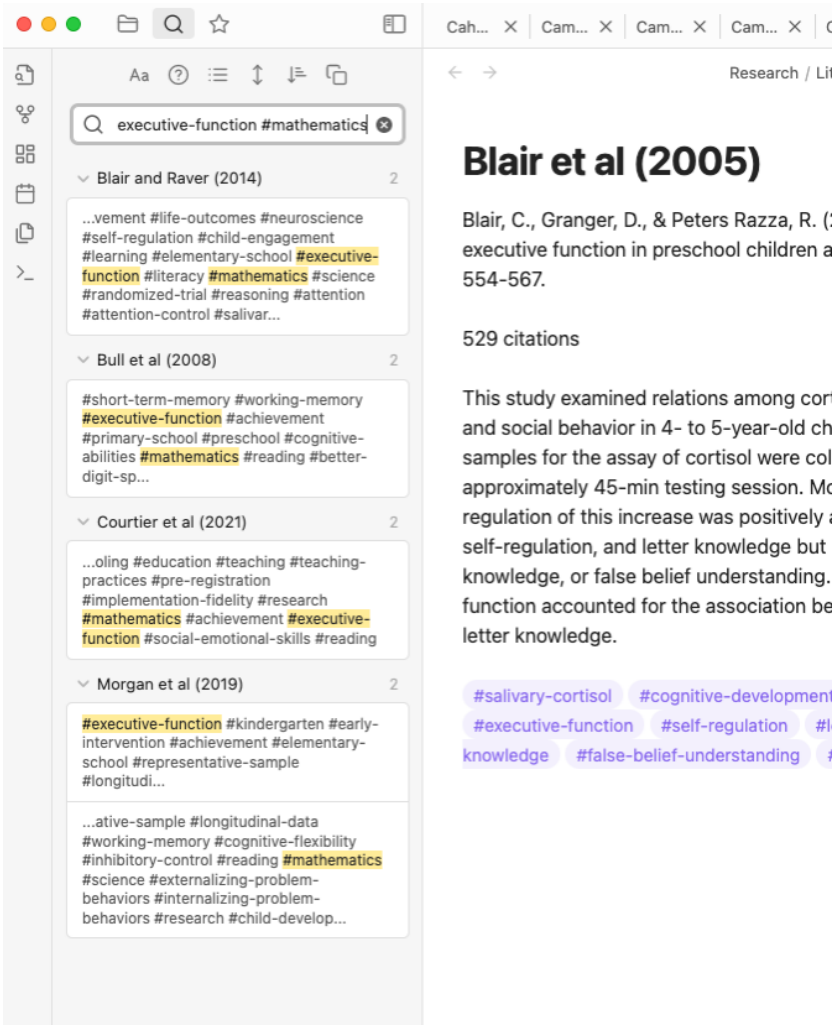

Figure 7: Identifying references related to more than one tag.

List of Early Childhood Education Journals

Here is a list of several prominent early childhood education journals, complete with short summaries that include their thematic/methodological focus and their respective impact factors.

1. **Early Childhood Research Quarterly**

   Impact Factor: 3.028 Focus: Research on early education and development from birth to 8 years old

2. **Child Development** Impact Factor: 4.061

   Focus: Research on child development processes and theory

3. **Developmental Psychology** Impact Factor: 3.857 Focus: Research on human development across the lifespan

4. **American Educational Research Journal** Impact Factor: 4.038 Focus: Diverse methods and topics in educational research

5. **Educational Researcher** Impact Factor: 5.642 Focus: Research, policy, and practice across all education levels

6. **AERA Open** Impact Factor: 2.395 Focus: Education research with emphasis on applied studies

7. **Journal of Educational Psychology** Impact Factor: 5.150 Focus: Educational psychology research and practice

8. **Journal of Child Psychology and Psychiatry** Impact Factor: 7.349 Focus: Research on child psychopathology and developmental psychology

9. **Cognitive Development** Impact Factor: 2.368 Focus: Research on cognitive development processes

10. **Developmental Science** Impact Factor: 3.874 Focus: Interdisciplinary research on human development

11. **Psychological Science** Impact Factor: 8.909 Focus: Experimental psychology research findings

12. **Annual Review of Psychology** Impact Factor: 29.9 Focus: Literature reviews of recent psychology research

13. **Journal of Experimental Psychology** Impact Factor: 3.056 Focus: Experimental studies across psychology disciplines

14. **Child Development Perspectives** Impact Factor: 9.321 Focus: Reviews and perspectives on child development research

15. **Contemporary Issues in Early Childhood** Impact Factor: 2.500 Focus: Research on contemporary early childhood education issues

16. **Early Child Development and Care** Impact Factor: 1.056 Focus: Research and practice in early childhood development and education

17. **Early Childhood Education Journal** Impact Factor: 1.114 Focus: Classroom practice, policy, and research in early childhood education

18. **European Early Childhood Education Research Journal** Impact Factor: 2.500

    Focus: Early childhood research and practice in Europe

19. **International Journal of Early Childhood** Impact Factor: 0.889 Focus: Global early childhood development research and policy

20. **Journal of Early Childhood Research** Impact Factor: 1.667 Focus: Interdisciplinary research on early childhood theory, policy, and practice

21. **Early Child Development and Care** Impact Factor: 1.056 Focus: Research and practice in early childhood development and education

Pre-Registration in Research

Understanding Pre-Registration

Pre-registration in research refers to the practice of registering the details of a study before it is conducted. This proactive step helps ensure transparency, robustness, and reproducibility in scientific research. By outlining and publicly sharing the research plan prior to data collection, researchers can prevent data mining, p-hacking, and other practices that may compromise the integrity and generalizability of the findings.

Benefits of Pre-Registration

Pre-registration brings a multitude of benefits to the research process:

- **Replicability:** By detailing the methodology and analysis plan beforehand, pre-registration makes it easier for other researchers to replicate the study.
- **Generalizability:** It ensures that the research question, design, and analysis plan are aligned and carefully considered, thereby contributing to the generalizability of the findings.
- **Transparency:** Pre-registration enhances transparency by reducing the chances of selective reporting or altering hypotheses post hoc.

Platforms for Pre-Registration

Several platforms facilitate pre-registration of research studies across disciplines:

- `clinicaltrials.gov` is a registry for clinical trials, and it is mandatory for certain clinical studies to be registered here.
- `aspredicted.org` provides a platform for researchers to outline their research plan, hypotheses, and analysis strategies.

- Researchers can use `GitHub` to create repositories that host pre-registration documents, ensuring transparency and version control.
- Other platforms such as `OSF Registries` and `Registry of Research Data Repositories (re3data)` also support pre-registration across various research domains.

Components of a Pre-Registration Proposal

A comprehensive pre-registration proposal should describe the following aspects:

- **Research Question:** A clear and concise statement of what the study aims to investigate.
- **Hypotheses:** Expected outcomes and predictions.
- **Methodology:** Detailed description of study design, participants, materials, and procedures.
- **Analysis Plan:** Outline of statistical methods and data analysis strategies.
- **Ethical Considerations:** Information about IRB approval and ethical compliance.

Handling Changes Post Pre-Registration

Changes in research approach after pre-registration are not uncommon. When such changes occur, it is essential to:

- Document and publicly disclose any deviations from the pre-registered plan, explaining the reasons for the changes.
- Ensure that the changes adhere to ethical guidelines and scientific rigor.

Pre-Registration in Grant Applications

Pre-registration is increasingly becoming a requirement in federal grant applications. Agencies such as the Department of Health and Human Services often necessitate pre-registration to ensure that taxpayer-funded research upholds scientific integrity and transparency.

Conclusion

Pre-registration is an invaluable step in conducting rigorous and replicable research. By clearly outlining the research plan beforehand and choosing an appropriate platform for registration, researchers contribute to the advancement of transparent and credible scientific inquiry.

Creating an Analysis Plan

Understanding an Analysis Plan

An analysis plan is a comprehensive document that outlines how data will be processed, examined, and interpreted in a research study. It is a blueprint that details the steps to be taken in the analysis phase, providing clarity and ensuring consistency in approach. An effective analysis plan is critical for the reliability and validity of the research findings.

Components of an Analysis Plan

A detailed analysis plan should encompass the following components:

- **Research Questions and Hypotheses:** Clearly state the research questions and hypotheses that guide the study. Specify the expected outcomes and predictions.
- **Data Cleaning and Preparation:** Describe the procedures for cleaning and preparing the data for analysis. This may include handling missing data, outliers, and data transformations.
- **Variables:** Define and categorize the variables involved in the study. Specify the independent, dependent, and control variables, along with any demographic variables.
- **Statistical Techniques:** Outline the statistical tests and techniques that will be used to analyze the data. Specify the rationale for choosing each technique and how it aligns with the research questions.
- **Assumptions Check:** Detail the assumptions for each statistical test and describe how these assumptions will be verified.
- **Sensitivity Analysis:** If applicable, describe any sensitivity or subgroup analyses that will be conducted.

- **Interpretation:** Explain how the results from the statistical analyses will be interpreted in relation to the research questions and hypotheses.
- **Ethical Considerations:** Highlight any ethical considerations relevant to the data analysis.

Importance in Pre-Registration and Data Requests

An analysis plan is a crucial component in both pre-registration and when submitting requests for datasets, such as from Cultivate Learning:

- **Pre-Registration:** Including a detailed analysis plan in the pre-registration ensures that the research is transparent, rigorous, and free from post hoc decision-making. It helps in mitigating biases and enhances the replicability of the study.
- **Data Requests:** When requesting data, providing a clear analysis plan demonstrates that the research is well-thought-out and aligns with the data being requested. It ensures that the data requested is relevant and will be used effectively.

Adapting the Analysis Plan

Research is dynamic, and sometimes the initial analysis plan may need revisions. Any changes made post pre-registration or data request should be:

- Documented meticulously, providing clear justification for each change.
- Ensured to adhere to ethical guidelines and maintain scientific rigor.

Conclusion

Creating a thorough analysis plan is a foundational step in the research process. By outlining the plan meticulously, researchers ensure that the study remains focused, transparent, and adheres to the principles of scientific inquiry from inception to conclusion.

Statistical Inference and Causality in Early Learning Research

In early learning research, establishing causality is paramount. It is not sufficient to merely observe relationships between variables; understanding the causal mechanisms is essential for creating effective interventions and policies.

