# The Nebraska Educator, Volume 6, Issue 2 (2022)

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# Contents

# Letter From the Editors

Something we have all become accustomed to (or have attempted to become accustomed to) over the past two years is change. Change is our only constant companion, and however uncomfortable it may be, it brings opportunities for growth. *The Nebraska Educator Journal* (NEJ) has changed a great deal since the first issue of Volume VI was published in October 2021. We welcomed six new associate editors, ushered in four new senior editors, and began another editorial cycle. We transitioned over to new leadership and started a new chapter, but we as the editorial board of the NEJ are still being led by the graduate students who came before us, without whom we would not be where we are today.

The process of running a student-led, open access, peer-reviewed journal that strives to imitate the quality and rigor of other more traditional, peer-reviewed journals is a challenge. We are tasked with seeking out scholarly works that display the highest quality of methodological rigor as well as showcasing the diversity of research that can be done in the field of education. We encourage fellow graduate students to work with us as external reviewers to ensure that the work we publish is exemplary. Perhaps most importantly, we collaborate with one another to guarantee that our publications are a true representation of the work we do on a daily basis as graduate students in the College of Education and Human Sciences at the University of Nebraska-Lincoln.

This work is challenging. It requires a great deal of coordinating schedules, finding willing volunteers, communicating the mission of this journal, and putting in extra hours that we probably don't have in between coursework, assistantships, comprehensive exams, and dissertation work. Regardless of the time we've been given and the other responsibilities that compete for our attention, time and time again we find time to put into this publication. For some of us, it is a considerable asset to add to our curriculum vitae. For others, it is valuable experience in higher education that allows us to develop useful skills for potential careers in research and academia, but for all of us, it is a labor of love. We put forth the effort because we are proud of the work we do here.

In this issue, you will find the remainder of the articles tied to this volume's theme of diversity, equity, and inclusion. The included papers are a testament to the variety of research topics undertaken by graduate students in the College of Education and Human Sciences and demonstrate how extensive educational research can be. The content spans from student citizen education to emotion regulation and metacognition. Regardless of the methodology employed, each paper contributes new information and unique perspectives to the growing knowledge base of educators at the elementary, secondary, and post-secondary levels. This dissemination of knowledge to foster a greater understanding of students, teachers, parents, instructional strategies, and curriculum is at the heart of our work here at the NEJ.

To our readers, thank you for reading. To our external reviewers, thank you for reviewing, and to our fellow board members, thank you for your steadfast efforts that continue to make this journal possible. Finally, thank you to our predecessors, the previous senior board members, Amy Barry, Taylor Hamblin, and Justin Andersson. Your leadership and your passion for excellence have pushed this publication to keep moving forward and to continuously set our sights on more and more ambitious goals with each passing year. This issue would not be possible without your dedication and hard work.

With Love,
Danika Lang
Heidi Jo Bartlett
Co-Editors-in-Chief, 2022

# Developing Metacognition: Leveraging a Spiral Curriculum to Enhance Strategy-Learning Programming

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## Abstract

There is significant converging literature that emphasizes the value of learning metacognitive strategies. Current approaches to teaching metacognition focus disproportionately on domain-specific strategies. These strategies emphasize domain-specific subject material rather than the metacognition itself. The following intervention proposal aims to develop a multi-level (5th-12th grade) metacognition program designed using a spiral curriculum. This novel approach flips the paradigm and chooses to center metacognition. Additionally, this program leverages encoding, retrieval, transfer-appropriate processing and, delivered specifically through the spiral curriculum, delivers content in a manner that encourages distributed practice, a concept that has been well-documented to be beneficial for learners. The proposed program could become a fully developed curriculum for use in schools and a general design is included in the methods section. Considerations are made for further discussion and development of evaluative measures of both the program and metacognition research itself. It should be noted explicitly that the following program is a *proposal,* carefully designed to reflect current research, but as of yet, has not been implemented or corroborated. It is the author's hope that the proposed program, if implemented, would be accompanied by research that would serve to validate the approach set forth in this manuscript or, perhaps, indicate where the program may fall short in its conceptual design.

*Keywords:* metacognition, spiral curriculum, strategy learning, program design, curriculum

Processes to encode new information and, subsequently, retrieve encoded information play an important role in learning. Humans have an additional layer of processing however, that enhances these two constructs even further. We are perhaps uniquely capable of thinking about our own cognitive processes. This "thinking about thinking" is commonly referred to as metacognition in psychology. There already exists a wealth of research that points to the value of metacognition in learning (Donker, De Boer, Kostons, Van Ewijk, & van der Werf, 2014) and that metacognitive strategies impact learning even after the initial learning episode (De Boer, Donker, Kostons, & van der Werf, 2018) Furthermore, research shows that metacognition is unrelated to aptitude and intellect and even compensates for delays or deficiencies in these domains (Swanson, 1990) It follows then, that educators who prioritize learning of metacognitive strategies are committed to enhancing the learning of their students.

Metacognitive strategies can be integrated into content-specific learning experiences. This integration is natural, relying on the learning of domain-specific strategies to enhance knowledge within a specific content area. However, researchers have delineated domain-specific strategies and higher-order strategies, that is, more generalized strategies which can be used to control other strategies (Pressley, Borkowski, & Schneider, 1987). Using this distinction, this proposal argues that direct instruction of general, higher-order strategies is deserving of stand-alone programming. Research on instructional studies also suggests that metacognition can be improved through modeling and direct instruction of strategy use (Jacobs & Paris, 1987). One could infer that a general program of this type benefits all student learning directly and enhances students' use of domain-specific strategies. The following program proposal outlines a unique, multigrade-level approach to explicitly teach metacognition that leverages a spiral curriculum, a curricular design initially conceptualized by Jerome Bruner (1960).

While there are potentially numerous additional benefits related to the design of this program including, but not limited to, self-efficacy, interpersonal development, and motivation, these benefits are beyond the scope of this proposal and is an opportunity for further research. Instead, the proposal will focus on presenting the program's aim and methodology in terms of metacognition, encoding, retrieval, and transfer.

## Key Terms

The following proposal includes several key terms that need to be precisely defined and placed within the larger context of psychology. While other cognitive constructs will be mentioned, the following terms will be used frequently and are of central importance to the proposal: encoding, retrieval, metacognition, and transfer.

*Encoding* is a cognitive process by which, information is placed into long-term memory (Bruning, Schraw, & Norby, 2011). The process of encoding can be enhanced through several strategies. These strategies are best conceptualized by the levels of processing framework developed by Craik and Lockhart (1972). In this view, the quality of memory for information is dependent on the way the information is initially analyzed (Craik & Lockhart, 1972). A handy generalization is to place encoding strategies on a spectrum between "shallow" and "deep" levels of processing. Strategies that prioritize maintenance rehearsal—maintaining information for as long as possible in short-term memory—are considered shallow while increasingly elaborative techniques like the use of imagery, mnemonics, and guided peer-questioning promote deeper levels of understanding. While it is best for the encoding strategy to fit the complexity of the to-be-learned information, it is advisable to encourage students to engage in deeper levels of learning as much as possible. A key component of the proposal program is geared toward

instructing students explicitly about encoding and specific encoding strategies so that they trend toward using increasingly elaborative techniques in their learning.

*Retrieval* is the cognitive process of accessing information from long-term memory and bringing it to consciousness (Bruning et al., 2011). Retrieval of information is tightly linked to the way information was initially encoded. However, it is important to note that retrieval processes like recall and recognition are highly contextualized and memory is reconstructed, not merely regurgitated exactly as it was encoded. One key understanding is that learning increases when students generate their own contexts for meaning (Slamecka & Graf, 1978). This understanding is operationalized in the program by the generation effect, elaborative interrogation, and guided peer questioning.

Another key understanding is that distributed practice is more efficient than massed practiced (Ashcraft, 1994). This understanding is operationalized through the novel use of the spiral curriculum. Distributed practice is characterized by regular periods of practice of the to-be-learned information. The spiral curriculum uses distributed practice to its full effect, not only extending the practice of cognitive and metacognitive processes throughout the school year, but then also in subsequent years of schooling (see *Table 1)*. This cohesion of learning over several years, provides the basis for powerful metacognitive learning.

*Metacognition* is the focus of this program proposal and must be placed into context with other important cognitive principles and educational goals. The term "metacognition" was conceived by Flavell in 1979 as, "knowledge and cognition about cognitive phenomena" and was further elaborated on by Ann Brown in 1980 and 1987. Brown made a helpful distinction between two dimensions of metacognition that are central to the program proposal.

