

Name: Jihoon Choi

Year in Program: 1st - Measurement and Quantitative Methods

Proposed Mentor: Dr. Kenneth Frank

Word Count: 697

**Evaluating Sensitivity to Differential Measurement Error in Observational Studies:
An Application of the Impact Threshold for a Confounding Variable (ITCV)
and the Robustness of Inference to Replacement (RIR)**

Introduction

Measurement error constitutes a critical source of bias in observational studies, alongside omitted variable bias and selection bias. Addressing this issue is essential for bolstering the robustness in social science research, where measurement errors can be prevalent in self-reported, retrospective surveys. Measurement error can be especially problematic when there is a correlation between the measured exposure and outcome due to errors in each (Bounds et al., 2001). This is often referred to as differential or systematic measurement error. Such correlations, like those stemming from socially desirable responses, can lead to either an overestimation or underestimation of exposure effects, potentially resulting in biased estimates and inferences (Paulhus, 2002; Steenkamp et al., 2010; Van Smeden et al., 2020).

Various methods, including the instrumental variable method, have been developed to address differential measurement error (Neuhaus, 1999; Lewbel, 2007; Ura, 2018). Notably, sensitivity analysis has also been advanced to define bounds and quantify the magnitude of differential measurement error that could potentially negate the treatment effect. Imai and Yamamoto (2010) explored this in the field of political science, particularly in terms of differential measurement error in exposure and its potential correlation with outcome variables. Similarly, VanderWeele and Li (2019) proposed a simplified sensitivity analysis, which involves

calculating the risk/odds ratio of true association and mismeasured association between exposure and outcome variables in both dichotomous and continuous settings.

Building upon the sensitivity analysis framework proposed by Frank (2000) and further developed by Frank et al. (2013), this study will utilize the ITCV (Impact Threshold for a Confounding Variable) and RIR (Robustness of Inference to Replacement) frameworks. These frameworks will be employed to quantify and evaluate the sensitivity of exposure and outcome variables to differential measurement error. Since these frameworks have been developed for linear and non-linear models and have been expanded to include mediation and difference-in-difference analyses (Lin et al., 2023), it is worthwhile to extend these frameworks to various bias-inducing scenarios encountered in observational data.

Project Description and Goals

The summary of the project includes:

1. Theoretical research on differential measurement error and sensitivity analysis, employing ITCV and RIR frameworks.
2. Development of a formal statistical framework for sensitivity analysis in differential measurement error.
3. Development of an R-based command and application of sensitivity analysis using educational data.

The SRDF and this project will strengthen three key areas. First, it will enhance my overall understanding of sensitivity analysis, especially focusing on the concepts of ITCV and RIR, which are central to my future research endeavors. Second, by deeply exploring and creating sensitivity analysis tools for specific bias-inducing conditions, my skills in statistical

proofing and developing related functional forms will be improved. Finally, the project will bolster my abilities in developing statistical packages through developing an R-based command. These efforts will collectively contribute to my proficiency in research and statistical analysis, equipping me with a robust skill set for my professional development.

Prior Research Experience

I am currently working as a research assistant under the guidance of Dr. Frank on two IES (Institute of Education Sciences) projects, focusing on quantifying the robustness of causal inference and network analysis to understand first-generation college students. In the first project, my primary role involves debugging and maintaining the R package “konfound” as part of the research team. My current focus is on debugging sensitivity analysis function for non-linear model and updating the output language for both R and Stata. For the second project, my responsibilities include preliminary data analysis, as well as evaluating and making minor modifications to survey data. Serving as a research assistant on these projects has enhanced my data analysis skills and ability to develop and maintain statistical software. It has also deepened my involvement in applying data-driven approaches to complex research questions, using real-world data for significant inferential and analytical contributions.

Before joining MSU, I completed my undergraduate and master's studies at Seoul National University. My research was focused on evaluating educational interventions and developing programs for students within vocational education. Building on this, I competed in graduate research competitions, employing various educational and employment panel datasets. This enhanced my skills in quantitative analysis and inference, specifically in assessing students' educational attainment and early career outcomes in vocational education contexts.