The Importance of Causality

Consider a relationship between classroom quality and child development. While a correlation may exist, it is crucial to ascertain whether higher classroom quality *causes* stronger child development.

Challenges in Establishing Causality

Third-Variable Problem A third-variable problem occurs when an external factor influences both variables. For example, the socioeconomic status of a neighborhood may affect both classroom quality and child development.

Reverse Causality Reverse causality implies that the direction of influence may be opposite. For instance, regions with better child development outcomes might attract better teachers and resources, thus improving classroom quality.

Approaches to Establish Causality

Experimental Design

Randomized controlled trials (RCTs) can help establish causality by controlling for confounding variables.

Quasi-Experimental Design

When RCTs are not feasible, quasi-experimental designs, such as matching or difference-in-differences, can approximate causal inference.

Instrumental Variables

Instrumental variables can help identify causal relationships by isolating exogenous variation in the independent variable.

Regression Discontinuity Design

This design leverages arbitrary cutoff points to compare similar groups, thereby mimicking random assignment.

Regression Analysis

Why Regression Analysis?

Regression analysis is a powerful tool for examining relationships between variables and making predictions.

Control Variables Including control variables allows researchers to account for confounding factors, thereby honing in on the relationship of interest.

Conclusion

Establishing causality is complex but crucial for impactful early learning research. By carefully selecting research designs and utilizing appropriate statistical techniques, researchers can move beyond mere correlations to uncover causal relationships that inform policy and practice.

Moderator and Mediation Analysis in Early Learning Research

This chapter delves into the nuances of moderator and mediation analysis, essential statistical methodologies in early learning research for investigating the dynamics of relationships between variables. These analyses can offer insights into equity and the effectiveness of various components in educational interventions.

Understanding Moderator Analysis

Definition

Moderator analysis examines how the relationship between two variables (e.g., an intervention and its outcome) changes across different levels of a third variable (e.g., socio-economic status).

Application in Early Learning

In early learning research, moderator analysis can identify discrepancies in intervention effects across diverse groups, thereby informing equitable resource allocation and policy decisions.

Conducting Moderator Analysis

This analysis often involves interaction terms in regression models to examine if the effect of the independent variable on the dependent variable differs across levels of the moderator.

Moderators vs Predictors

In the context of statistical analysis, especially within regression models, the terms "statistically significant moderator" and "statistically significant predictor" refer to different roles that variables can play in a model, and understanding these roles is crucial for interpreting the results correctly. Let's define each term:

Statistically Significant Predictor

- A predictor (also known as an independent variable) in a regression model is a variable that is hypothesized to have a direct effect on the dependent (outcome) variable.

- When a predictor is termed "statistically significant," it means that the effect of this predictor on the dependent variable is unlikely to be zero, considering the data and within the confidence level set by the researcher (usually at a 95

- Statistical significance of a predictor is usually assessed by looking at p-values from hypothesis tests or confidence intervals for the predictor's coefficient in the regression model. A small p-value (typically less than 0.05) suggests that the effect of the predictor is statistically significant.

Statistically Significant Moderator

- A moderator variable is a third variable in a regression model that affects the strength or direction of the relationship between a predictor and the dependent variable. It essentially modifies how one variable influences another.

- When a moderator is "statistically significant," it means that its interaction with another variable (typically a predictor) significantly affects the dependent variable. This significance is also determined by p-values or confidence intervals, similar to how predictors are evaluated.

- In practical terms, a statistically significant moderator indicates that the effect of a predictor on the outcome varies depending on the level or value of the moderator. For example, the effect of a training program (predictor) on work performance (outcome) might depend on the level of prior experience (moderator) of the employees.

In summary, a statistically significant predictor directly influences the dependent variable, and its significance is evaluated based on the strength of this direct relationship. In contrast, a statistically significant moderator does not directly affect the dependent variable on its own, but rather changes the strength or direction of the effect of another predictor on the dependent variable. The significance of a moderator is assessed based on how much it changes this relationship.

Mediation Analysis

Definition

Mediation analysis explores the mechanism or pathway through which an independent variable affects a dependent variable by considering an intermediary variable (mediator).

Importance in Early Learning

In early learning, mediation analysis can elucidate how an intervention exerts its effects. For instance, understanding how a professional development program improves teaching quality (mediator) and thereby enhances child outcomes.

Conducting Mediation Analysis

Statistical approaches for mediation analysis often involve a series of regression models to assess the relationships between the independent variable, mediator, and dependent variable.

Causal Mediation Analysis

Context of Randomized Interventions

When an intervention is randomized, causal mediation analysis can be employed to dissect the causal pathways and understand how different components contribute to the observed effect.

Approaches and Challenges

Approaches like structural equation modeling or causal inference methods can be employed. However, assumptions such as no unmeasured confounding are critical for causal interpretation.

Leveraging for Equity and Effectiveness

Informing Resource Allocation

By understanding how effects vary (moderator analysis) and the pathways through which they occur (mediation analysis), researchers can inform decisions on resource allocation and intervention focus.

Implementation Drivers

Mediation analysis can reveal which components of an intervention are key drivers of its effectiveness, aiding in the scaling and replica-

tion of successful programs.

Conclusion

Moderator and mediation analyses are vital tools in early learning research, offering deeper insights into the mechanisms and boundary conditions of interventions. By employing these analyses thoughtfully, researchers can contribute to the development and implementation of more effective and equitable educational programs.

Using R in Early Childhood Education Research

R, a versatile and open-source statistical software, has become an invaluable tool for researchers in early childhood education. This chapter provides an overview of how R can be employed to address the unique challenges and nuances of research in this field.

Pre and Post Research Design

In early childhood education, pre and post research designs are frequently used to assess changes in outcomes before and after an intervention.

- **R Packages:** Packages like `tidyverse` facilitate data manipulation and visualization, while `pairedsamples` can be used for analyzing pre-post designs.
- **Usage:** Functions such as `t.test()` can be used for paired t-tests to compare means before and after interventions.

Imputation of Missing Data

Handling missing data is a common challenge.

- **R Packages:** The `mice` package supports multiple imputation.
- **Usage:** The `mice()` function helps in imputing missing data, while the `pool()` function combines results across multiple imputed datasets.

Hierarchical Linear Modeling

Hierarchical Linear Modeling (HLM) is preferred when dealing with nested data, common in early childhood education research.

- **Why HLM:** HLM accounts for the hierarchical structure of data, such as students nested within classrooms.

- **R Packages:** The `lme4` and `nlme` packages are used for hierarchical linear modeling.
- **Usage:** Functions like `lmer()` and `lme()` facilitate the fitting of linear mixed-effects models.

Factor Analysis and Psychometrics

Factor analysis and psychometrics are crucial for tool development and data collection.

- **R Packages:** `psych` for factor analysis and `eRm` for Rasch models.
- **Usage:** Functions such as `factor.analysis()` and `rasch()` can be used for tool development and checking reliability.

Statistical Sampling

R aids in creating representative samples from populations.

- **R Packages:** `sampling` and `survey` are useful for complex survey sampling.
- **Usage:** Functions such as `strata()` and `svydesign()` assist in creating and analyzing samples.

Conclusion

R, with its extensive packages and functions, offers comprehensive solutions to the unique challenges faced in early childhood education research. By leveraging R, researchers can ensure robust, reliable, and nuanced analyses.

Imputation of Missing Data

Handling missing data is a common challenge in research. Imputation, the practice of replacing missing data with substituted values, is a robust approach to maintain data integrity and enhance the validity of statistical analysis.

Rationale for Imputation

- **Preserve Data:** Imputation helps in retaining valuable data that could be lost due to missing values.
- **Bias Reduction:** Proper imputation can reduce bias introduced by the absence of data.
- **Improved Precision:** Imputation increases the sample size available for analysis, leading to more precise estimates.

Guidelines for Imputation

- **Missing Data Mechanism:** Consideration must be given to the mechanism causing the data to be missing:
  - *Missing Completely at Random (MCAR):* Missing values are unrelated to any variable.
  - *Missing at Random (MAR):* Missing values are related to observed data but not the missing data itself.
  - *Missing Not at Random (MNAR):* Missing values are related to the missing data itself.
- **Amount of Missing Data:** The proportion of missing data should be examined. Small amounts might not necessitate imputation, while larger amounts may.
- **Sensitivity Analysis:** Before deciding to impute, a sensitivity analysis should be conducted to understand the impact of missing data.

Single vs Multiple Imputation

- **Single Imputation:** Involves replacing each missing value with a single estimate.
  - *Pros:* Simplicity and ease of use.
  - *Cons:* Can underestimate the variance and give overly precise estimates.
- **Multiple Imputation:** Involves creating multiple datasets with different imputed values, analyzing them separately, and then pooling the results.
  - *Pros:* Accounts for the uncertainty of imputed values, providing more realistic variance estimates.
  - *Cons:* Computationally more intensive.
- **Preferred Approach:** Multiple imputation is generally preferred for its ability to provide more unbiased and accurate estimates.

Variables for Imputation

- Both predictors and dependent variables can be imputed, depending on the research question and the missing data mechanism.

How Imputation Works

- **Single Imputation:** Missing values are replaced with plausible values based on other observed data. Methods include mean imputation, regression imputation, etc.
- **Multiple Imputation:** Multiple sets of plausible values are imputed to create multiple complete datasets. These datasets are analyzed separately and the results are then pooled.

Conclusion

Imputation is an essential tool for handling missing data. By understanding the guidelines for imputation and choosing appropriate methods, researchers can ensure the validity and reliability of their analyses.

What is Power Analysis

Power analysis is an important statistical tool used to determine the minimum sample size required to detect an effect of a given size with a given degree of confidence [1]. Conducting power analysis is recommended to ensure adequate statistical power when designing studies. This chapter provides an overview of power analysis and examples for common analyses in early learning research.

[1] Jacob Cohen. *Statistical power analysis for the behavioral sciences*. Academic press, 2013

What is Power Analysis?

Statistical power refers to the probability that a statistical test will correctly reject the null hypothesis when the alternative hypothesis is true. It is dependent on four factors:

- Sample size
- Significance level (usually $\alpha = 0.05$)
- Effect size
- Statistical test being used

Power analysis uses these factors to determine the minimum sample size required to achieve a target statistical power. Typical targets are 80% or 90% power. Higher power gives more confidence in results but requires a larger sample.