The first dimension is knowledge of cognition and it is subdivided into three component parts: declarative knowledge, procedural knowledge, and conditional knowledge (Brown, 1987) All three components are directly addressed in the program. Declarative knowledge concerns knowledge about ourselves as learners including human capacity for information and the factors that affect our cognitive performance. The earliest stages of the program operationalize this knowledge by explicitly teaching the cognitive concepts of metacognition, encoding, retrieval, and transfer. Procedural knowledge is the knowledge of how to use cognitive strategies themselves. Conditional knowledge is the ability of an individual to accurately assess when to use a strategy to maximize effectiveness and why. All three component parts are explicitly taught and serve as a centerpiece to early instruction.

The second dimension of metacognition, according to Brown (1987) is the regulation of cognition through planning, monitoring, and evaluation. Planning consists of any process of identifying appropriate strategies for use and the allocation of resources for a task. Monitoring is the evaluation of progress during a planned task or process. Evaluation is the appraisal of both the metacognitive strategies used and the outcome of the perceived learning. This repertoire of actions is required of students throughout the program and is consciously taught early on explicitly and revisited with frequent reflection. One of the theoretical assumptions of this metacognitive program is that conscious reflection of regulation of cognition is key to automating these processes (Brown, 1987).

Both dimensions are not only taught as concepts within the program but used within the instruction of the program itself. In this manner, students will be using metacognitive strategies to learn about metacognition. This serves two purposes, increasing knowledge of metacognition and providing practical experience in using general metacognitive strategies. Developing a

strong base knowledge of metacognition will further improve students' ability to adapt these techniques to any domain of learning.

***Transfer*** is the process by which an individual uses previously learned strategies in new settings. Transfer assumes that encoding, retrieval, and metacognitive strategy use are heavily dependent on context. This is a significant pitfall for any encoding or metacognition training and can hinder all learning. For this reason, teaching the transfer of strategies (Pressley & Harris, 2006) is a highlight of this programming. A major component of the program design is the inclusion of domain-specific strategy development via integration of content from students' other classes. This not only links strategies directly to their application (Duffy, 2002) but also encourages application of strategies in many different, authentic settings (Mayer & Wittrock, 2006). Again, the spiral curriculum design serves to help automate these processes as well, further encouraging successful transfer.

It is important to consider the current author's conceptualization of a spiral curriculum. The concept sprang from a single line in Jerome Bruner's *The Process of Education,* "any subject could be taught to any child at any age in some form that is honest" (1960). This idea has since been mistranslated, maladapted, and taken out of context. Current understandings often reduce the concept to a simple revisitation of instructional material periodically over time. This interpretation misses the spirit of the message. Rather, a spiral curriculum, in theory, is effective in that it is designed to explore a few central phenomena repeatedly, over time, in a manner that is developmentally appropriate for a learner. Crucially, this means that the instruction must adapt *with* the capacities of the learner. Readers may note in the subsequent program overview that this spirit is kept intact and that the concepts explored are revisited and reapplied to the student experience at increasing levels of complexity and nuance. This approach to metacognitive

training is novel and while there is broad discussion and criticism of the implementation of a spiral curriculum, the current proposal has narrowed its focus to highlight how this approach makes the most of the benefits of distributed practice mentioned above.

## Program Overview

The proposed program is designed as a multi-year curriculum encompassing the equivalent of 5th through 12th grades. It is designed to teach students about encoding, retrieval, transfer, and metacognition as well as specific strategies within each of these constructs at developmentally appropriate levels. It considers research suggesting that metacognition develops relatively late (Baker, 2002) and that student ability to recognize the need to harness their memory develops slowly throughout childhood (Pressley & Schneider, 1997). While this design was built to accommodate a typical school environment, the spiral curriculum approach enables a high level of adaptability and could be implemented on a smaller scale as a specific academic intervention and is readily integrated with more typical content-specific courses. The time frame in which this program is delivered can also be condensed or lengthened to suit the wide variety of organizations and institutions that may ultimately consider this approach. It should be noted however, that a strength of the program is in its commitment to intentional distributed practice delivered over several years in increasing levels of granularity and complexity.

Research suggests that strategy instruction usually benefits students regardless of aptitude or intellect but is particularly helpful for lower-achieving students (Bruning et al., 2011) and strategy instruction has been rated with importance across a diverse range of cultures (Hattie, Biggs, & Purdie, 1996). Additionally, a new research proposal has offered that certain components of metacognition may have parallel constructs with executive function and might be beneficial for developing an individual's dorsolateral prefrontal cortex (Brooks, in press). These

wide-ranging benefits suggest that almost any student can benefit from this programming and it is well-fit for whole-school implementation.

Concerning implementation, if designed effectively, the proposed curriculum could be manualized for distribution to individual schools and districts. Additionally, curriculum specialists could be engaged to further aid in the implementation of the programming and to help individualize it to accommodate the variety of educational settings that exist. Implementation considerations are not extensively explored in the current proposal.

## Program Design

*Table 1* provides an overview of the design, with broad program goals for each cohort as well as examples of specific strategies and activities. It should be noted that the goals and examples are not exhaustive and have been tailored to the focus of this proposal. In keeping with the spirit of the spiral curriculum, increased levels of task and content complexity are integrated into the instructional design. The 5th-6th grade cohort is designed to be provided instruction via the 9th-10th grade cohort and evaluated by the 11th-12th grade cohort. The 9th-10th grade cohort's curriculum design is assisted and evaluated by the 11th-12th grade cohort. To clarify, it should be assumed that a student would be receiving two years of instruction within a cohort before moving onto the next, not that a student receives the content once during a two-year time span.

## Program Discussion

In the 5th-6th grade cohort, the primary aim of the program is to build the base knowledge, comprehension, and foundational instructional strategies that will be used in subsequent years. This involves an in-depth exploration of the key terms' definitions, sub-components, and applications. These terms and concepts are designed to be taught using metacognitive strategies.

Students plan, monitor, and evaluate their learning of these materials. Additionally, students begin to explore how to begin transferring the knowledge gained in this program to other content classes. To offer an example, after receiving explicit instruction on the Peg method, students design their own Peg method system and apply it to both the current program and an outside content class.

The 7th-8th grade cohort is focused on reinforcing the learning from the previous cohort. Reflective activities encourage students to examine their use and knowledge of metacognition, encoding, retrieval, and transfer. The concepts are explored in increasing granularity and complexity and, specifically to enhance transfer, this cohort should begin to integrate the skills learned into students' other classes. This helps students apply their learning in new contexts. Furthermore, as a tie-in with state-dependent learning, this cohort serves as an opportune time to potentially integrate independent social and emotional learning programming, providing further benefit to students.

The 9th-10th grade cohort concerns itself with the application and synthesis of the core concepts. These students are tasked with creating the very curriculum that they will then teach to the youngest cohort. Not only does this design once again make students consider their prior knowledge, further reinforcing the information and its applicability, but it takes advantage of reciprocal teaching. This design could encourage deeper reflection on the core concepts and practical insight into how individuals learn. This serves to enhance their knowledge of transfer which can then be leveraged into their content classes outside of the program.

The 11th-12th grade cohort is centered around analysis and evaluation. During these years, students are in their final stages of the program. In this stage they are tasked with assisting and evaluating the 9th-10th grade cohort's curriculum design. To do this, they must draw on their deep

knowledge of the content and their own experiences in the process. This cohort also must analyze the success of the program for the 5th-6th grade cohort. At this point in the program, they have experienced the full range of instructional design. As a final project, they are to develop their own individualized learning program within a domain of their choosing. This process and evaluation is captured through the development of a portfolio and an oral defense of their design, using themselves as evidence.

## Conclusion

While this proposal program supports a comprehensive and research-informed curriculum, it is not without its limitations. As the program encompasses several years and involves the interaction of multiple grade levels, it presents logistical and implementation challenges that, while crucially important, are beyond the scope of this broad proposal document. The complexity of the design can serve as much as a weakness as it does a strength. The planning required to operationalize this program would require significant amounts of time and human energy. It also incorporates a structure that is not currently seen in contemporary educational settings. This requires a willingness to embrace a paradigm shift away from domain-specific curriculum design (content classes) and, as such, would require significant retraining and professional development for educators to specifically prepare for implementing the programming.