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Name: Dominic Hateka

Year in Program: 1st, Curriculum, Instruction & Teacher Education

Proposed Mentor: Dr. Watson, Vaughn.

Word Count: 708

Decolonized Art Education: A Critical Analysis of Curriculum Development Literature

Introduction

For over a decade, I have experienced teaching art in both primary and pre-service teacher education settings. I started at the International Community School in Kumasi, Ghana, where I taught using the Cambridge Curriculum. Later, I moved to Ngwane Teachers College in Swaziland, a government-run college, where I taught art until 2023. During this time, I recognized that my curriculum is grounded on the principles and theories of colonial or “white” art education theories. The content and context often present narratives from the perspective of the colonizers, marginalizing or omitting the experiences and perspectives of the colonized (Ndlovu-Gatsheni, 2018; Du Plessis, 2021; Giroux, 2020) and the devaluation of indigenous languages (Simpson, 2004; Heleta, 2016). To encourage the development of self and indigenous identity and combat negative self-perception of cultural identities, it is crucial to re-evaluate the dominant “Western” pedagogy and promote critical education scholarship. To do so, I propose an SRDF project to investigate the principles and theories that will facilitate the decolonization of art education theory and practices.

The process of decolonizing the curriculum is a significant and ongoing task that requires sustained effort (Moosavi, 2020). It is not a temporary or symbolic gesture (Tuck & Yang, 2012; Ackah, 2021). Instead, decolonizing the curriculum involves a rigorous and comprehensive

examination of curriculum pertaining to art education theory and practices, with particular attention to how such curriculum affects educational outcomes (Prest et al., 2022). This proposed SRDF review project aims to fill the gap and contribute to the literature on the decolonization of art education. Specifically, I am interested in exploring the key theoretical frameworks, methodological approaches, strategies, and challenges associated with guiding and preparing teachers to decolonize art curriculum and instruction.

Aim and Research Skills to be Developed

Through this SRDF, I will:

1. Develop a thorough literature review that allows me to be fluent in the language on the subject of decolonizing Art Education.
2. Compare the theoretical frameworks and methodological approaches that underpin the decolonization of curriculum, building my background knowledge on the methodological approaches to the decolonization agenda.
3. Develop a set of answerable research questions based on the literature review for future studies.

Prior Research

Based on my preliminary review in TE901 and TE921 on issues of decolonizing education, I realized that there is empirical research on this topic that is readily available on the decolonization of curriculum in other subject areas such as Science, Social Studies, English Language (Mbhele et al., 2023; Obiagu, 2023; Chimbunde & Kgari-Masondo, 2021) but not a substantial literature exist on the decolonization in Art education.

Previous research indicates that theoretical frameworks such as Postcolonial and Afrocentric theories support the process of decolonizing the curriculum (Sithole & Bondai, 2020). Decolonizing the curriculum involves a deliberate effort to challenge the pervasive influence of colonialist and patriarchal epistemological worldviews that have shaped the curriculum (Asadullah, 2021). Such decolonizing work is a multifaceted process of unlearning and undoing the damage caused by colonization (Cheang & Suterwalla, 2020). To decolonize the curriculum, it is imperative to address the historical harm, recognize the grievances of indigenous and marginalized communities, and acknowledge the limitations of Eurocentric models (Padayachee et al., 2018). This decolonization work has been described in other subjects (Mbhele et al., 2023; Du Plessis, 2021; Chimbunde & Kgari-Masondo, 2021), but not a substantial literature exists on decolonization in Art education. My SRDF work and future research will seek to fill this gap in the literature.

Methodological Approach to SRDF

I plan to approach this project using the scoping literature review method. The scoping review will help me identify the types of available evidence, clarify key concepts, and identify knowledge gaps (Colquhoun et al., 2014; Munn et al., 2018; Peters et al., 2015) related to decolonizing the Art curriculum. I will conduct a systematic search using the MSU Libraries database, Eric, Sage, Research Rabbit, and online sources, and create a comprehensive reference library by identifying and collecting relevant academic sources such as peer-reviewed articles, books, reports, and other scholarly materials. Ultimately, this project will not only be an opportunity for me to develop my research skills, but it will also contribute to my development as a researcher interested in decolonizing art curricula.