Why Use Power Analysis?

There are several benefits to conducting power analysis when designing a study:

- Ensures there is adequate power to detect effects.
- Avoids wasting resources on an underpowered study.
- Provides justification for proposed sample size.
- Often required for grant applications.

In early learning research, small sample sizes are common but make it difficult to find statistically significant results. Using power analysis helps prevent this issue.

Power Analysis for Common Tests

Power analysis calculations depend on the statistical test being used. Here are examples for some common early learning analyses:

Multiple Regression

For multiple regression, power depends on the anticipated effect size f^2, the number of predictors, desired power, and alpha level. f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects respectively.

HLM

For hierarchical linear modeling, power depends on the number of groups, group size, ICC, effect size, power, and alpha [2]. ICC is the intraclass correlation describing clustering within groups.

[2] Linda K Muthén and Bengt O Muthén. How to use a monte carlo study to decide on sample size and determine power. *Structural equation modeling*, 9(4): 599–620, 2002

Power Analysis in R

The R statistical programming language provides several packages for conducting power analysis. Some popular options include:

pwr Package

The pwr package allows power analysis for t-tests, F-tests, chi-square, and multiple regression. Key functions include:

- `pwr.t.test()` - Power for one or two sample t-tests
- `pwr.f2.test()` - Power for ANOVA F-test
- `pwr.r.test()` - Power for multiple regression

SIMR Package

The SIMR package can estimate power and sample size for mixed effects models, including hierarchical linear models, using simulation. The main function is `simr()`.

Monte Carlo Simulation

For some complex power analysis scenarios, Monte Carlo simulation methods can be used when closed-form power analysis formulas are not available. This involves using simulated data to estimate power. For example, for hierarchical linear models (HLM):

1. Simulate data under the alternative hypothesis with a specified effect size, intraclass correlation, etc.
2. Fit the HLM model to the simulated data.
3. Test the treatment effect using the model results.
4. Repeat many times and calculate power as the proportion of p-values below the significance level.

The simr package provides functionality to automate this process for HLM power analysis via the `simr()` function. The main steps are:

- Specify the data structure and model.
- Set the true parameter values under the alternative hypothesis.
- Run simulations and model fitting.
- Estimate power from the p-values.

This approach is flexible for situations where analytical power analysis is challenging. The downside is high computational burden requiring many simulations to get stable estimates.

Conclusion

Power analysis should be used to justify sample size and ensure adequate statistical power when designing early learning studies. It is important for detecting true effects and producing replicable research.

Understanding and Interpreting Effect Sizes

The Importance of Effect Sizes

Effect sizes are a critical part of research reporting as they provide a standardized measure of the magnitude of observed effects, independent of sample size. This allows for a clearer interpretation of the practical significance of study results, making it easier to compare findings across studies.

Types of Effect Sizes

Different statistical measures are used as effect sizes depending on the nature of the variables involved and the design of the study.

Cohen's d and Variants

Cohen's d is a widely used effect size for continuous variables. It represents the difference between two means expressed in standard deviation units. Variants of Cohen's d, such as Hedges' g, correct for biases in small sample sizes.

Correlation Coefficients

For assessing the relationship between two continuous variables, the correlation coefficient (Pearson's r) is commonly used. It measures the strength and direction of a linear relationship.

Odds Ratios and Risk Ratios

In studies involving categorical outcomes, odds ratios and risk ratios are often reported. These measure the strength of the association between exposure and outcome in case-control studies and cohort studies, respectively.

Interpreting Effect Sizes

Benchmarking Effect Sizes

Cohen provided a rough guide to interpreting effect sizes as small, medium, or large. For Cohen's d, 0.2 might be considered small, 0.5 medium, and 0.8 large. However, these benchmarks are context-dependent and should be used with caution.

Standardization of Variables

Standardizing variables to have a mean of zero and a standard deviation of one can make results more interpretable, especially when variables are measured on different scales. Results can then be communicated in terms of standard deviation units, providing a universal metric.

Reporting Effect Sizes in Early Care and Education Research

In the field of early care and education, it is common to report effect sizes to gauge the impact of educational interventions or policy changes. This practice facilitates a better understanding of the implications for practice and policy.

Effect Size Versus Statistical Significance

While statistical significance tests whether an effect exists, effect sizes measure the size of an effect. It is possible to have a statistically significant result with a small effect size, which may not be practically meaningful.

Conclusion

Effect sizes provide a valuable means of conveying the practical significance of research findings. In early care and education research, understanding the magnitude of effects is essential for informing policy and practice.

Analyzing Complex Survey Data in R with the `survey` Package

Introduction

Survey data often comes from complex sampling designs that deviate from simple random sampling (SRS). These designs are used to reduce cost, improve coverage of key subpopulations, and allow for more efficient data collection. However, failure to account for these designs in analysis can lead to biased estimates and incorrect inferences. In this chapter, we demonstrate how to use the `survey` package in R (developed by Thomas Lumley) to appropriately analyze complex survey data, using examples based on the National Survey of Early Care and Education (NSECE) and U.S. Census Public Use Microdata Sample (PUMS).

Key Concepts

Simple Random Sampling (SRS)

In SRS, every unit in the population has an equal probability of selection. This allows analysts to use standard statistical techniques that assume independent and identically distributed (i.i.d.) observations. However, real-world surveys often use stratification, clustering, and weighting to meet design and logistical constraints.

Stratification and Oversampling

Stratification divides the population into distinct subgroups (strata) based on characteristics like geography or income level. Sampling is then conducted independently within each stratum. Oversampling marginalized or hard-to-reach groups improves the precision of subgroup estimates and ensures adequate representation.

Clustered Sampling

In clustered sampling, the population is divided into clusters—often naturally occurring units such as schools, child care centers, or geographic blocks. A sample of clusters is selected, and all or a subsample of units within selected clusters are surveyed. This approach is cost-effective when listing all units in the population is expensive or infeasible. However, clustering tends to increase standard errors due to intra-cluster correlation, and this must be accounted for in the analysis by specifying the cluster variable (PSU) in the survey design.

Multistage Sampling

Multistage sampling extends clustered sampling by applying multiple levels of sampling. For example, a survey may sample counties in the first stage, then child care centers within counties, and finally teachers within centers. This approach mirrors real-world administrative structures and reduces logistical burden. Like clustered sampling, multistage designs increase the complexity of variance estimation, which must be handled using appropriate design specifications.

Design Weights

Design weights account for unequal probabilities of selection. For example, if a low-income household had a higher chance of being sampled, a weight less than 1 would downweight its contribution to population estimates. Design weights are crucial for unbiased population-level inference.

The `survey` Package in R

Installing and Loading the Package

```
install.packages("survey")
library(survey)
```

Defining a Survey Design Object

Assuming you have a data frame `nsece` with weights `weight`, strata `stratum`, and primary sampling units `psu`:

```
design <- svydesign(id = ~psu, strata = ~stratum, weights = ~weight, data = nsece, nest = TRUE)
```

Descriptive Statistics

```
svymean(~child_care_cost, design)
```

```
svytotal(~num_children, design)
svytable(~provider_type + state, design)
```

Regression Analysis

To run a linear regression adjusting for survey design:

```
model <- svyglm(wage ~ education + experience, design = design)
summary(model)
```

This approach adjusts standard errors and estimates to reflect stratification, clustering, and weighting.

Example: Using Census PUMS Data

Suppose we are interested in estimating median income across racial groups, using PUMS data:

```
pums_design <- svydesign(id = ~SERIALNO, strata = ~ST, weights = ~PWGTP, data = pums, nest = TRUE)
svyby(~PINCP, ~RAC1P, pums_design, svyquantile, quantiles = 0.5)
```

Survey Question Design: Avoiding Bias and Improving Reliability

Effective survey design requires not only thoughtful sampling, but also well-constructed questions. Drawing from psychology, behavioral economics, and the heuristics and biases literature, survey questions should be:

- **Clear and specific**: Avoid vague terms or abstract concepts (e.g., "Do you regularly participate in community events?" should specify time frame and types of events).
- **Neutral and non-leading**: Refrain from wording that implies a preferred response. Leading: "Don't you agree that the program was helpful?" Neutral: "How helpful was the program, if at all?"
- **Cognitively accessible**: Minimize memory burden by using bounded recall periods (e.g., "In the past 7 days...").
- **Minimizing acquiescence bias**: Include reverse-worded items when measuring attitudes or satisfaction.
- **Pre-tested for interpretation**: Cognitive testing and piloting can reveal misunderstandings or ambiguous phrasing.

  In addition, consider behavioral economics insights:

- **Framing effects**: The same information framed differently can yield different responses (e.g., "90% survive" vs. "10% die"). Use neutral frames.
- **Anchoring**: Avoid numerical anchors unless justified (e.g., avoid suggesting values that may bias numeric responses).
- **Social desirability bias**: Use indirect or self-administered formats for sensitive questions.

Careful question design reduces measurement error and improves the reliability and validity of the resulting data.

Conclusion

Accounting for survey design in your analysis is essential for producing valid estimates. The `survey` package in R provides a powerful and flexible set of tools for analyzing stratified, clustered, and weighted data from surveys such as the NSECE and Census PUMS. Whether estimating means or fitting regression models, proper use of these tools ensures your inferences reflect the real-world complexity of the data you work with.

Requesting Data from Cultivate Learning

This chapter provides a comprehensive guide on the procedure for submitting research proposals at Cultivate Learning, ensuring that researchers are well-informed and equipped to navigate the process effectively. Early learning research is a scientific discipline, and at Cultivate Learning, we honor this pedigree and affiliation by adhering to stringent scientific procedures in our work.

There have been various issues in education science and social science that have threatened the trust the public places in scientific work, primarily concerning the replicability of scientific findings. Statistical science elucidates two types of errors a researcher can make while analyzing data – finding a result when it doesn't exist, or failing to find a result when it does. The replicability crisis in social sciences largely revolves around the first type of error.

Researchers have proposed various procedures to ensure replicability within the field of social sciences. One such procedure emphasized in this document is the adherence to proper scientific procedures and the avoidance of data-mining. Data-mining, colloquially referred to as "torturing the data until they confess," involves conducting an unlimited number of hypothesis tests until a result worth reporting is found. This approach, spurred by the increasing availability of data and relaxed restraint on the part of researchers, has inverted the traditional process of scientific research.