A reasonable starting place for this programming or a close adaptation thereof, could be within specialized programming, like as an intervention for a smaller, focused cohort of students. Ideally, this proposal could become the flagship program of a newly developed non-traditional school.

Evaluating both the efficacy of the program and student performance within the program also requires thinking in a new direction. Regarding the former, this author, within a separate proposal has explored using a multi-method approach that bridges the gap between the cognitive concept of metacognition and the neuroscientific construct of executive function (Brooks, in press). New techniques and assessments used to evaluate executive function could offer evidence for prioritizing this type of programming. Regarding the latter, strategies ranging from simple, teacher assessments of student strategy and student self-assessment on instruments of metacognition like the Motivated Strategies for Learners Questionnaire (MSLQ) to complex, global measures of student performance on common academic achievement tests pre- and post-program could all be useful methods to evaluate students. The nature of the programming requires a rethinking of evaluative measures and priorities themselves, a difficult issue worth exploring entirely on its own.

However, just because something is difficult and different should not preclude it from being attempted. This program has the potential to fundamentally shift what is prioritized in educational environments. Researchers have discovered so much about how we learn. This proposal offers a program that was designed to use those discoveries as a starting point.

**Table 1**

**5th-6th grade cohort** *(instructed by 9th-10th grade cohort; evaluated by 11th-12th grade cohort)*

| Broad Program Goals | Specific Strategy Examples |
|---|---|
| • Define and discuss value of Metacognition, Encoding, Retrieval, and Transfer | **Encoding**- mediation, imagery, mnemonics, guided questioning, levels of processing |
| • Teach specific strategies for Metacognition, Encoding, Retrieval, and Transfer | **Retrieval**- recognition, recall, elaborative interrogation |

| | |
|---|---|
| • Use metacognitive approach to deliver instruction (e.g., planning, monitoring, evaluating)<br><br>• Begin to explore domain-specific applications outside of program | **Metacognition**- regulation of cognition (e.g., planning, monitoring, evaluating) |

**7ᵗʰ-8ᵗʰ grade cohort**

| Broad Program Goals | Specific Strategy Examples |
|---|---|
| • Revisit all concepts above with further granularity and sub-component definitions (<br><br>• Emphasize transfer to domain-specific contexts<br><br>• Encourage reflection on strategy use<br><br>• Encourage reflection on value<br><br>• Continue to use metacognitive approaches to deliver instruction | **Encoding**- reflection, additional elaborative techniques<br><br>**Retrieval**- State-dependent learning, reconstruction<br><br>**Metacognition**- knowledge of cognition (declarative, procedural, conditional)<br><br>**Transfer-** integrate learned strategies into content classes |

**9ᵗʰ-10ᵗʰ grade cohort** *(curriculum design assisted and evaluated by 11ᵗʰ-12ᵗʰ grade cohort)*

| Broad Program Goals | Specific Strategy Examples |
|---|---|
| • Develop and design curriculum for teaching metacognition, encoding, retrieval, and transfer<br><br>• Instruct 5ᵗʰ-6ᵗʰ grade cohort using designed curriculum<br><br>• Reflection on teaching strategies and learning outcomes | Reflective activities on prior knowledge of metacognition<br><br>Reflective activities on transfer to content classes<br><br>Adaptation of mnemonics<br><br>Reciprocal teaching with 11ᵗʰ-12ᵗʰ grade cohort |

| Broad Program Goals | Specific Strategy Examples |
|---|---|
| • Continued self-integration and monitoring of metacognitive strategies within domain-specific content classes | |

**11ᵗʰ-12ᵗʰ grade cohort**

| Broad Program Goals | Specific Strategy Examples |
|---|---|
| • Peer assist curriculum design of 9ᵗʰ-10ᵗʰ grade cohort<br><br>• Evaluate performance of 5ᵗʰ-6ᵗʰ grade cohort and provide instructional feedback for 9ᵗʰ-10ᵗʰ grade cohort<br><br>• Evaluate success of metacognitive program and reciprocal teaching design<br><br>• Develop personalized exploratory class within a choice domain | Portfolio creation<br><br>Program evaluation<br><br>Self-assessment of strategy use<br><br>Oral defense |

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# A Thematic Analysis of Faculty Advice for Doctoral Students

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## Abstract

The present study examines advice given by the graduate faculty in a department (n=24) to new Ph.D. students in the department. The thematic analysis employed inductive coding to draw themes from the data, and seven salient themes emerged from the interviews: *relationships, openness, individuality, purpose, academic work, self-care, and logistics*. Grounded in a theoretical framework of social constructivism, the present study analyzes how knowledge is created as a social artifact that is passed down from faculty to graduate student and highlights the ways in which doctoral students then shape the meaning of said knowledge through their own interpretations and actions. This study analyzes the interview data to examine the ways in which systemic challenges of pressure and power are perpetuated within academia and highlights the many ways in which graduate faculty are truly invested in their students and their well-being. The findings serve as a catalyst for introspection for the various actors in academic systems, while providing an uplifting motif of genuine care for the overall wellness of doctoral students.

*Keywords:* constructivism, thematic analysis, faculty advice, sociocultural learning theory, doctoral studies

**Introduction**

Extensive research has been done on the experiences of doctoral students entering academia, the roles of university faculty, and the complex dynamics between doctoral students and their mentors (Antony, 2002; Astin, 1984; Weidman & Stein, 2003). Research has also paid close attention to the areas of graduate student recruitment, retention, career choice, involvement, and academic success. Studies like Zhang (2018) have looked at effective mentoring strategies to help faculty members in the process of mentoring, and findings from various scholars have focused on the elements that lead to success in graduate school. However, there is no previous research that has specifically analyzed advice given from faculty to doctoral students.

The advice faculty choose to give students provides a unique window into their own experiences within the academy – both as faculty members and previously as doctoral students – into their priorities, and even into what they hope to see in the future. We are as much concerned with *what* advice is given as we are with understanding what that might mean about *why* faculty have chosen those particular words of wisdom. The purpose of the present study, therefore, was to better understand faculty members' shared priorities for doctoral students across an entire department as illustrated by their advice to doctoral students, and to explore the implications of these commonalities. By synthesizing the perspectives of the faculty in a university department when advising new students, this study provides insight regarding the construction of human knowledge and mechanisms of socialization in academia.

As part of an introductory course required for all first-year doctoral students, the faculty in the department were interviewed by the course instructor - a tenured professor - and asked to provide their advice for new Ph.D. students. This study seeks to analyze and synthesize the

advice in order to answer the research question: *What are the shared priorities of faculty when it comes to advising doctoral students, and what can be learned about the PhD program experience from these priorities?* We will first establish a theoretical framework that positions social constructivism and the construction of knowledge as a human product at the core of our argument in an effort to illustrate the notion that the advice given from faculty to graduate students shapes the graduate student experience. The method section will then outline how this study was carried out, followed by the findings, and concluding with implications for future research.

### *Theoretical Framework*

This study is grounded in Vygotsky's (1978) social constructivism theory, especially as this theory pertains to knowledge construction. As shown in the literature, social constructivism theory is deeply tied to both socialization processes (how we learn from social interactions), and to the emergence of cultural artifacts (what we pass down from generation to generation), including knowledge in the form of advice. A closer look at existing research about graduate student socialization within the framing of sociocultural theory can be useful in analyzing the implications of the advice being given from faculty to Ph.D. students.

Constructivism, as conceptualized by Piaget (1966), proposes that learning is constructed through the accommodation and assimilation of past and present experiences. Bruner (1960) takes constructivism further, adding that social interaction plays a significant role in cognitive development. Stemming from Bandura's 1977 social learning theory and Vygotsky's 1980 sociocultural learning theory, social constructivism highlights the interplay between learners and models as well as the importance of cognitive processes that derive meaning from experiences. The theories of behaviorism, cognitive theory, and sociocultural theory scaffold a foundation for

understanding of social constructivism (McMahon, 1997). First, behaviorist theories propose that learning happens from stimulus-response cycles that either reinforce or discourage patterns of behavior (Skinner, 1963). However, cognitive theory argues against the oversimplification of operant theories, adding that there is an important dimension of individual cognitive awareness, introspection, and reflection which cannot be neglected (Bruner, 1960). Finally, Vygotsky's (1980) sociocultural learning theory positions the co-construction of knowledge as a socially-mediated process in which observation of models serves as the main source for the construction of knowledge.