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Yashi Ye

1st year Ph.D. Student

Faculty Mentor: Jerome Graham

Word Count: 698

Overview

After learning about K–12 education systems and comparative education policies in the course and out-of-class research project, I became interested in the OECD's Programme for International Student Assessment (PISA). Every three years, this assessment compares the ability of 15-year-old students from 70 countries and regions to apply their knowledge to real-world problems (Lie&Linnakyla, 2004). As a former teacher and investment analyst in a K–12 education group from mainland China, I am conversant with East and Inner Asia K–12 environments. The Summer Research Development Funding(SRDF) allows me to explore PISA data, particularly in the U.S., to understand school leadership in the Western context and develop my research skills. If granted funding, I will analyze evidence from PISA on distributed school leadership's impact on U.S. mathematics achievement using its 8-cycle data and survey from 2000-2022. Through school effectiveness (Teddlie et al., 2002; Scheerens, 2013; Rincón-Gallardo & Fullan, 2016) and distributed leadership (Spillane et al., 2001; Gronn, 2002; 2011; Tian & Huber, 2020) theories, I will examine configurations of school leadership and its potential relation to mathematics education in the U.S over the last 20 years.

Research Foundation

The PISA test results show a fluctuating decline in U.S. middle school students' mathematics scores from 2000–2022, particularly after 2012 (OECD, 2022). Meanwhile, teachers and parents have increasingly taken on school leadership roles

over the past 20 years (Leithwood, 2021; Sun et al., 2024). Related PISA surveys confirm this trend (Liu et al., 2018). Although the mathematics scores of U.S. students have shown some improvement in PISA ranking, studies found this might be due to declining performance in other countries rather than U.S. educational progress itself (Burris, 2012; Carnoy et al., 2016; Yew et al., 2017). Moreover, over a third of U.S. 15-year-olds performed poorly in post-pandemic mathematics assessments (OECD, 2022), highlighting disparities in mathematics education within the U.S. K–12 education system.

Existing studies on distributed leadership in U.S. schools indicate that implementing such a leadership style, which empowers teachers with more autonomy, has enhanced teachers' sense of job involvement and satisfaction, positively impacting student mathematics achievement (Heck & Hallinger, 2009; Torres, 2019). However, some research critiques school leaders for decentralizing management power without adequate organizational maturity, leading to a decline in student performance due to chaotic school administration (English, 2009). There has been a lack of systematic analysis of the impact mechanisms of the evolving trends in school leadership on student mathematics achievement in the U.S. over the past 20 years. I aim to assess the positive or negative impacts of leadership decentralization on academic achievement by conducting regression analyses of the U.S. scores and questionnaire results from the last eight PISA mathematics assessments. Additionally, I plan to review literature related to the relationship between distributed leadership and student performance over the past two decades, providing references for educational policy adjustments in mathematics education in the U.S.

Previous Research Abilities

Through the research assistantship, coursework, and self-learning in the first year at MSU, I have:

- Participated in a research project on simulation technology in school leadership
- Comprehended methods of making well-reasoned arguments and writing reviews
- Learned basics of research paradigms, designs, and methodologies
- Acquired statistical tools SPSS and R for data analysis
- Learned regression analysis and relevant statistics of education

My research knowledge and skills gained in the 1st year at the K-12 education administration program, especially the quantitative approaches, will provide a solid foundation to understand and write the literature review and conduct data analysis in the summer.

Research Competencies to be Enhanced

I plan to make three achievements from this summer research:

Comprehensive Literature Review: I aim to write a thorough literature review that demonstrates both the pragmatic and theoretical value of using PISA as an indicator for school leadership and student achievement.