In devising this document, two primary considerations have been at the forefront. Firstly, we aim to foster an environment that encourages and rewards creativity and initiative. We envision a system where any researcher coming forward with a credible, feasible, and innovative research project has the opportunity to take a lead and contribute to the knowledge base.

Simultaneously, we strive to ensure that the research proposals submitted have undergone due diligence and are specific, original, and well-researched. The objective is to prevent instances where broad or vague proposals may inadvertently hinder the progress of other researchers who might come forward later with more refined proposals on similar topics.

To strike a balance between encouraging innovation, ensuring consistent progress, and upholding scientific integrity, this chapter outlines the necessary steps for researchers (or groups of researchers) at Cultivate Learning to register an idea, obtain exclusive rights to work on and lead the project, and subsequently be evaluated at regular intervals. This approach aims to ensure that consistent progress is made on each project, thereby maximizing the research output of Cultivate Learning and preserving the trust in our scientific endeavors.

Conducting research with data from Cultivate Learning requires a thoughtful and systematic approach. This chapter outlines the steps researchers should take to formulate a research question, conduct a literature review, assess ethical considerations including IRB approval, and request access to data.

To align with best principles of scientific research [3], the scientific endeavor should follow these steps:

1. construct a theory describing a phenomenon we are interested in
2. determine a test that would invalidate such theory
3. attempt to invalidate such a theory
4. share your results with the scientific community

[3] Larry V Hedges. Challenges in building usable knowledge in education. *Journal of Research on Educational Effectiveness*, 11(1):1–21, 2018; Thomas Kuhn. *The structure of scientific revolutions*. Princeton University Press, 2021; Karl Popper. *The logic of scientific discovery*. Routledge, 2005; and Martin EP Seligman. Positive social science. *Journal of Positive Behavior Interventions*, 1(3):181, 1999

The importance of the above procedure is that construction of a hypothesis based on a thorough knowledge of the literature precedes data analysis rather than being done ex post to explain relationships found in the data. This guide will elaborate on these steps and describe a procedure for submission research proposals. A committee composed of members of the Community-Engaged Research and Evaluation Group will evaluate such research proposals and promising and well-researched proposals will be given the green light, while other proposals lacking in some aspects outlined in this document will be returned for further elaboration and invited to re-submit at a later date (with a minimum of three months between consecutive submissions to ensure that CERE's time is being used efficiently).

Research proposals will be required to follow rigorous quantitative or qualitative methods in order to advance knowledge and build research capacity at Cultivate Learning. The thrust of the analysis needs to be generalizable to a national, state, or population or a subgroup within the sample that the dataset represents. The research may focus on a wide range of topics within early childhood education and development.

Applicant Eligibility

Applicants from staff at Cultivate Learning are encouraged, especially staff who consider a career in research. It is strongly recommended that applying staff have training in research methodology, qualitative analysis, or statistical science. Applicants may be submit at most 3 proposals within any given 3-month period (in order to not overwhelm CERE staff who has to evaluate such proposals).

Dataset Eligibility

The research project should include an analysis of a Cultivate Learning dataset. An applicant will not obtain an access to such data until such time that the research proposal is approved by CERE, however, an access to a codebook or data manual that describes the nature of the dataset will be allowed so that a proposal may be crafted around such information.

Timeline

Upon approval of the project, an applicant will be given 9 months to put the proposal into action and publish the relevant research in a peer-reviewed early education journal. Once this 9-month time limit expires, CERE will entertain proposals from other applicants that may overlap with the original unfinished proposal/project. If an applicant wants to extend the initial 9-month period, they need to resubmit their proposal to CERE and provide sufficient explanation for the apparent lack of progress and make a convincing argument for why the applicant should continue to be given preferential rights to a given research question. Once an application is submitted, CERE will take 3 months to review the proposal. Three rejected proposals in a row from a single applicant will result in a 6 month period during which an applicant will not be allowed to submit proposals so that the applicant may conduct an in-depth reflection as to what a proper research proposal should look like or to devote themselves to learn the skills necessary to submit a successful proposal.

Evaluation Criteria

Evaluation criteria include the significance of the research question, the conceptual clarity and potential contribution of the proposal, the relevance to an important policy issue, the strength of the methodological model and proposed statistical analysis, and the applicant's relevant research and academic experience. Additionally, the review

criteria include the following: What is already known on the issue? How does the methodology relate specifically to the research question? Does the applicant know the data set? Does the analytic plan fit the question and the data? Is the applicant qualified to carry out the proposed study? Reviewers will be members CERE. Applicants will be given individual feedback on rejected proposals in order to build expertise and research capacity within Cultivate Learning.

Applicants should choose research topics that can be supported by the samples and variables contained in the proposed data set(s). Applicants should also be familiar with the User Guides and/or Manuals (e.g., use of design weights and design effects) of the specific data sets. Applicants should be familiar with statistical methods and available computer programs that allow for sophisticated analyses of the selected data. The proposed topic must have ECE policy relevance, and the models to be tested must include predictor variables that are manipulable (e.g., instructional practices used by teachers, parental involvement). Studies using psychometric tools such as CLASS/ECERS data should clearly define the construct and identify the kinds of items to be used to operationalize the topic of interest. Also, when planning to use existing sub-scales, the applicant should describe why these sub-scales are appropriate and how they will be applied.

The procedure outlined here is similar to the procedures required to gain access to confidential dataset for research purposes by such organizations as National Opinion Research Center (NORC) at the University of Chicago, or the US Bureau of Census and to gain research funding from the American Educational Research Association (AERA). A person that submits a valid reseach proposal complying with the guidelines in this document as evidenced by the CERE committee's approval will then be allowed to assemble a team (see authorship guidelines at Cultivate Learning for guidance as to organize authorship for a research project) and will be a first author in public dissemination of the research project.

Submission information

The submission should be a single file either in PDF or MS Word format and shall include all the information outlined in this section along with proposal title and the start and end dates of the project.

Dataset(s) used

Name data set(s) used. Applicants are encouraged to reach out to CERE regarding available datasets within the organization and meta-

information on such datasets (codebooks, manuals, etc).

Project abstract

Enter the abstract of your proposed research project (250 words maximum).

Contribution to the field

Briefly describe the potential contributions this research will make to the field of education (250 words maximum).

Previous work

Discuss how this project relates to your previous work, including your dissertation work. List any previous publications (200 word maximum).

Proposal

Narrative Prepare a narrative (limited to 7 single-spaced pages) to include the following:

1. Statement of how this research advances the current state of knowledge in the field, substantively and/or methodologically
2. Theoretical or conceptual framework for the research
3. Brief review of relevant research/policy literature
4. Research questions, hypotheses to be tested
5. Description of methodology including the data set(s) and justification for selecting data file to address research question; any additional or supplemental data sample (e.g., groups used, exclusions to sample, and estimated sample sizes); rationale for variables used; and specification and clarification of variables and analytic techniques
6. Data analysis plan and/or statistical model or formulas, appropriately defined
7. Brief dissemination plan for this research including proposed conferences to present the findings and potential scholarly journals to publish the research

Variables list Provide a categorized list of the variables from the Cultivate Learning data set(s) that will be used in this research project. (2 single-spaced pages maximum)

References cited This list will not be part of the page limit.

Timeline and authorship Provide a timeline for research indicating the steps taken from the beginning of the project all the way to a successful submission. Indicate authorship – who will do what and in which order authors will feature on the publication of the proposed research.

Principal and Co-Principal Investigator curriculum vitae (limited to 2 pages each) The CV shall include:

1. Research and academic employment history
2. Relevant graduate courses in statistics and methodology
3. Relevant publications and presentations
4. Relevant professional affiliations and/or memberships

This requirement will be waived for projects led by College of Education faculty.

Tips for Applicants

Conducting Literature Review to Ascertain Originality of the Proposal

A hypothesis cannot be constructed in a vacuum, one needs to know the present state of scientific endeavor within the narrow field they are interested in before they can articulate a sound scientific hypothesis that pushes the field forward in a specific direction. To demonstrate that such due diligence has been done prior to articulating the research question, the research proposals will be required to summarize the extant literature on a given topic and indicate the hole in present knowledge that the research project is attempting to fill.

Conducting Review of the Policy Landscape to Ascertain Policy-Relevance of the Proposal

ECE and education generally is a field of applied research, very often applied psychology. In applied research, there is a strong focus on policy implications. Researchers help provide insights that policymakers need as they craft and implement policy. Even if a research proposal is original as required by the previous step above, it still needs to demonstrate that it responds to an urgent social need or provides a solution to an existing problem of broad relevance.

Conducting a Review of the Methodology to Ascertain the Feasibility of the Analysis

Even as a research project demonstrates its originality and policy-relevance, it is still important to understand how exactly data will be used to answer the research questions, what are the limitations of the proposed analysis, what are the advantages, how does the proposed methodology differ from existing research on the topic. Above all, it is important to convince the committee that the proposed method actually is a sound way to test the hypothesis stated in the proposal.

Further Questions

Contact Director of Community-Engaged Research and Evalution Janet Soderberg for further questions.

Step 1: Formulate a Research Question

Before delving into data requests, it is crucial to formulate a clear and specific research question. A well-crafted research question should be:

- **Specific**: It should target a particular aspect or phenomenon to explore in-depth.
- **Measurable**: It should be possible to answer the question using empirical evidence.
- **Achievable**: Ensure the research can be conducted with available resources.
- **Relevant**: The question should have significance in the field.
- **Time-bound**: The research should be feasible within a given time-frame.

Example of a Broad Question: "I want to know the differences in well-being between rural and urban ECE providers."
Refined Research Question: "Are rural ECE providers more susceptible to burnout than their urban counterparts?"

Step 2: Conduct a Literature Review

Once your research question is formulated, conduct a comprehensive literature review. This review should not only focus on the main question but also on its individual components. For instance, in the context of the question on rural ECE providers and burnout:

- Explore how burnout is defined and measured.
- Understand the distinctions between burnout and depression.
- Analyze the definition and characteristics of rural areas.
- Investigate if rural populations, not just ECE providers, face higher rates of depression or burnout.
- If focusing on a specific state (e.g., Washington), justify why findings in this context may be relevant to the broader national debate.