The aggregate of behaviorist theory, cognitive theory, and sociocultural theory leads to the logic behind Vygotsky's 1978 theory of social constructivism, which states that learning takes place through reinforcement in social contexts and from the meaning that is individually and socially derived from various experiences. Social constructivism holds true the idea that interactions between individuals serve as the core for construction of knowledge, adding that learning happens from and within the reinforcement obtained in social interactions (Vygotsky, 1978). Constructivism posits that the ways in which learners interpret experiences and the conclusions they draw from those experiences with others are as important as the experiences themselves.

In the domain of advice-giving and receiving, social constructivism would emphasize that giving advice reveals plenty about the giver's experience, and receiving advice shapes the receiver's future experience and perception. For instance, if you enter a restaurant and a friendly stranger offers you the advice to steer clear of the oysters, three things are likely to occur. First, you will be unlikely to order the oysters, or you might feel hesitant about them if you do choose to order. Second, you will wonder what is wrong with the oysters and perhaps generalize that

advice onto other aspects of that restaurant. Finally, you might even pass that advice on to others, whether or not that experience has been your own. In the domain of doctoral programs, advice from faculty directly impacts the experience of graduate students and, if faculty are advising for or against something, it also shows that they themselves have had that experience.

One key concept of social constructivism is that the human mind is *mediated* through social interactions and social artifacts (such as knowledge and advice) embedded into our thought processes (Lantolf, 2010). The concept of the mediated mind relies on external actors shaping our cognitive and affective perspectives. Mind mediation can happen through various actors, such as "shared modeling of social customs and hierarchies," (Nelson, 1998). The process of having faculty at a university give advice directly to doctoral students is social constructivism and mind mediation in its purest form. The faculty construct knowledge based on their own past experiences and schemas, passing it down to doctoral students who then receive that knowledge and actively alter it through their own interpretations and conclusions.

When researchers have examined advice, they have usually drawn upon advice given horizontally, across disciplinary hierarchies, meaning what faculty thinks faculty should do, or what students think students should do. The present study, however, is not concerned with the utilization of advice and organizational behavior (Van Swol et al., 2018). Instead, this study's focus is on analyzing the possible reasoning behind advice given from mentors to mentees in academia and understanding what might be revealed about a system when looking at commonalities across various individuals navigating the same system in unique yet similar ways. Returning to our restaurant analogy, we are interested in understanding what the advice of two dozen restaurant managers might reveal about the restaurants themselves. In the world of

academia, what can be learned about the Ph.D. program experience by analyzing the commonalities between the advice faculty choose to give new doctoral students?

In analyzing the construction of knowledge between faculty and doctoral students (mentors/mentees), systems theory is another beneficial framework as it highlights the interactions between different levels in an environment. Bronfenbrenner's ecological model (1979) illustrates the ways in which social environments shape individual human development, and Zhang (2018) uses Bronfenbrenner's ecological approach to examine academic advising for students, focusing on the interaction between individual and contextual factors at play in the experience of college students. Various studies like Zhang's have looked at such interactions, analyzing best practices for faculty advisors or for graduate students, but an analysis has not been done on general advice given directly from faculty to doctoral students regarding their doctoral journey.

When individuals who are further ahead or higher up within a system provide advice for those just entering a system, the advice itself can outline the organizational power hierarchies and common challenges faced within that system. As noted by Kukla (2000), members of a society together invent the properties of the world. Bandura's 1978 reciprocal determinism theory likewise states that there is a tri-directional relationship between a person's behavior, individual attributes, and social context. In other words, a person's behavior shapes their social context and personality just as much as the behavior itself is shaped by the context and personal attributes.

Additionally, Bronfenbrenner and other systems theorists posit that systems actively work to maintain themselves, so top-down advice within a system must also inherently function to reproduce some of the same challenges previously faced by those with more

experience. In *Introduction to Sociocultural Theory,* Lantolf (2000) states that, "Physical as well as symbolic (or psychological) tools are artifacts created by human culture(s) over time and are made available to succeeding generations, which can modify these artifacts before passing them on to future generations" (p. 1). Advice passed down from generation to generation can therefore be conceptualized as psychological artifacts, built upon and modified by each generation. A thematic analysis of these psychological artifacts within the culture of academia can reveal aspects of the academy and the dynamics within it that might otherwise remain unexplored.

**Method**

*Participants*

Participants for this study included all of the faculty members from a university department (n=24). Faculty were asked to participate by the course instructor, a tenured professor in the department, and all agreed to be interviewed. Every faculty member in the department participated, including the course instructor, who provided their advice to the authors via email following the completion of the course. While the sample size is relatively small and having faculty from only one department is a possible limitation, we believe that the demographics within the department are quite diverse in age, gender, race, and the nature of individual professional experience and personal background. 33% of participants were male (n=8), while 66% of participants were female (n=16). Out of the 24 participants, 75% (n=18) identified as White, roughly 4% (n=1) identified as Asian, roughly 8% (n=2) of the participants identified as Latino, roughly 4% (n=1) identified as Indian, and approximately 8% (n=2) of the participants identified as African or African American. Every participant held a Ph.D. and was a full-time faculty member, though their individual experiences ranged from recent immigrant to American citizen, no experience outside of the university domain to decades

of domestic and international teaching experience, and a wide variety of specializations and disciplines within the field of education.

*Procedure*

**Data collection.** The interview data was collected by the professor teaching the required doctoral seminar. The course instructor asked all faculty members in the department to meet with them individually via online video conferencing and all of the interviews were recorded and made public. The authors were both first-year Ph.D. students and enrolled in the required course at the time of the interviews. 22 of the 24 interviews were conducted by the course instructor through individual online video conferences. One faculty member was unable to schedule a time for the interview, so they sent their advice to the instructor via email. The final piece of advice was that from the course instructor, which was sent to the authors of this study via email upon their completion of the course. It is important to note that faculty members were asked to provide just one piece of advice for new Ph.D. students, so responses were limited to what each faculty member chose to prioritize above everything else. All faculty members were asked to answer the interview question, "What is one piece of advice would you give first-year Ph.D. students?" during their faculty interviews.

**Data analysis.** The 22 interviews were transcribed by the authors and inductive coding was used to look for overarching themes through numerous iterations. Four transcripts were first randomly selected for the initial round of thematic analysis and coding. Initial codes, illustrated in Figure 1, sought to capture commonalities across participants. After four rounds of recoding, the authors were able to identify seven codes that accurately captured the data and created the coding frame for the data analysis. The resulting coding frame was flat, with equal value assigned to each code. With the organizational structure in place, each author

individually coded the interviews, extrapolating and organizing direct quotes by theme. Using

the coding frame, the authors were able to quantify the results and interpret the significance of

that numerical data in conjunction with the qualitative data (see Figures 1 and 2).

The original thematic analysis yielded seven general themes, which included:

relationships, passion/interest/affective, intellectual immersion, purpose, pressure, micro vs

macro thinking, mindfulness, imposter syndrome/self-efficacy/belonging, the game of academia,

and patience/humility/personal growth. By the last round of coding, seven salient themes

emerged from the interviews: *relationships, openness, individuality, purpose, academic work,*

*self-care, and logistics* (see Figure 1).

*Figure 1: Seven Themes*

| Relationships | Individuality | Purpose | Openness |
|---|---|---|---|
| Relationships<br>Advisors<br>Pursuing faculty<br>Taking initiative<br>Courage | Hike your hike Agency<br>Self-efficacy Belonging<br>Experience<br>Self-advocacy Individuality<br>Marathon vs sprint Belief in<br>self | Passion<br>What is your why?<br>Sand in your shoes | Humility<br>Flexibility<br>Transformation<br>Growth<br>Failure |
| **Logistics** | **Self-Care** | **Academic Work** | |
| Planning<br>Setting priorities<br>Time management | Self-care<br>Joy<br>Mindfulness<br>Pressure | Reading<br>Writing<br>Exploring<br>methodology<br>Early scholarship<br>Intellectual<br>immersion<br>Interdisciplinary<br>curiosity<br>Effort<br>Hard work | |

**Findings**

Of the seven themes that emerged from the data (relationships, openness, individuality,

purpose, academic work, self-care, logistics), five are concerned with intangible aspects of the

doctoral journey, and two remain focused on the concrete obstacles that doctoral students might face. 29% of participants (n=7) spoke about the importance of various relationships. 42% (n=10) focused largely on the importance of remaining open-minded. Three of the themes – maintaining one's sense of individuality, focusing on purpose and passion, and handling logistics – were each mentioned by 25% of participants (n=6). Finally, 38% (n=9) focused on aspects of academic work, and 21% (n=38) focused on the importance of self-care. Table 1 illustrates the results by percentage of participants per theme, while Table 2 illustrates the results by number of individual participants per theme.