Statistical Proficiency: I intend to improve my skills by using SPSS to conduct regression analysis on PISA data to enhance understanding of relationships and trends within PISA, leadership, and effectiveness.

Research Agenda Construction: My plan after this project is to establish a draft agenda focusing on effective technology in Leadership Configurations, and its impact on student achievement and teacher learning. This research will structure my inquiries and contribute significantly to the field, paving a clear path for progress.

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Name: Lindy J. Johnson

Year in Program: 1st; Special Education

Proposed Mentor: Dr. Adrea Truckenmiller

Word Count: 699

Exploring the Role of Various Component Skills of Reading Comprehension for Autistic¹ Students

It has been well-established that around 65% autistic students have difficulty with reading comprehension (Nation et al., 2006; McIntyre, Solari, Gonzales, et al., 2017; Solari et al., 2019). As reading ability is not only integral to academic success, but also in health and employment outcomes (Davidson, 2021; Morrisroe, 2014), it is imperative that schools and parents have a full understanding of the complex skills that intertwine during the development of reading comprehension so they can provide optimal instruction and intervention.

The simple view of reading (Gough & Tunmer, 1986; Hoover & Gough, 1990) has long been a guiding model of reading comprehension development. The theory asserts that reading comprehension is the product of two main components, word reading and listening comprehension. There is a recent model of reading comprehension called the Direct and Indirect Effects model of Reading (DIER) that expands the simple view of reading to include the various component skills (e.g., phonology, orthography, vocabulary, grammar, inference, perspective taking, comprehension monitoring) that support word reading and listening comprehension, as well as explains the pathways of relations between those skills (Kim, 2017, 2020a, 2020b).

¹ I have chosen to use identity-first language (i.e., autistic students) to acknowledge the preferences of community members. I respect, and am engaged in, the ongoing conversation about language. For an in-depth review, please see Botha et al. (2021) and Bottema-Beutel et al. (2021).

For autistic students, no clear pattern has emerged from the existing research on reading abilities (Nation et al., 2006; McIntyre, Solari, Grimm, et al., 2017; Ricketts et al., 2013). What has become clear is that many autistic students do have reading comprehension deficits (Frith & Snowling, 1983; O'Connor & Klein, 2004; Solari et al., 2017). While there have been several studies investigating reading comprehension profiles in autistic students, and even how specific component skills are related to reading comprehension, the DIER model has yet to be tested in this specific population (Sorenson Duncan et al., 2021; Davidson, 2021). When this research is undertaken, it may allow investigators to understand what specific component skills are related to the breakdown in reading comprehension for autistic students, with implications for providing better instruction for autistic students.

Project Description and Goals

If granted the Summer Research Development Fellowship, I plan to examine the existing research on factors that influence reading comprehension in autistic students. I will divide my time over the summer between examining the research literature; writing a systematic literature review; developing research questions for my apprenticeship project; finding extant datasets, searching for studies that have similar measures for decoding and reading comprehension, to compare autistic students to decoding-matched peers; and completing the *Yale Seminar on Autism and Related Disorders* (n.d.) course. I intend to use what I find and learn from this summer to form the basis of my apprenticeship project in the fall semester and to write a conference proposal for presenting my systematic literature review to a wider audience.

This project will help me further develop my research skills by focusing on these objectives:

1. To cultivate effective search strategies for literature and existing datasets

2. To develop a research question (about the components of reading comprehension for autistic students) that can be answered in a systematic literature review, which will be submitted for a conference presentation and potentially a publishable manuscript

Past Research

In my current role as a Graduate Research Assistant, I participate in a variety of research projects. With my advisor, Dr. Adrea Truckenmiller, I have collected and organized a large dataset for our project evaluating literacy assessment in schools and I have worked on finding and synthesizing the literature for that manuscript in preparation. I have also worked this semester on Dr. Truckenmiller's project, Writing Architect, where I was part of the team responsible for finding current evidence-based interventions and creating a presentation for our advisory board. Additionally, in my work with Dr. Kristin Rispoli, I am helping to code behavioral observations for a project that is investigating an emotional regulation intervention for autistic children and their parents.