Step 3: Ethical Considerations and Institutional Review Board (IRB) Approval

Before proceeding with the data request, researchers must evaluate whether their study requires approval from an Institutional Review Board (IRB). This step ensures that the research adheres to ethical guidelines and safeguards the rights and well-being of any individuals involved.

Researchers should critically assess the following:

- **Nature of the Data**: Determine whether the data is public or involves personal identifiers. Research involving human subjects or sensitive data typically requires IRB approval.
- **Risk to Participants**: Evaluate if the study poses any risk to the participants, even if the data is anonymized.
- **Compliance with Institutional Guidelines**: Ensure the research complies with the policies and guidelines set by your institution or any collaborating institutions.

Based on this assessment, researchers should:

- **Argue for IRB Exemption**: If researchers believe that the study does not require IRB approval, they should clearly articulate the reasons, aligning with ethical guidelines and institutional policies.
- **Provide IRB Approval Evidence**: If the study requires IRB approval, researchers should submit documentation demonstrating that they have sought and obtained the necessary permissions before accessing the data.

Ensuring ethical considerations are met and IRB approval (if necessary) is obtained is a crucial step in the research process and must be considered before data can be requested from Cultivate Learning.

Step 4: Setting Up a SharePoint Site for Project Documentation

Once you have formulated your research question and conducted a preliminary literature review, the next step is to establish a SharePoint site dedicated to your research project. This site will serve as a central repository for all documents and materials related to your research and the data access request.

Purpose of the SharePoint Site

The SharePoint site will be used for storing and organizing various documents, including:

- IRB documentation for the project.
- The literature review, along with PDFs of all referenced materials.
- A detailed description of the data analysis plan.
- Other relevant materials that support the request for data access.

Maintaining an organized SharePoint site allows Cultivate Learning staff to easily review and track materials related to the project throughout the data request and research process. Key documents like IRB records and the data analysis plan should be uploaded to the SharePoint site soon after it is created. The SharePoint helps facilitate communication and collaboration with the Cultivate Learning research committee.

Step 5: Request Access to Data

After completing the literature review, researchers can proceed to request data from Cultivate Learning. The request should include:

- **Research Question**: Clearly state the research question.
- **Literature Review Summary**: Include a concise summary of the literature review, highlighting gaps your research aims to fill.
- **Data Requirements**: Specify the dataset, variables (columns), and samples (rows) you wish to access. For instance, you may want data on family child care providers or center-based care providers.
- **Data Analysis Plan**: Outline how you plan to analyze the data and ensure that the plan aligns with the research question and the literature review.
- **Value Addition**: Articulate how your research will contribute to the existing body of knowledge.

Please, use the CERE Request form to communicate your data request to the CERE team: https://form.asana.com/?k=c4Uht2VzMc629ZCnDoxXsQ&d=941506444463212

Conclusion

Adhering to this systematic approach ensures that your data request aligns with your research goals and can significantly contribute to the field. By articulating a clear research question, substantiating it with a comprehensive literature review, and outlining a consistent data analysis plan, researchers at Cultivate Learning can effectively utilize available data to advance our understanding of early childhood education practices.

Cultivate Learning Authorship Policy

At Cultivate Learning we advance the fields of early childhood education and expanded learning opportunities through expert content knowledge and development of resources that bridge theory to practice. A hallmark of this work is the dissemination of research findings as contributions to the larger research community. Thus, Cultivate Learning has developed data use agreements and authorship policies for internal staff, university students, University of Washington personnel, external partners, consultants, and other entities that utilize data, materials and resources produced by Cultivate Learning. This policy shall be used for all Cultivate Learning developed manuscripts and presentations.

Determining Authorship

In all cases, Gail Joseph, Director of Cultivate Learning, as well as the Principal Investigator (PI) shall be listed as authors. Order of authorship will be determined using the *Authorship Determination Scorecard* (ADS; endorsed by the American Psychological Association and constructed by Winston, 1985 in the process of researching authorship and the attitudes of the research community with respect to relative contributions to research endeavor). Winston (1985) identified considerations to ensure that decisions are fair and represent individual contributions in conceptualization, design, data processing, statistical analyses, and drafting of materials. The following will be taken into consideration:

- Quantity and significance of contribution
- Principal Investigator reserves right to be included as co-author
- Professional advancement needs (first time, lead authorship, etc.). Cultivate Learning will develop professional development policies for research staff concurrently with this effort to ensure staff can take advantage of these policies and produce quality work.

The following should be determined utilizing the Authorship Determination Scorecard *prior* to writing the proposal (if required) or the full manuscript:

- First and second authorship
- Tentative list of additional authors
- Timeline for draft reviews and completion of manuscript

The following should be revisited utilizing the Authorship Determination Scorecard 1) upon review of accepted proposal of the first draft and 2) just before final submission:

- List of additional authors
- Order of authors
- Timeline for completion

Recommended procedure for assigning contribution scores into the ADS

Persons involved in the research should, as a group and through consensus seeking processes, assign points to each person. The challenge in this effort may be that in a complex project not everyone is aware of others' contributions to various aspects of the project. In this context, the following iterative procedure is suggested (a group may use any procedure that is agreed upon by the whole membership [the procedure should be agreed upon in the initial stages of the process of developing a research project]):

1. In the first round, everyone will enter scores for their own contribution for the activities (line items) they participated in (this means they have some awareness of that activity). These scores will then be added together to see whether they add up to the total for a given line item/research activity. If the scores do not add up, proceed to step 2 below.
2. For a given line item/activity, the team would solicit opinions/scores from all participating members as to the contributions of all participating members (including themselves). Every score will be accompanied by a short text (justification) explaining the score. If the scores differ, proceed to step 3.
3. For the line items where scores differ, all members will review scores and justifications for all other members. All members will be asked to review their scores/justifications based on seeing what others proposed and wrote down. If then scores still differ, step 3 will be repeated until convergence.

4. If the procedure fails to converge (gets 'stuck') in a sense that scores do not change any more and still are not adding up Cultivate Learning Director, Deputy Director, and the Director of Research will arbitrate and enter scores for others, even in line items they did not directly contribute to.

Anyone whose contribution does not reach the *threshold* of authorship (is not an author) but who significantly assists in developing the materials (e.g., in data collection, management, or analysis; literature review; editing; typing or graphics preparation; previous material development) should be recognized in the acknowledgments.

Handling of Tiebreakers and Disagreements of Authorship Order

If there are ties in the scorecard or disagreements about authors or order of authorship, they will be resolved by the investigator team in a manner consistent with APA/ASA standards (https://www.apa.org/science/leadership/students/authorship-paper; Helpful Tools tab). If they cannot be resolved in this manner, mediation by independent investigators will be sought.

Manuscript Review Process

Timely reviews are critical for productivity. Review timelines are to be negotiated between authors. Ideally, co-authors should review a manuscript that is circulated to them within two weeks.

Authorship responsibilities

Drafting and editing of sections will be negotiated among the authors. If work is stalled or production slows, authors will meet to renegotiate authorship to expedite completion. All authors must provide a scholarly review of the manuscript before submission, per APA guidelines. All co-authors have the privilege and responsibility of responding to revisions in a timely manner.

Presentations

Any individual using Cultivate Learning data, materials, or resources must acknowledge the following both verbally and visually during their presentations:

- The specific Cultivate Learning project from which the data were obtained
- Gail Joseph, Director of Cultivate Learning

- The funding agency

Outside requests

Gail Joseph, Director of Cultivate Learning, will consider outside requests to use Cultivate Learning data, instruments, and other products. Use of Cultivate Learning data, instruments or other products requires the completion of Cultivate Learning Use Agreements.

- *Data*: If Cultivate Learning data are requested for use in a non-Cultivate Learning published work, Gail Joseph and when applicable, the PI of the relevant project will consider whether the use overlaps with or enhances Cultivate Learning efforts. If permission is granted, authorship will be negotiated with the requestor, based upon Cultivate Learning Authorship Policy.
- *Instruments, measures, and other products*: Gail Joseph and when applicable, the PI of the relevant project will generally grant requests to use Cultivate Learning instruments and measures, with the stipulation that a complete citation will accompany their use.

General Principles for Determining the Need for IRB in Early Learning Interventions

Understanding the Context

In the dynamic field of early learning, it is crucial to discern when an Institutional Review Board (IRB) review is necessary. The line between research and programmatic intervention can sometimes blur, and understanding the nuances is vital to ensure ethical conduct and compliance.

Defining Research

According to federal guidelines, research is defined as a systematic investigation designed to develop or contribute to generalizable knowledge. If an intervention in early learning seeks to derive conclusions that can be applied beyond the immediate context and intends to contribute to the broader academic discourse, it is typically categorized as research.

Programmatic Interventions

Conversely, programmatic interventions are activities or strategies implemented to enhance the learning experience or address specific needs within a given context. These may involve assessing the efficacy of teaching methods or tools but are designed for internal improvement rather than generating generalizable knowledge.

When is IRB Necessary?

1. **Experimental Learning Tools**: If a new learning tool is being tested with the intent to publish the findings or apply the results beyond the immediate setting, an IRB review may be necessary.

2. **Data Collection**: Interventions involving systematic data collection from children or educators for research purposes, particularly when identifying information is involved, typically necessitate an IRB review.
3. **Vulnerable Populations**: Early learning often involves working with vulnerable populations. Any research involving minors necessitates careful ethical scrutiny and potentially an IRB review.
4. **Exemptions**: Some research activities might be eligible for exemptions from a full IRB review, such as studies conducted in established or commonly accepted educational settings that involve normal educational practices.

IRB Considerations for Secondary Data Analysis

Research involving human subjects typically requires review by an Institutional Review Board (IRB) to ensure ethical standards are met. However, when researchers are not collecting new data but are instead using previously collected data, the need for an IRB review may differ.

Determining the Need for an IRB in Secondary Data Analysis

When considering whether an IRB review is necessary for secondary data analysis, the following factors should be evaluated:

- Whether the data are publicly available or restricted
- The level of identifiable information contained within the dataset
- The consent provided by participants regarding the future use of their data

In cases where data are de-identified and publicly available, and participants have consented to the use of their data for future research, an IRB may determine that the research is exempt from review. However, this exemption should not be assumed by the researcher; it must be formally determined by an IRB.