*Table 1: Results by Percentage of Participants per Theme*
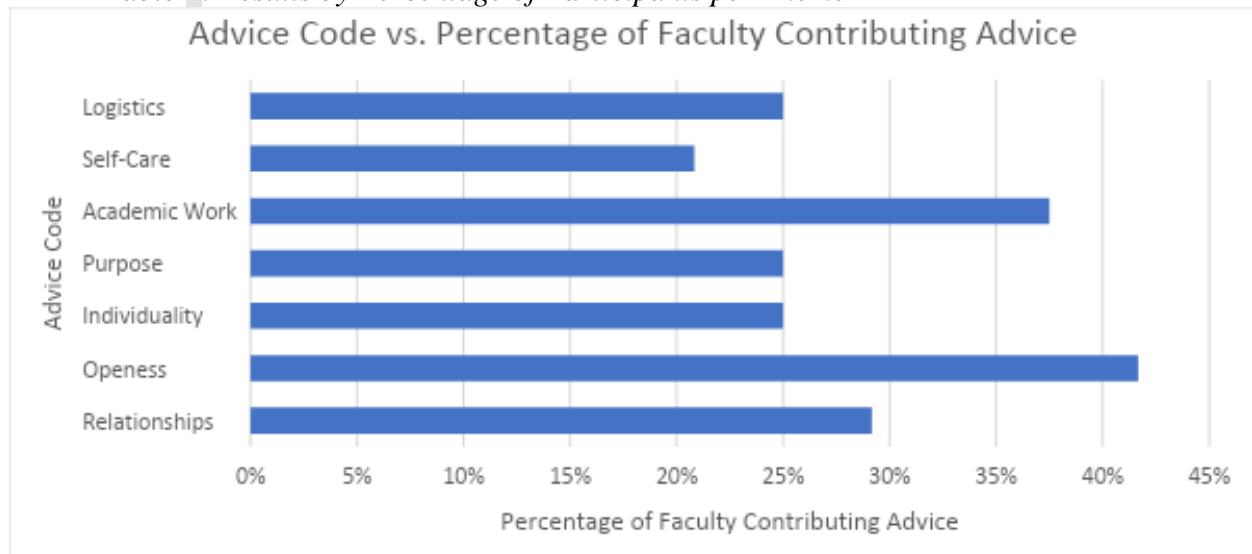
*Table 2: Results by Number of Individual Participants per Theme*



Number of Faculty Contributing Advice vs. Advice Code
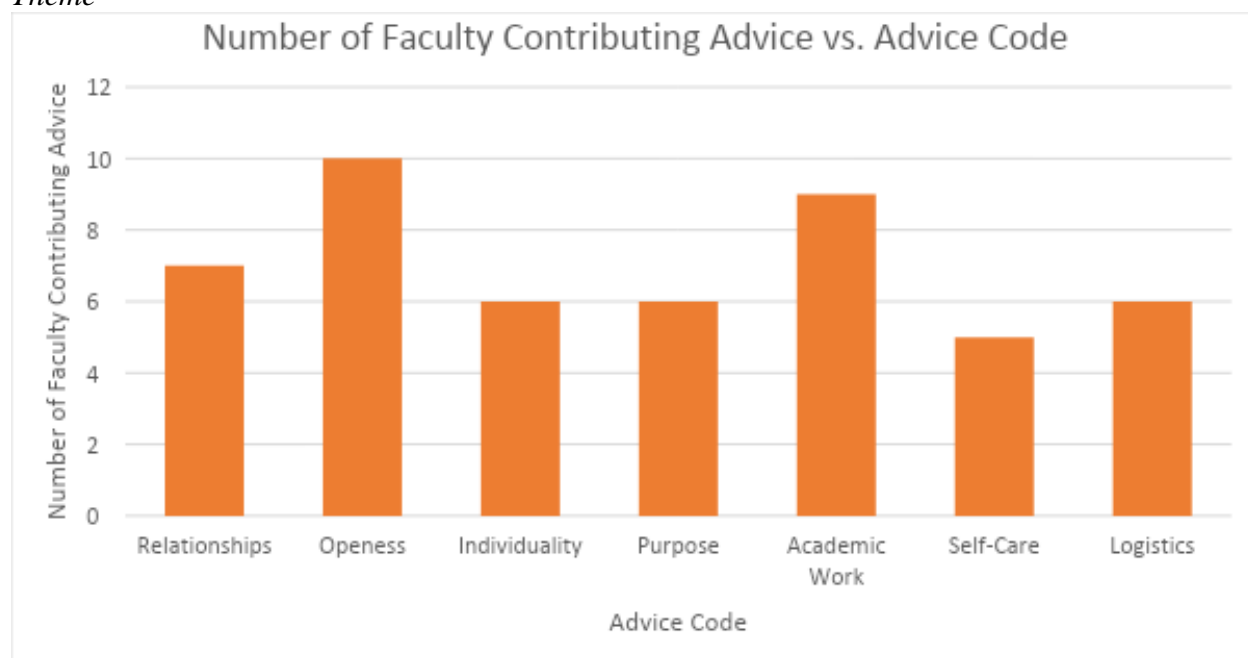
The theme found in the data most frequently, with 42% of faculty speaking to its importance, is the theme of *openness*. This theme across the data encompasses the ideas of humility, flexibility, transformation, growth, and failure. Another theme we identified is *individuality*. 25% of UNL graduate faculty contributed advice about individuality, which includes doctoral students having a sense of belonging and agency, having autonomy over their Ph.D. program, and an understanding that a doctoral program is a marathon where one must navigate the system bravely as an individual. Nine of twenty-four faculty members' advice extended into *academic work*. Academic work is centered around reading, writing, and leveraging different opportunities for research, acknowledging the fact that completing a doctoral program is not possible without immense amounts of effort and time, especially time devoted reading and writing. 25% of graduate faculty contributed advice about navigating the *logistics* of a doctoral program. The theme of logistics across the data includes elements such as having a clear plan for which classes to take, setting priorities for time management and commitments, and utilizing tools needed to successfully complete a Ph.D. program.

Five of the faculty members (21%) referenced the idea of *self-care* and mental health in their advice. Being present, keeping the journey in perspective, and showing kindness and compassion for oneself are all elements of self-care that the faculty proved to value. Another salient theme throughout the interviews was that of *relationships* and their significance and impact on a graduate students' trajectory. Seven faculty members (29%) referenced this theme in their piece of advice. Finally, six out of the 24 faculty members (25%) spoke about the theme of *purpose and passion.* This theme highlights the idea that doctoral students must ensure that they do not lose sight of why they embarked on this challenging journey and the greater purpose they are working toward in order to draw strength from that passion and meaning, particularly in moments of need. In the sections that follow, we will provide a broader explanation for each of the themes, including specific examples from the data.

### Theme 1: Openness

*Openness* was found across the data as the ideas of humility, flexibility, transformation, growth, and failure. Faculty member Q's advice was entirely centered around this idea. They encouraged students to remain humble and open to learning, regardless of their level of experience, and spoke about the importance of revisiting literature or concepts that might seem familiar, because they can hold entirely new levels of depth and complexity as our perspectives evolve with time and experience. This faculty member gave the example of taking the same course as a master's student and later as a doctoral student and getting completely different value out of the course each time. They encouraged doctoral students to jump into new opportunities and to not shy away from big responsibilities.

Faculty members W and N each mentioned the importance of being open to new opportunities and experiences, trying new things, and "putting yourself out there." Similarly,

faculty member V said we should "be willing to take some detours along the way," and faculty member E encouraged students to be receptive to new possibilities and to learning something new that might lead to new and exciting directions. Likewise, faculty member F cautioned against holding on to the "grand notions" with which students enter doctoral programs, and stated that, while it is important to have a plan, it's equally important to know that there's no perfect pathway. This professor also spoke about the everyday realities that will change those original plans and assured students that these detours are healthy preparation for the imperfect roads that make up academic life in general.