Prior to my admission to Michigan State, I attended Central Michigan University, where I completed an independent research project with my faculty advisor, Dr. Katrina Rhymer. I was also a research assistant on another of Dr. Rhymer's projects. Additionally, I completed a research project in the Spring of 2020 and the poster was accepted for presentation at the Student Research and Creative Endeavors Exhibition; however, the presentation was cancelled due to the pandemic.

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Emma Taylor
Year One Ph.D. Student
Faculty Mentor: Dr. Madeline Mavrogordato
Word Count: 697

Synopsis

As a former teacher and novice researcher, I feel grateful for the opportunity to study problems I observed during my time in K-12 schools. The Summer Research Development Fellowship (SRDF) is a way for me to connect the research skills I developed in year one of my program with my experience as a practitioner. Broadly, my research interests include English learners (ELs) and the ways schools support their success. Specifically, I am interested in ways school leaders impact ELs, and how school leaders are prepared to work with ELs. If awarded a SRDF, I will conduct a thorough literature review surrounding these topics, identify and understand theoretical frameworks that underpin school leaders' EL-focused professional learning opportunities, develop a set of research questions based on these topics, and build knowledge on methodological approaches that will answer my research questions.

Guiding Rationale

School leaders have the authority and resources to leverage equity for ELs (Mavrogordato & White, 2019). Since they have the tools to change ELs' outcomes, what they learn about ELs is essential. Unfortunately, most school leaders do not have a background as EL-focused teachers, nor do they have access to professional learning opportunities on serving EL students that are geared toward leaders. Instead, they may be invited to teacher-focused learning opportunities or learning opportunities about laws. If school leaders are expected to leverage their power to impact ELs positively, more must be understood about what they know about ELs,

how they currently learn about them, and best approaches to building their knowledge base on EL students.

Prior research points to the important role school leaders play in leveraging their leadership role to promote equity for ELs (Callahan & Shrifer, 2016; Callahan & Hopkins, 2017; Mavrogordato & White, 2019). There is research surrounding EL-focused professional learning opportunities for pre-service (Sugimoto, et al., 2017; Kelly, 2018; Ramanayake & Williams, 2017) and in-service teachers (Babinski et al., 2018; Tong et al., 2017). In contrast, research that centers school leaders' EL-focused professional learning opportunities is scant. In literature that does center school leaders' learning opportunities, researchers often focus on pre-service learning opportunities (Callahan et al., 2019; Irby et al., 2020). Some studies come close, like Menken and Solorza's (2015) study on principals who ended their schools' bilingual education programs; interestingly, the authors conclude with suggestions for improving pre-service programs, with no recommendation for professional learning opportunities for in-service school leaders. Research that does center in-service school leaders' professional learning opportunities often relies on self-reported data from surveys (Lopez, 2013; Louie et al., 2019).

Researchers have established school leaders as important players in equitable outcomes for ELs; they have established the need for professional learning opportunities for pre- and in-service school leaders. However, research has not thoroughly described or evaluated current EL-focused professional learning opportunities for in-service school leaders. This is the gap I will begin to address with a SRDF.

Prior Research Skills

Through my assistantships and coursework, I have:

- Participated in an academic journal's editorial process

- Learned guiding principles surrounding the literature review process
- Participated in web scraping data collection for a research project
- Learned research design principles
- Learned research paradigms' basic features

These skills and background knowledge will be a solid foundation for my proposed summer research.

Research Skills to be Developed

This summer I plan to accomplish four goals:

1. develop a thorough literature review that allows me to be fluent in the language of professional learning opportunities for school leaders specifically as well as professional learning opportunities for all practitioners who work with ELs;
2. identify and understand theoretical frameworks that underpin why and how to provide high quality professional learning opportunities for school leaders and differentiate between how professional learning should be structured for school leaders versus classroom teachers;
3. develop a set of answerable research questions for future study;
4. identify and build background knowledge on methodological approaches that will be used to answer these research questions.