Case Example: Washington State's Early Care and Education Providers Survey

Consider the case where Cultivate Learning conducted a survey of Washington State's early care and education providers, focusing on their mental well-being, and the data were intended for a report to the Department of Children, Youth, and Families. If someone later

wishes to use this dataset for new research questions, they would need to determine if an IRB review is required. Factors to consider include:

- Are the survey data publicly available or restricted? If restricted, permission may be needed.
- Do the data contain identifiable information about providers? If so, consent for future use may be needed.
- Did participants consent to future research uses of their data at the time of the original survey?

By evaluating these factors, the researcher can determine if IRB review is needed before conducting secondary analysis on this dataset.

Conclusion

For Cultivate Learning, where the emphasis is often on service, it is important to ask: Is the primary intent of this intervention to contribute to generalizable knowledge, or is it aimed at immediate program improvement? By answering this question and understanding the nuances discussed, one can better navigate the often intricate path to determining the need for an IRB review in early learning interventions.

University of Washington Guidance for Determining the Need for IRB Review in Early Childhood Education Research

The University of Washington Human Subjects Division provides a self-determination checklist so researchers can decide whether they need an IRB Review. The specific are described in this chapter. This link – https://www.washington.edu/research/hsd/do-i-need-irb-review/ – is a first-hand resource for determining whether one needs an IRB at the UW. This chapter serves as a re-phrasing of that content.

Purpose and Applicability

This chapter is designed to assist educators and researchers at Cultivate Learning in determining whether a particular activity qualifies as human subjects research under the Common Rule definitions, and thus, if it necessitates an Institutional Review Board (IRB) review. Cultivate Learning encourages researchers to use this chapter as a guide for self-determination, thereby ensuring ethical conduct in their interventions and studies.

Instructions

To ascertain whether an activity is human subjects research, one must assess it against the definitions outlined below. Consider each item sequentially to reach the correct conclusion. We recommend that researchers document their determinations and retain these records for future reference and communication with relevant stakeholders.

The Common Rule (45 CFR 46 Subpart A)

Definition of Research Research is defined as a systematic investigation aimed at contributing to generalizable knowledge. This includes

development, testing, and evaluation processes designed to broaden the knowledge base of a field.

Criteria to Determine if an Activity is Research:

- **2.1 Systematic Investigation:** The activity involves a prospectively identified approach, system, method, or plan.
- **2.2 Generalizable Knowledge:** The activity aims to produce information that extends beyond the immediate context or specific subjects studied.

If both criteria are met, the activity is considered research according to the Common Rule and you should proceed to the next section. Otherwise, the activity does not require IRB review.

Definition of Human Subject A human subject is a living individual from whom a researcher obtains information through intervention or interaction, and uses this information for research purposes.

Criteria to Determine if Research Involves Human Subjects:

- **3.1 Living Individuals:** The project includes living individuals.
- **3.2 Data Pertaining to the Person:** The project seeks to understand aspects related to the individual, such as their opinions, behaviors, or experiences.
- **3.3 Interaction or Identifiable Information:** The researcher will obtain information through interaction with the individual, or the researcher will obtain and use identifiable private information.

If all three criteria are met, the research involves human subjects according to the Common Rule, and further assessment is required to determine if it is exempt or requires IRB review. If not, no IRB review is necessary.

Conclusion

For those engaged in early childhood education at Cultivate Learning, it is vital to discern whether the activities undertaken are research involving human subjects, as this dictates the need for IRB review. By carefully assessing activities against the criteria outlined above, researchers can ensure ethical compliance and adherence to required protocols.

Understanding Exempt Determinations

The Institutional Review Board (IRB) reviews research proposals to ensure ethical standards are met. In some cases, a study may qualify for an "exempt determination," which means it is exempt from some or all of the requirements usually applied to human subject research. This chapter aims to provide guidance on when one might expect to receive an exempt determination and when one might not.

Criteria for Exempt Determination

Research studies may be deemed exempt from IRB review when they pose minimal risk to participants and fall into specific categories as defined by federal regulations. Common criteria include:

- **Educational Practices:** Research conducted in established or commonly accepted educational settings, involving normal educational practices.
- **Surveys and Observations:** Research involving the use of surveys, interviews, educational tests, or observation of public behavior, provided that the information is recorded in such a way that subjects cannot be identified.
- **Existing Data:** Research involving the collection or study of existing data, documents, or records, if these sources are publicly available or if the information is recorded in a way that subjects cannot be identified.
- **Low Risk to Privacy:** Research that does not risk breaching the privacy or confidentiality of participants.

When Exempt Determination is Unlikely

Research studies might not qualify for an exempt determination in the following cases:

- **Vulnerable Populations:** Studies involving vulnerable populations such as children, prisoners, or individuals with cognitive impairments may require additional protections and hence may not be eligible for exemption.
- **Sensitive Information:** Research that involves collecting sensitive information, where disclosure could have adverse consequences for participants, is less likely to be exempt.
- **Invasive Procedures:** Studies involving invasive procedures, potential harm, or significant levels of stress or discomfort to participants typically require full IRB review.
- **Deception:** Research involving deception or withholding of information from participants often requires a more thorough review.

Conclusion

While exempt determination can streamline the research approval process, it is essential to thoroughly understand the criteria and consult with the IRB or a knowledgeable advisor to ensure that the research plan aligns with ethical guidelines and regulatory requirements. Remember, even if a study qualifies for an exempt determination, researchers must still adhere to ethical principles and respect the rights and welfare of participants.

Weighing the Options: Opt-in vs. Opt-out Consent in Research

Introduction

In the realm of research ethics, the manner in which consent is sought from participants is a topic of pivotal importance. Two commonly contrasted approaches are the opt-in and opt-out consent models. Both have their own sets of advantages and challenges, especially when considered in the context of educational research and interventions. This chapter aims to present a balanced discussion on the pros and cons of opt-in versus opt-out consent models.

Opt-In Consent

Pros:

1. **Explicit Permission:** Opt-in consent requires participants to actively express their willingness to partake in the study, ensuring that their participation is voluntary and deliberate.
2. **Ethical Assurance:** This approach is often perceived as more ethically sound because it respects the autonomy of the participants and adheres to the principle of informed consent.
3. **Engaged Participants:** Researchers may find that participants who actively opt in are more engaged and invested in the research process.

Cons:

1. **Limited Sample Size:** Since participants have to take an explicit action to be part of the study, this may lead to smaller sample sizes.
2. **Selection Bias:** The need for active consent might mean that only

certain types of individuals (e.g., those more interested or motivated) participate, potentially skewing the results.

3. **Resource Intensive:** The process of obtaining opt-in consent can be time-consuming and costly, possibly limiting the scope of the research.

Opt-Out Consent

Pros:

1. **Increased Participation:** Opt-out consent often leads to larger sample sizes since participants are included unless they actively decline.

2. **Diverse Representation:** The ease of participation can lead to a more representative and diverse sample, potentially enhancing the generalizability of the findings.

3. **Efficiency:** Opt-out procedures can be less resource-intensive, allowing for broader studies with the same amount of resources.

Cons:

1. **Ethical Concerns:** Critics argue that the opt-out approach may not fully honor the principle of informed consent, as participants might be included without a clear understanding of the study.

2. **Passive Participation:** Participants may be included without their active engagement, which could potentially affect the quality of data collected.

3. **Risk of Inadvertent Inclusion:** Participants might be included in the research without their knowledge, leading to ethical dilemmas if sensitive data is involved.

Considerations for Early Childhood Education Research

In the context of early childhood education research, these considerations take on added weight. For instance, opt-in consent ensures that parents and guardians are actively involved in the decision to include their children in research. However, the opt-out model may allow for more comprehensive and diverse data, which can be invaluable in educational settings.

Conclusion

The choice between opt-in and opt-out consent models is nuanced and requires careful consideration of ethical implications, the nature of the research, and the characteristics of the population being studied. Striking a balance between ethical rigor and practicality is crucial, and researchers must weigh the pros and cons in the context of their specific study while always prioritizing the rights and well-being of participants.

Washington State Institutional Review Board Process

In Washington State, the Institutional Review Board (IRB) process plays a crucial role in ensuring that research conducted within its jurisdiction is ethically sound and protects the rights and well-being of participants. This process is even more stringent when projects involve vulnerable populations such as children and youth.

Researchers engaging in projects with the Department of Children, Youth, and Families (DCYF) need to navigate a meticulous approval process. Not only is it mandatory to obtain IRB review and approval from the University of Washington (UW), but projects must also be reviewed and approved by the Washington State IRB (WSIRB). This dual-review system underscores the importance placed on ethical considerations in research.

Pre-Review by IOAA

Before initiating the IRB application, DCYF mandates a 'pre-review' step led by Cultivate Learning. Warren Wesling, who oversees this stage, outlines the process to obtain Washington State IRB approval as follows:

1. **DCYF Form Submission:** Researchers must complete DCYF Form 04-015 and submit it to `dcyf.datagovernance@dcyf.wa.gov`. The review may take up to a month, although the aim is to complete it within a few weeks.

2. **Feedback and Conditional Approval:** Researchers receive feedback on the submitted form. If conditionally approved, they can then commence the WSIRB application process.

3. **WSIRB Application:** Researchers must follow the instructions provided in the application and communicate with DCYF for any queries.

4. **Appendix Completion:** The WSIRB application may necessitate the completion of specific appendices (G, H, and/or G-Addendum). Once completed, these should be forwarded to the aforementioned email address. DCYF will review them within

the Office of Innovation, Alignment, and Accountability (OIAA), potentially requiring an additional few weeks.

5. **Pre-Review Completion Memo:** If approved, DCYF forwards a "Pre-Review Completion Memo" to the WSIRB, and researchers receive a courtesy copy of this approval.

6. **Confidentiality Agreement:** DCYF mandates a Confidentiality Agreement (CA) from the WSIRB for all studies, even if the application is found to be exempt from IRB oversight. The CA undergoes a final review to ensure alignment with the approved appendices, which may take a few additional weeks.

7. **Initiation of Data Collection:** Once the fully-executed Confidentiality Agreement, signed by the OIAA Director, is received, researchers can initiate data collection and other activities pertinent to the study.

Post-IOAA-Review: The Washington State IRB Process

Following the pre-review led by Warren Wesling from the Office of Innovation, Alignment, and Accountability (IOAA), an internal watchdog within DCYF, researchers must proceed to the Washington State Institutional Review Board (WSIRB) for a comprehensive review of their research protocols. This link – `https://wsirb.my.irbmanager.com/Attachments/e5c90816-89ad-43c2-b714-50087516ae6b` – provides information about navigating the Washington State IRB process (post-review). The summary of this document is presented in this section along with some answers to questions we have encountered along the way.