This theme was presented in a slightly different variation from faculty member X, who encouraged doctoral students to "be a little selfish." She spoke of a doctoral journey as an "incredibly special and unique time" and "very much the time for students to become who they want to be and learn the things that they want to learn on their becoming journey." In a tangential piece of advice, faculty member M illustrated the importance of failure as a teacher and "a pathway to success." The theme was perhaps most succinctly summarized by faculty member I who said, "transformation takes time, effort, and most importantly, openness to others' feedback and a willingness on your part to grow intellectually."

***Theme 2: Individuality***

*Individuality* as a theme is conceptualized as having autonomy and agency, having a sense of belonging, and being confident in one's personal purpose and attributes. At some point during a doctoral program, everyone experiences questions of "What am I doing here?" or "Why did I decide to do this?" and these questions are a direct product of doing challenging work that is not always linear and rarely follows a clear or predictable path. Faculty member D commented, "Remember that you do belong here. That who you are matters, and that

you shouldn't reserve what you have to say because you're here and you deserve to be here." For doctoral students, remembering that their program intentionally selected them can be helpful reassurance when challenges feel insurmountable. In the same vein, sometimes advisors might be interested in an area of research or project that doctoral students are not invested in, and faculty member W states that when that happens, self-advocacy is invaluable. Faculty member K expands on this notion by saying that no other advice matters for doctoral students unless they truly analyze who they are as individuals at their core. This professor said, "Own who you are, never forget where you come from because that in itself will fragment you and keep you from enacting change because all of you [first year Ph.D. students] can start changing the world right now." If doctoral students do not yet have a foundational understanding of their own identity and take ownership over that identity, it will be challenging for them to find the sense of belonging and to advocate for themselves within a doctoral program.

Since Ph.D. programs are completed by individuals, there is something to be said about sticking to unique, individual plans and not being distracted or intimidated by others' progress. In a sense, doctoral students have full autonomy over the path they choose. Faculty member C uses the analogy of "hike your own hike," as they want people to understand that graduate school is not the place to be in competition with others but the time to focus on what you want out of the experience. This professor stated:

> *Grad school is the place for you to pursue what is important for you and to think about how those commitments matter in the larger realm of education. There is no shortage of problems out there. What is your unique contribution to the problem that you see the most pressing?*

Faculty members across the study compared graduate school to various sorts of physical journeys. Faculty members T and I compared doctoral programs to running a marathon, emphasizing the notion that truly investing oneself and pacing the work in a way that allows for meaningful scholarship is one of the most important factors for success. Faculty member I advised Ph.D. students to remember that during a marathon there is transformation happening and that professional identities should be transformed by the time a doctoral program is completed. Faculty member T warned students that it is an individual marathon and that doctoral students are the only ones who can prevent themselves from crossing that finish line. This faculty member talked about having the willpower to push through hardship when the end might not be in sight, adding that doctoral students are constantly learning to engage in the highest level of scholarship which can be very challenging, so it is important to push themselves through those hurdles by remember who they are as individuals.

Faculty member F added another layer of complexity to the idea of holding on to individuality within a doctoral program. They focused on the idea of agency and highlighted the fact that "programs don't just happen to people." They added that graduate students often struggle with the management of their program, the power or agency to decide who they want to be at the end of the journey. This faculty member stated:

> *You came into this program with an idea of a particular identity that you wanted. Who is*
>
> *that and how do we flush that out? What are the skills? The content knowledge? The*
>
> *belief structure that we need to push on, collaboratively, to get you there?*

They cautioned that faculty cannot make those ideals a reality for their students, and that students must be the ones to forge that path for themselves, with the scaffolding and guidance from

faculty. Faculty member F stated that graduate students must know what their "big dreams" are before they can get support and guidance toward achieving those dreams.

### *Theme 3: Academic Work*

The theme of *academic work* speaks to the importance of immersing oneself in the real work of scholarship through constant reading and writing. "Read, read, and read some more" is one piece of advice offered by faculty member J. Another faculty member expands on that by saying, "Read and write in an interdisciplinary way. Don't just limit yourself to your discipline, whether it's social studies education or language acquisition or you know whatever your official academic niche is, go big or go home." Faculty members acknowledge the tension between everything that there is to do in order to become a successful scholar, and the real time limitations faced by everyone. Reading and writing take great amounts of time, and various faculty members encourage students to cope with this tension by remembering to "relish in those moments during the week when [they] have a couple of hours to sit down and write something or to read something." Other faculty members suggested that reading is one of the most important ways students can improve their writing.

Writing was the focus for three different graduate faculty members. The general sense was that writing is challenging and time consuming, but that it does not have to happen alone. Faculty members suggested that writing often happens most effectively in groups, and one professor expanded on this by saying:

> *Write with your advisor if they're willing to write with you, write with other peers*
>
> *that are willing to work with you, or if you're writing on your own still get together on*
>
> *the weekend mornings, whenever you have an opportunity, and get going on this thing*
>
> *with accountability partners because the writing thing is the hardest thing to accomplish.*

Two faculty members spoke to the fact that lazy writing without a commitment to excellence will not prove to be fruitful for doctoral students, and encouraged students to embrace the process of revising and editing various drafts in order to create writing that they are proud of.

Another aspect of *academic work* is the need for doctoral students to work on research projects, to design and carry out their own projects, and to figure out what methodologies and designs work best for them. One faculty member urged Ph.D. students to pursue these insights before their dissertation, as that is not the time to be figuring out what they do or do not enjoy in research. They advised students to start looking deeply in whatever direction interests them, to design studies, pilot studies, and collect data as early as they can, because this is the only way to figure out their own voice as researchers. Another professor urged Ph.D. students to put themselves out there and contact faculty members who they might be interested in working with. Faculty member B encouraged students to immerse themselves in their work, while faculty member V promoted the benefits of attending conferences to share their work and grow their network. All of this advice highlights the need for a strong work ethic, but also underscores the need for strategic decision-making in the work that is done to leverage all opportunities presented.

### Theme 4: Logistics

While *logistics* are often dismissed as basic common knowledge, navigating the complex structures of graduate programs can require quite a bit of cultural and systemic understanding of those structures. Even for students who have spent decades in the American education system, knowing where to find forms, how to complete the forms, and where/when to submit them is only one example of the added logistical challenges for doctoral students. Knowing

which courses to take can also be quite overwhelming. One professor spoke about the importance of establishing a clear plan of action as a key component of being successful in a doctoral program. This professor advised doctoral students to read their department requirements, graduate college requirements, the benchmarks that one has to meet in order to obtain their degree and to be in communication with their advisor regarding these milestones.

One professor represented this theme of *logistics* differently by cautioning graduate students against deviating too much from the outlined guidelines and rubrics for various tasks. They gave the example of having written a five-page play based on *Waiting for Godot* as part of their comprehensive exams and explained that a bold move such as that one can easily backfire if the audience is not receptive. This faculty member encouraged students to play by the rules so that "they (the graduate committee) will know what to do with it."

Identifying priorities when there are various opportunities presented is another challenge for doctoral students. Faculty member M wanted doctoral students to feel empowered to say 'no' when an opportunity does not align with their purpose, but also encouraged students to say 'yes' when the opportunities are exciting. This faculty member said, "When you want to say 'HECK YES, I want to do that!' say yes. All the other times, say 'no.' By doing this, you can learn to prioritize your time." Faculty member W echoed that insight by telling students to keep an open mind ready for different opportunities, but to also be realistic about what can be done within time constraints. This faculty member suggested that students should leverage the opportunities presented to them but not over-commit or try to do too much.

As graduate students at a research institution, where research is an expectation for many, the use of tools to keep all information organized is a logistic theme. Faculty members N and J highly recommended that students figure out software for their citations early on in their

program. Faculty member J specifically mentioned "find some good citation software so that you can keep track of all this reading and all of your notes." Both professors admitted to learning this lesson the hard way and do not wish that for current and future students.

### Theme 5: Self - Care

Practicing kindness toward oneself was a key component of this theme throughout the interviews. Two professors, in particular, focused on this idea, but the theme was woven into much of the advice from most of the faculty. Faculty member V talked about the fact that deadlines will be missed, and that rejection is common, so they urged students to have compassion for themselves. They also talked about impostor syndrome and the toxicity that it can inject into an academic's psyche. The professor went on to say:

> *This is hard but try not to let rejection - harsh feedback - you know, missed deadlines, or mistakes drag you down. I think as academics, I was once told, 'get used to the word no,' because we get rejected more than we get accepted.*

They emphasized the importance of students giving themselves grace and coming to terms with the fact that everyone struggles while pursuing such an advanced level of scholarship.