The SRDF will allow me to advance my research skills and background knowledge so I am well positioned to continue to advance my own research agenda. By the end of the summer, I will have developed skills and resources for use in my second year and beyond.

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Name: Al Wood

Year: 1st year – CITE Program

Proposed Mentor: Dr. Kyle Greenwalt

Word Count: 698 words

Teaching Outside the Core: An Exploratory Mixed Methods Study Investigating Where, How, and Why High School Psychology is Taught

Psychology is among the most sought after high school electives, which makes sense given its relevance in helping students understand topics as widespread as addiction, sexuality, and racism (American Psychological Association, 2022; Keith et al., 2013). Psychology's analysis of social relationships, discrimination, and biological bases of behavior also prepares students for empathy development and perspective taking, in which the broader social studies education community has called students and teachers engage so they may analyze their own identities and establish personal connections in their study of historical, political, and economic actors (Andolina & Conklin, 2021; Barton & Levstik, 2004; Garrett, 2017). Such perspective taking is especially important in light of recent calls for trauma-informed practices in social studies education (Garrett, 2011; Sondel et al., 2018; Yoder, 2020). Intermittently, calls are made to emphasize the importance of high school psychology (Keith et al., 2013; McEntarffer & Whitlock, 2022; Ragland, 1992). Yet, despite psychology's ongoing popularity and growing relevance, there is only a smattering of research exploring any element of secondary psychology.

Geography-specific research on secondary psychology is even less prevalent. Rural schools are less likely than urban and suburban counterparts to have the economies of scale to support elective courses such as psychology (Bouck, 2018; Walstad, 2001). Yet, psychology

could help students better understand racism and discrimination, which is increasingly important in rural communities as many rural schools have rich and growing populations of color and experience increasing calls to unpack issues of race following events such as the murder of George Floyd (Walker, 2021; Williams, 2018). Psychology can also facilitate better understandings of sexuality in rural communities, where 49% of rural LGBTQ youth felt their community was “somewhat or very unaccepting of LGBTQ people” compared to only 26% of urban and suburban youth (The Trevor Project, 2021, p. 1). Psychology can also help students better understand the prevalence of opioid addiction in rural communities (Chowdhury, 2022; Hale & Satel, 2018) and process the reality that 29% of rural children have experienced two or more adverse childhood experiences (Frankland, 2021).

Project Goals and Timeline

My goal is to collect and analyze data exploring where, how, and why high school psychology is taught. This can ultimately inform future research directions on increasing rural access to quality high school psychology courses.

Goals Prior to SRDF

In the fall, Dr. Greenwalt and I established a spreadsheet of MSU partner schools of varying geographies where psychology is taught and contact information for their psychology teachers. This semester, I will submit a proposal to IRB and create and distribute a basic mixed methods survey to these teachers, from which we can identify general patterns on where and how psychology is taught. I will also use my spring coursework to draft a literature review on secondary psychology education.

Goals for SRDF

I would begin by analyzing the mixed methods survey data and develop an initial research question. Next, I would identify approximately six of the surveyed teachers of differing geographies to interview with deeper questions on how and why these individuals teach psychology. For this, I would develop interview questions and learn effective techniques for interviewing research subjects. After conducting these interviews, I would transcribe and analyze these qualitative data.

Goals following SRDF

From the data analyzed over the summer, I will work with Dr. Greenwalt to develop conference proposals for the 2023 AERA conference and 2022 National Council for the Social Studies Conference. I will also develop manuscripts based on my findings, use the findings to inform psychology teacher education requirements at MSU, and inform research methods and directions for my practicum and dissertation.

Skill Development

I have limited research experience from my master's thesis in 2015, in which I developed a literature review and analyzed student written work samples. I will also write three literature reviews for my coursework this year, one of which required working within a theoretical framework. I propose to use the SRDF to learn how to develop a research question, collect and analyze mixed methods data, and conduct effective interviews, all of which will make me a more critical consumer of scholarship and empower me to more confidently conduct future research, both stemming from these findings and in other realms.

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