IRBManager: An Overview

WSIRB utilizes **IRBManager**, an online submission and workflow management system, for managing and overseeing the submission of research protocols. This platform supersedes the previous practice of email submissions, allowing researchers to submit a range of forms including initial research applications, continuing reviews, amendments, adverse event reports, and study closures.

User Accounts and Navigation

Other users can create an account directly on IRBManager using an email and password, with the option to reset forgotten passwords.

Upon logging in, researchers are greeted with the **Home Dashboard Page**, which provides an overview of their projects, forms in

process, submissions, and project statuses. Quick links for starting new submissions, viewing recent activity, messages, and documents are available in the **Left Sidebar Menu**.

Initiating New Submissions

Researchers can use the **"Start xForm"** links to initiate new submissions, amendments, or continuing reviews. For continuing reviews and amendments, it is crucial to navigate to the specific project first before selecting an xForm. All fields in the online forms must be completed and forms must be signed electronically before submission.

Adding New Study Personnel

New personnel can be added either before or during the submission of an amendment. Researchers must first use the **"New Contact Form"** to enter the details of the new personnel, followed by checking **"Change in Personnel"** and **"Add Research Team Members"** in the amendment form.

Getting Help

For assistance, researchers can contact WSIRB staff at `wsirb@dshs.wa.gov` or call 360-902-8075. It is important to note that IRBManager messaging is reserved for system-only communications, and any queries regarding projects should be communicated via email.

Point of Contact

The point of contact for researchers during this process is **Wendy Grove**, a Compliance Specialist at the WSIRB.

Clarifying Roles in Research: Definitions of Common Terms

When engaging in the IRB process through IRBManager, several roles and terms are commonly used to describe different individuals contributing to a research study. To ensure clarity, we define these terms below:

Study Coordinator: A non-investigator staff member responsible for the day-to-day management of the study. Tasks for the study coordinator may include scheduling study visits, ensuring compliance with the protocol, managing study-related data, communicating with the IRB, and assisting in participant recruitment. The study

coordinator does not partake in the development of the study design or the interpretation of results unless they also hold a role as an investigator.

Co-Investigator: A researcher or clinician who shares responsibility with the principal investigator (PI) for the development, management, and reporting of a research study. Co-Investigators are often involved in the study design, data analysis, and interpretation of results. They may undertake some of the tasks and responsibilities of the PI if delegated to do so and are typically listed on publications resulting from the study due to their significant role in the research.

Sub-Investigator: A researcher or clinician who plays a more minor or focused role in the research compared to the PI or co-investigator. Sub-Investigators may be responsible for specific tasks or components of the research, such as data collection, certain lab tests, or working with a specific subgroup of participants. The role and responsibilities of a sub-investigator are generally narrower in scope than those of a co-investigator.

Letter of Support in IRBManager xForm

In the IRBManager interface, researchers may encounter an xForm item requesting the attachment of a *Letter of Support* from Agency management or leadership under the following conditions:

1. The Principal Investigator (PI) is a current employee of the agency.

2. The PI will not be requesting records but will be contacting state agency personnel or clients.

3. The PI is a current employee or is conducting work on behalf of their agency, without requesting records or contacting subjects.

In this context, researchers affiliated with the University of Washington and working with the Department of Children, Youth, and Families (DCYF) may use the *IOAA Pre-Review Letter* as a substitute for the requested letter of support. Wendy Grove, a Compliance Specialist at the Washington State Institutional Review Board (WSIRB), has clarified that the letter obtained from the pre-review process led by Warren Wessling from the Office of Innovation, Alignment, and Accountability (OIAA) can be used to fulfill this requirement in the xForm submission.

Timeline of the IRB Approval Process: A Case Study

The Institutional Review Board (IRB) approval process, which includes the IOAA pre-review and the actual WSIRB review, can be complex and time-consuming. This section outlines the timeline of this process using the example of the QUIC validation study conducted in 2023-2024.

IOAA Pre-Review

- **August 31, 2023:** The research team initiated contact with Warren Wessling from the IOAA to inquire about the procedure, mentioning that the UW IRB was already completed.
- **September 5, 2023:** Warren responded outlining the pre-review steps and shared the DCYF Form 04-015 for submission. The team completed and emailed the form on the same day. Warren sought clarification regarding differences between the current and past studies.
- **September 6, 2023:** The team responded to Warren's query, outlining the differences between the studies.
- **September 19, 2023:** Warren notified the team that the pre-review letter was sent to WSIRB and informed Wendy Grove about the completion of the pre-review process.

WSIRB Review

- **September 27, 2023:** Wendy Grove sought clarification regarding the nature of the project and asked about the submission of an xForm in IRBManager. The team responded on the same day.
- **September 28, 2023:** Wendy instructed the team to use the IRBManager and xForm for the submission. The team initiated the xForm and sought clarification on some points, to which Wendy responded promptly.
- **September 29, 2023:** The team asked a follow-up question, received a response, and submitted the xForm.
- **October 3, 2023:** Wendy informed the team that the Principal Investigator, Gail Joseph, needed to sign off on the xForm before review.
- **October 9, 2023:** The team checked in on the process, clarifying the next steps and discussing WSIRB fees with Wendy. On the same day, Wendy received confirmation from Warren that DCYF would cover the fees.

- **October 25, 2023:** The team received the first round of feedback on the xForm, responded, and was informed that Gail had signed off on the modified xForm.
- **October 31, 2023:** The team was still awaiting further feedback.

This timeline illustrates the iterative and collaborative nature of the IRB approval process, highlighting the importance of clear communication and prompt responses between the research team, IOAA, and WSIRB.

Conclusion

This rigorous process highlights the commitment of Washington State, the DCYF, and its affiliates towards ensuring ethical research practices. Researchers are expected to adhere to these protocols meticulously, ensuring that studies conducted within this framework uphold the highest standards of ethical integrity.

Selecting a Suitable Journal for Publication

Introduction

Choosing the right journal for publishing your research is a critical decision that can influence the reach and impact of your work. This chapter provides guidelines to assist young researchers in making an informed choice.

Understanding Your Research

Scope and Focus

Understand the core themes and contributions of your research. Consider whether your work is specialized, interdisciplinary, or has a broad appeal.

Target Audience

Identify the primary audience for your research. Determine whether it is more suited to practitioners, academics, policymakers, or a combination.

Evaluating Journals

Relevance and Scope

Ensure the scope of the journal aligns with your research. Review previously published articles to ascertain compatibility.

Impact Factor and Reach

Consider the journal's impact factor, readership, and influence in the field.

Type of Access

Determine whether open access, paid subscription, or a hybrid model is preferable for your target audience.

Review Process and Time

Investigate the journal's peer-review process, average review time, and acceptance rate.

Indexing and Visibility

Ensure the journal is indexed in recognized databases to enhance visibility.

Publication Ethics

Select journals that adhere to ethical guidelines and practices.

Strategies for Selection

Create a Shortlist

Curate a list of potential journals considering all the factors mentioned above.

Seek Mentorship

Consult with experienced colleagues or mentors for recommendations and insights.

Pilot Submission

Consider sending pre-submission inquiries to gauge interest and fit.

Conclusion

Choosing the right journal is a strategic step towards ensuring your research gets the attention and impact it deserves. By evaluating journals based on relevance, reach, access type, review process, and ethical standards, researchers can make informed decisions that amplify their work's value.

Developing a New Assessment Tool

Developing a new assessment tool, akin to the Early Childhood Environment Rating Scale (ECERS) or Classroom Assessment Scoring System (CLASS), requires a careful and systematic approach. This chapter outlines the steps and considerations involved in creating a reliable and valid instrument for assessing early childhood education environments.

Identifying the Need

Gap Analysis

Conduct a literature review to identify gaps in existing tools and justify the need for a new assessment tool.

Defining Objectives

Clearly outline what you aim to measure and the purpose of the tool.

Conceptual Framework

Theoretical Foundation

Establish a theoretical basis for the tool, ensuring alignment with current research and theory in the field.

Defining Constructs

Identify and define the constructs to be measured, ensuring they are grounded in theory and practice.

Designing the Tool

Item Generation

Develop a pool of potential items or indicators based on the identified constructs.

Format and Structure

Decide on the format (e.g., Likert scale, observational checklist) and structure of the tool.

Pilot Testing

Conduct pilot tests to refine items and gather initial feedback.

Validity and Reliability

Content Validity

Seek expert opinions to ensure the tool accurately represents the constructs.

Construct Validity

Test the tool to ensure it measures what it is intended to measure.

Reliability

Assess the consistency and stability of the tool through methods such as test-retest and inter-rater reliability.

Refinement and Iteration

Data Analysis

Analyze pilot data to refine items, remove redundancies, and improve clarity.

Iterative Testing

Conduct multiple rounds of testing and refinement to enhance the tool's validity and reliability.

Implementation and Training

User Guidelines

Develop comprehensive guidelines and training materials for users.

Standardization

Ensure standardized procedures for administering and scoring the tool.

Continuous Improvement

Feedback and Updates

Regularly gather feedback from users and update the tool as necessary.

Adaptability

Ensure the tool remains adaptable to different contexts and settings.

Conclusion

Developing a robust assessment tool requires a systematic approach, grounded in theory and practice, to ensure its validity, reliability, and utility in assessing early childhood education environments. Continuous refinement and adaptability are key to the tool's long-term success.

Exploring the Interplay between Improvement Science and Implementation Science

In the evolving landscape of systematic approaches to organizational and process improvement, two significant fields have emerged as frontrunners: improvement science and implementation science. Though they share the common goal of enhancing practices and outcomes, their approaches, methodologies, and areas of focus have distinct characteristics. This chapter aims to delineate these differences, explore how they can complement each other, and discuss their respective use cases, providing a comprehensive understanding crucial for practitioners and scholars alike.

Understanding Improvement Science

Improvement science, deeply rooted in the principles of continuous quality improvement and lean methodology, is a systematic approach focused on iterative, incremental improvements in processes or systems. It originated primarily in the healthcare sector but has since found applications in education, social work, and business. The core of improvement science is the Plan-Do-Study-Act (PDSA) cycle, which encourages small-scale, rapid-cycle testing of changes to improve quality. This methodology emphasizes learning from each test and progressively refining the processes.