In parallel advice, faculty member X cautioned that, although it might feel counterintuitive, being a Ph.D. student is the most important time to establish norms for self-care. This faculty member explained that, while it is tempting to say 'yes' to everything and be a people-pleaser as a graduate student, this is dangerous territory to navigate because these paradigms will follow doctoral students after they finish their program and enter the world of academia as scholars. Faculty member X encouraged students to balance their "ability to do incredibly challenging and high-level intellectual work with [their] ability to take care of [themselves] as human beings."

*Theme 6: Relationships*

    *Relationships* emerged as a salient theme across multiple pieces of advice, and faculty spoke vehemently about the vital need for various forms of supportive relationships throughout a doctoral journey. The first of these relationships mentioned in the data is that of doctoral student and graduate advisor. One faculty member focused on the importance of doctoral students connecting with their major advisors early and often. They cautioned that not doing so is a trend they have noticed with their own students, and one that hinders the students' progress. Faculty member S also spoke to the benefits of maintaining a healthy level of contact with one's advisor, stating that doing so allows students to move forward more quickly and gain confidence. They outlined the possibilities that can come from these interactions, such as discussing literature together and collaborating toward the co-construction of knowledge. In this view, faculty member S was advocating for this particular relationship because of the logistical and academic benefits that are sure to come of it. Faculty also talked about the importance of Ph.D. students finding a good mentor whose values and interests align with their own. One faculty member stated that, "a good mentor does work that you're passionate about but is also someone that you like to work with and feel comfortable with. Someone who cares about you and who you care about but also someone that can push you further intellectually."

    The second form of relationships that appeared in the data was that of doctoral student-graduate faculty at large. Faculty member W encouraged students to seek out various faculty members to tap into their expertise and reassured students that faculty are willing and happy to help in any way they can. Speaking to this particular department, faculty member W noted that faculty are ready and eager to help and to engage with graduate students, so she urged students to

"take advantage of that." Along the same lines, faculty member E stated that faculty are invested in student success and encouraged students to seek out those opportunities to learn from faculty.

The third relationship is that of doctoral student-graduate peers. Faculty expanded on this idea by speaking to the importance of collaborating with peers, stating that they are resources - "intellectually, socially, and logistically." Faculty urged students to connect with other graduates as a source of constant support. Faculty member C said, "Find your people. Find the people who make you feel sane, make you laugh, and make you think" and stated that this is key to success as a doctoral student. This professor went on to say that it is a "unique and stressful thing to earn a doctorate" and stressed the importance of having people you can trust, talk to, and confide in without ego getting in the way of authenticity. Faculty member C spoke whole-heartedly to the fact that there is enough ego and competition in academia without personal relationships adding to that, and they encouraged students to seek out relationships that lead to feeling "fed, nurtured, and supported."

Finally, faculty member L added the disclaimer that these relationships take time to develop within a new community. They urged students to invest the time into knowing more about the graduate community that they will be working with. This patience could prove to be challenging, and the process might feel lonely, but doctoral students investing in the people surrounding them during their graduate careers can make the difference between success and failure, and, more importantly, can define the quality of their experience.

### Theme 7: Purpose and Passion

The theme of *purpose and passion* was illustrated by two faculty members through use of metaphor. One professor stated that purpose is the "sand in your shoes," meaning that our purpose should be something that "raises questions and is going to inspire us and lead to trying

to understand what is at the root of an issue." Another professor spoke about the importance of doctoral students knowing "their why" in order to keep them centered and grounded. Faculty noted that having a true purpose or passion keeps doctoral students motivated to do something about the problem they are hoping to help solve.

Faculty member M posed the question, "Why isn't the purpose of education happiness?" They urged students to find joy in the process of learning and teaching, to find something that they're passionate about, and to never give up. This professor encouraged students to "find the joy in the things [they] do prioritize." Faculty member T spoke about purpose as the source of discipline and persistence that will allow students to "keep going when it would be so much easier to just stop" and said that, in many cases, this can be the "difference between who will finish and who won't." Faculty member V encouraged students to keep their goals in mind as they navigate this journey, and faculty member A highlighted the importance of savoring each moment, without focusing on the end result. They spoke to the importance of concentrating on the present moment and what they are learning, and to think about why their journey matters in the bigger picture. Faculty member C eloquently summarized this theme by saying:

> *I would just really encourage you to think - just to remember why you chose to pursue*
>
> *this in the first place. It's a really big thing you are doing, it's a huge commitment, and*
>
> *you have experiences and passions and questions that are yours alone, so I would really*
>
> *encourage you to remember what those are.*

**Discussion**

At the most basic level, the themes across this data can be separated into intrapersonal and interpersonal. The themes of openness, individuality, purpose, academic work, self-care, and

logistics all operate at the individual level, within oneself, while the theme of relationships is the only interpersonal thread. This observation points to the often-solitary quality of the doctoral journey, but also underscores the vital need for supportive relationships in navigating all of those intrapersonal challenges. The faculty advice ranges from concrete to abstract, covering everything from practical and logistical concerns to intangible issues of purpose and joy. This range illustrates the need for balance in the human experience, regardless of the intensity of the experience. The holistic range of advice given by the faculty to doctoral students highlights the fact that no one area of a person's can be truly fulfilling if the others are truly lacking.

One of the most interesting findings from this study is the intersubjectivity between faculty about the challenges, opportunities, and necessities within academia (Gillespie & Cornish, 2010). Intersubjectivity is defined as mutual awareness and the shared agreement between individuals when it comes to defining an object or situation (Gillespie & Cornish, 2010; Mori & Hayashi, 2006). While the institution of academia is built upon common understandings about how to collectively navigate various practices, it is important to note that there is an even deeper level of intersubjectivity regarding the challenges, skills and coping mechanisms needed to thrive in the academy. The advice provided by this department's faculty illustrates a strong consensus about the ways in which academia can prove to be a truly challenging space.

Beyond a shared awareness about the challenging aspects of academia, the interview data further reveals that the professionals within the academic systems are socialized to accept the realities of the structure, without generally seeking to disrupt it. Doctoral students are initiated into the academy by learning to navigate its many challenges, so there is little or no incentive to disrupt the root causes of those challenges. People actively shape the systems they are

simultaneously navigate, but those higher in the hierarchy have much more ability to effect change, while those at the bottom of the hierarchy are limited to being reactive actors.

Even as advice is being passed down from expert to novice, the shared knowledge is largely about how to cope with the pressures and demands, and not about how to stop their development altogether. From a social constructivist perspective, this phenomenon illustrates the power of socialization. Doctoral students get advice about how to cope with the demands of academia, learn to cope with those demands, go on to become faculty who are adept at navigating the extraordinary pressures, and then pass down that knowledge to another generation of doctoral students who continue the cycle. The data points to a perpetuation of normalized pressures within academia through imitative learning and shared knowledge.

One of the most significant points of discussion from the advice analyzed for this study is the fact that faculty in this department share a unanimous and genuine passion and care for their students. The data shows that faculty are invested in their students' well-being far beyond ensuring their academic success. They demonstrated a sincere concern with students' emotional and spiritual wellness, focusing on elements of self-actualization, purpose, passion, and self-care. They commonly mention the importance of being present in the moment and not worrying about competing for status or proving one's worth. While these notions are often contradicted by the ways in which academia pressures students and faculty to produce far beyond what is plausible in a healthy work-life balance, those kind-hearted sentiments are still noteworthy and significant. If faculty share that desire to see their students live a happy, balanced life, free of unhealthy pressure within academia, then it is possible for faculty and students alike to come together to create a humanizing academy.

**Conclusion**

Academia is a structure through which knowledge is constructed on a daily basis by the intellectual forces of individuals committed to moving their fields forward. This intentional merging of old and new ideas is an integral and normal part of the daily lives of academics, and one they are keenly aware of. However, we hope that this study has highlighted the ways in which knowledge is also constructed subconsciously each day through social interactions, through the ways in which we choose to engage with various tasks, and through the boundaries and priorities we define within our own lives. As doctoral students, we learn from our professors, and we become conditioned to see the world largely as they see it. As faculty, it is an important opportunity to reflect on the intentionality with which that example is being set, and the ways in which challenges and obstacles are being recreated each day within our own systems.