Understanding Implementation Science

Implementation science, on the other hand, is the study of methods and strategies to promote the uptake of interventions that have proven effective into routine practice. It emerged from the recognition that there is often a significant gap between what research shows is effective and what actually happens in practice. This field is particularly concerned with understanding and overcoming barriers to the implementation of evidence-based practices. Its methodologies are diverse but often focus on aspects like fidelity (adherence to the

intervention as designed), context (how different settings impact implementation), and sustainability (ensuring long-term adoption).

Comparing and Contrasting

While both sciences aim to improve outcomes, they differ in their primary focus and methods. Improvement science is often more experimental, utilizing iterative trials to refine processes, while implementation science is more prescriptive, focusing on how to integrate and sustain specific, proven interventions. Improvement science might test a variety of approaches in a specific context, while implementation science is concerned with the 'how' of rolling out a specific, defined intervention more broadly.

Synergies and Complementarities

Despite their differences, improvement science and implementation science are not mutually exclusive and can be highly complementary when applied together. Improvement science's strength in testing and refining changes in a specific context can feed into the broader goals of implementation science. For example, implementation science might identify an evidence-based practice for reducing patient readmissions in a hospital. Improvement science could then be used to iteratively test and adapt the implementation of this practice within the unique context of a particular hospital ward. This synergistic use ensures not only that the best practices are being implemented but also that they are optimized for the specific environment.

Use Cases

In healthcare, improvement science has been used to enhance patient safety through small-scale changes in hospital processes. In education, it's applied to incrementally improve teaching methods or administrative processes. Implementation science, in contrast, is often seen in the public health sector, ensuring that community health programs are effectively adopted and maintained. In the realm of policy, it can help in the rollout of new educational standards or guidelines. When combined, these approaches can lead to more effective and sustainable improvements. For instance, a new digital health record system (an evidence-based practice) might be implemented across a healthcare network (implementation science) while using improvement science to tailor the system's use in different departments.

Practical Considerations and Challenges

Applying these sciences in real-world settings involves practical considerations. A key challenge is the potential resistance to change, which can be mitigated through stakeholder engagement and effective communication. Another consideration is the resource allocation for both the implementation and continuous improvement processes. It's essential for practitioners to understand the unique constraints and facilitators within their specific context. Setting realistic goals, establishing clear metrics for success, and maintaining flexibility to adapt as needed are crucial elements for success in both disciplines.

Quality Rating and Improvement Systems in Early Childhood Education

Quality Rating and Improvement Systems (QRIS) have emerged as a pivotal strategy in the early childhood education sector, aiming to enhance the quality of care and education for young children. This chapter delves into the history, purpose, and effectiveness of QRIS, providing insights into how these systems have become integral in shaping early learning environments.

History of Quality Rating and Improvement Systems

The concept of QRIS originated in the late 20th century, driven by a growing recognition of the importance of early childhood education quality on child development outcomes.

Origins

Early initiatives focused on developing standards for childcare and preschool programs, which gradually evolved into more formalized QRIS frameworks. The idea was to create a systematic approach to evaluate and improve the quality of early learning environments.

Evolution Over Time

Over the years, QRIS has seen various transformations, adapting to changing educational needs, research findings, and policy directions. States in the USA, for instance, have developed their QRIS, each with unique criteria and standards, reflecting the diverse needs of their populations.

Purpose of QRIS

QRIS serves multiple purposes, from enhancing child care quality to providing parents with clear indicators of program quality.

Assessment of Quality

QRIS typically involves rating systems that categorize early childhood programs based on multiple quality indicators such as teacher qualifications, learning environment, and child outcomes. These ratings help in identifying areas for improvement and in recognizing high-quality programs.

Improvement Strategies

Beyond assessment, QRIS also focuses on improvement strategies. This includes professional development for educators, technical assistance for programs, and sometimes financial incentives to achieve higher quality standards.

Research on the Effectiveness of QRIS

Research on QRIS effectiveness has provided mixed results, indicating both successes and areas for further development.

Impact on Early Childhood Settings

Studies have shown that QRIS can lead to improvements in some quality indicators, like teacher-child interactions and curriculum quality. However, the impact on child outcomes is less clear, with some research suggesting modest or variable effects.

Challenges and Limitations

Challenges in implementing QRIS include ensuring consistency across different programs, addressing the diverse needs of children, and securing adequate funding. There is ongoing debate on the best methodologies for rating and improving quality in varied and complex early childhood environments.

Conclusion

QRIS represents a significant effort to standardize and elevate the quality of early childhood education. While it has shown potential in enhancing certain quality aspects, continuous refinement and research are essential to maximize its impact on child development outcomes.

Continuous Quality Improvement in Early Education Systems: Integrating Data-Driven Decision-Making

Continuous Quality Improvement (CQI) represents a critical approach in early education systems, focusing on iterative evaluation and redesign to enhance quality and outcomes. This chapter explores CQI within the context of early childhood education (ECE), emphasizing its application at both the teacher and system levels. It also delves into how data-driven decision-making can be an integral part of this process, particularly in state Pre-K programs and Quality Rating and Improvement Systems (QRIS).

Understanding Continuous Quality Improvement (CQI)

CQI in early education is a process-oriented approach that involves regular, systematic review and improvement of educational practices. It's based on the principle that there is always room for improvement, no matter how effective a program or teaching method may be.

Key Principles of CQI

The cycle of Plan-Do-Study-Act (PDSA) forms the backbone of CQI, encouraging ongoing assessment and refinement. Emphasis on stakeholder involvement, including teachers, administrators, parents, and children. Focus on measurable outcomes to guide improvements.
3. Data-Driven Decision-Making in CQI Data plays a pivotal role in the CQI process. The ability to collect, analyze, and interpret data effectively is essential for informed decision-making and targeted improvements.

The Role of Data in CQI

Collecting data from diverse sources including classroom observations, student assessments, and parent feedback. Using data to identify strengths, weaknesses, and opportunities for improvement.

Data interpretation and its application in the PDSA cycle.

CQI at the Teacher Level

At the teacher level, CQI focuses on professional development and enhancing classroom practices.

Professional Development and Teacher Training

Regular training sessions based on identified needs from classroom data. Peer reviews and collaborative learning as part of professional growth.

Classroom Practices and Student Engagement

Adjusting teaching methods and materials based on student performance and engagement data. Continuous feedback mechanisms for teachers to refine classroom strategies.

CQI at the System Level

Applying CQI at the system level, such as in state Pre-K programs or QRIS, involves a broader scope, impacting policy and program structure.

State Pre-K Programs

Implementing CQI in state Pre-K programs like ECEAP through regular program evaluations and adjustments. Collaborative efforts between state education departments, early childhood educators, and other stakeholders.

Quality Rating and Improvement Systems (QRIS)

Utilizing CQI in QRIS to assess and improve program quality ratings. Iterative design and evaluation of QRIS components based on comprehensive data analysis.

Challenges and Future Directions

While CQI presents numerous benefits, there are challenges to its implementation, including resource limitations and resistance to change. The future of CQI in early education systems lies in its integration with technology, increased stakeholder involvement, and a stronger emphasis on equity and inclusivity.

Conclusion

Continuous Quality Improvement is a dynamic and vital approach in early education, offering a pathway to enhance educational practices at both the teacher and system levels. By harnessing the power of data-driven decision-making, early education systems can not only identify areas for improvement but also implement changes that lead to tangible, positive outcomes in early learning.

Utilizing Public Datasets for Early Learning Research

This chapter provides an overview of key publicly available datasets in the field of early learning research. These datasets are invaluable resources for understanding various aspects of early care and education, including program effectiveness, child development, family dynamics, and more.

National Survey of Early Care and Education (NSECE)

1. **Description**: The NSECE, collected in 2012 and 2019, offers comprehensive data on early care and education providers, and the households of children from birth through age five not yet in kindergarten.

2. **Variables**: Provider characteristics, program types, cost of care, workforce information, child demographics.

3. **Sample Participants**: Childcare providers (center-based and home-based) and households with children under six years old.

4. **Studies Using NSECE Data**: Research on childcare availability, quality of care, and the early childhood workforce.

Early Head Start Research and Evaluation (EHSRE) Study

1. Description: The EHSRE study provides data on the impact of Early Head Start programs on children and families.

2. Variables: Child development outcomes, family practices, program type and quality.

3. Sample Participants: Families and children enrolled in Early Head Start.

4. Studies Using EHSRE Data: Evaluations of the effectiveness of Early Head Start in improving child and family outcomes.

Early Childhood Longitudinal Study - Birth Cohort (ECLS-B)

1. Description: The ECLS-B follows a nationally representative sample of children born in 2001 through kindergarten entry.
2. Variables: Child development, health, care and education experiences.
3. Sample Participants: Children born in 2001 and their families.
4. Studies Using ECLS-B Data: Longitudinal analyses of early childhood health, development, and schooling experiences.

Family and Child Experiences Survey (FACES) and Baby FACES

1. Description: FACES and Baby FACES provide detailed information about Head Start and Early Head Start programs, the children and families they serve, and the staff who work in these programs.
2. Variables: Program characteristics, child and family demographics, developmental outcomes.
3. Sample Participants: Head Start and Early Head Start children, families, and staff.
4. Studies Using FACES/Baby FACES Data: Assessments of Head Start and Early Head Start program quality and outcomes.

Head Start Impact Study Data

1. Description: This study assesses the impacts of Head Start on children's school readiness and parental practices.
2. Variables: Cognitive, social-emotional, and health outcomes, family practices and characteristics.
3. Sample Participants: Children enrolled in Head Start programs and their families.
4. Studies Using This Data: Analysis of Head Start's effectiveness in improving child development and school readiness.

Head Start Program Information Reports Data

1. Description: Annual reports containing data on Head Start programs, participants, families, and staff.
2. Variables: Enrollment figures, program services, staff qualifications.

3. Sample Participants: All Head Start participants, families, and staff.
4. Studies Using This Data: Program evaluation and policy analysis of Head Start.

Conclusion

This chapter underscores the wealth of information available in public datasets for early learning research. These datasets enable researchers to explore a wide range of questions pertinent to child development, educational practices, program effectiveness, and policy implications in early childhood education.

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