Social constructivism highlights the importance of socialization in human development, but it also emphasizes the idea of personal agency over how that learning is interpreted and operationalized. All of us in academia have the agency to mitigate challenges by being intentional about our boundaries, priorities, and commitments. As the advice from the faculty in this department revealed, there is a strong need for self-care, balance, and self-advocacy within academia, and faculty are committed to these notions. Professors want the best for their students, and they believe in their students' agency to forge those healthy and balanced ways of engaging in scholarship. Our hope is that this study serves as a reminder that imagination and awareness cannot take us further than our daily choices and social interactions, so we must all work to construct a balanced environment, one choice and one social interaction at a time.

**Implications and Future Research**

An important direction for future research would be to conduct a similar study across different disciplines, in different departments. It is also worth noting that having participants share only one piece of advice is valuable in that it reveals what faculty prioritize above all else, but it is also a limitation as it does not allow for a broader dataset that might reveal a more nuanced analysis. If participants had the opportunity to share various pieces of advice for doctoral students, we might be able to observe more patterns and deepen our understanding of the themes outlined in the present study. Future research would also benefit from conducting a similar study, in various departments, in which the faculty members could have the time to elaborate on their reasons for the advice they choose to share.

With systems theories and social constructivism in mind, it is interesting to consider the individual factors that might lead to faculty from various backgrounds to share unique perspectives and advice. What leads an African American professor to provide one piece of advice might be very different than the driving force behind a Latinx professor's perspective. Current research on the construction of knowledge would support the idea that the advice faculty choose to give might be greatly shaped by their own experiences, opportunities, needs, and challenges. For instance, navigating the logistical aspect of pursuing a doctorate might be of much higher importance to a faculty member whose first language is not English and who represents a minoritized background in the U.S. On the other hand, someone who has spent decades navigating the American education system would likely be much less concerned with logistics and have more freedom to focus on the aesthetics of academia. Studying the nature of advice from faculty, whether it focuses on concrete logistics or abstract idealism, by race,

gender, socioeconomic level, home language, and other demographic and individual

characteristics would likely yield important findings.

In this study, we have sought to highlight the need for more research around the nature of

knowledge construction and mediation between faculty and doctoral students at universities. The

systems and structures that dominate academia can be spaces of great intellectual freedom and

ingenuity, but they can also be spaces of inadvertent oppression and unfortunate power

imbalances that result in a tremendous amount of stress for those working their way up the ladder

of academia. We hope that this paper might serve as a catalyst for self-reflection for

professors and faculty who have the power to dismantle oppressive and unhealthy structures that

work against them and their students. At the same time, we hope that this study can give

doctoral students helpful advice to draw from and allow for a deeper understanding of the

systems they navigate every day.

# Emotional and Attentional Regulation: Impact of Trauma and Journal Writing?

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## Abstract

Traumatic experiences are very common and have a high lifetime prevalence rate, which a large body of research indicates negatively impact the ability to self-regulate, including emotional and attentional regulation. This study focused on traumatic experiences caused by peer victimization and aimed to examine the effects on self-regulation after exposure to artificial trauma and journaling in graduate students. A convenient sample of 9 graduate students were randomly assigned to the control or intervention group. All participants were asked to engage in a journaling activity after watching the assigned video. Three emotional Stroop tasks were administered to participants: before watching the assigned video, after watching the assigned video, and after journaling. The results suggest that after the exposure to artificial trauma, participants in the intervention group had quicker average response time (ART) across negative and neutral word types with 100% accuracy for negative words and lower average accuracy rate (AAR) for neutral and positive words. The control group had quicker ART and slightly lower AAR for negative words, slower ART, and slightly lower AAR to neutral words, and remained the same on positive words with increased AAR. The results also suggest that, after journaling, all participants had slower ART for negative words, and quicker ART for neutral and positive words; there were increases in AAR across all word types. These findings suggest that both trauma and journaling have short-term effects on attentional processing in the context of emotion and point to the potential promise of journaling in interventions to support self-regulation.

*Keywords:* self-regulation, trauma, journal writing, Stroop task

Can adults be academically successful without self- regulation? Self-regulation in an educational setting is like oxygen to a beating heart and functioning brain. There is a plethora of studies (Djambazova-Popordanoska, 2016; Blair & Raver, 2015; Teisl & Cicchetti, 2008; Zimmerman & Schunk, 2001) completed to examine and understand self-regulation in an educational setting for children and adolescents. One such study found that self-regulation had greater influence on academic achievement than general intelligence (Blair & Raver, 2015). However, exposure to trauma is likely to threaten an individual's ability to self-regulate (Bardeen & Reed, 2010). There are also several studies that speak to the positive impact of journaling on mood, stress, and mental health (Lara, 2020; McGough, 2013; Kliewer, et al., 2011). These works also examine this interaction in school age children and undergraduate students. However, there is a lack of examination of how self-regulation is impacted by trauma and the experience of journaling in graduate students and/or non-traditional students. The purpose of the current study is to examine the effects on self-regulation after exposure to artificial trauma and journaling in graduate students.

**Theoretical Framework**

This study is guided by the findings of researchers Pennebaker and Beall (1986) and the development of the Written Emotional Disclosure Paradigm (WEDP). Journal writing is a personal experience that allows the transference of thoughts outside of the mind and reduces the overwhelming feelings of being in constant thinking. The premise of the WEDP is that writing about emotional experiences and stressful events increases overall physical and psychological well-being (Pennebaker & Beall, 1986). Given the opportunity to write about a traumatic event and the emotions associated with it creates conditions for improvement for short-term physical health and long-term psychological wellbeing (Pennebaker & Beall, 1986).

**Literature Review**

*Attentional and Emotional Regulation*

Self-regulation is an important cognitive concept, specifically emotional and attentional regulation (Zimmerman, 2002). Many studies have revealed how self-regulation skills can lead students to academic success in school regarding nature, origins, and especially development (Zimmerman & Schunk, 2001). Children will show poorer academic achievement when they are more easily distracted during learning. Students engaging in self-regulation practice typically also have higher motivation and higher achievement than those who are not (Ramdass & Zimmerman, 2011). People with higher levels of attentional control are better able to regulate and reduce negative emotions associated with traumatic stimuli (Bardeen & Read, 2010). Simultaneously, negative emotions associated with trauma tend to negatively impact people's attentional and emotional regulation (Bardeen & Read, 2010; Khanna et al., 2017). Children with better emotional regulation skills are considered to be more attentive and more academically advanced because they are able to focus their attention on the task and ignore distractions (Djambazova-Popordanoska, 2016). This point relates back to helping children find and learn ways to shift their attention and regulate their emotions appropriately during learning.

*Trauma*

**Trauma & Self-Regulation.** Emotional regulation is a developmental process in which individuals can understand his/her emotions, manage distress, and control emotional responses to internal and external stimuli (Barlow et al., 2017; Dvir et al., 2014; Ehring & Quack, 2010; Teisl & Cicchetti, 2008). Emotional regulation can be affected by facing life stressors or challenges (Burns et al., 2010; Dvir et al., 2014). Emotional development and regulation are important to help provide individuals with what they need to persevere through life stressors and challenges,

while allowing individuals to learn to their full potential (Mareschal et. al., 2013). For years researchers have studied self-regulation, specifically emotional regulation, and what can impact a person's emotional regulation.

For this study, the effects of trauma on emotional regulation will be observed. Trauma is important to study because "traumatic experiences are very common and have a lifetime prevalence rate of more than 60% in the general population," (p. 104) as stated by Caparos and Blanchette (2014). Due to the high prevalence rate of experiencing trauma, it is more likely that many individuals have difficulties with self-regulation. Exposure to trauma, especially in early life, radically changes the way an individual process and prioritizes emotional information (Marusak et. al., 2015). Due to ethical principles, bullying/peer victimization was conceptualized as an 'artificial trauma' for the purposes of this study.

**Peer Victimization & Bullying as Artificial Trauma.** Peer victimization has been defined as "a form of interpersonal trauma associated with both immediate and long-term adverse effects on mental health and general well-being" (McIver et. al., 2018, p. 136).  Peer victimization can take place at any point during an individual's lifetime, but the effects of peer victimization can last for years. Personal experiences with rejection and bullying can negatively affect an individual's psychological adjustment, as well as their overall wellness (Masten et. al., 2013). If adolescents experienced peer rejection and frequently witnessed others being bullied or rejected by peers, adolescents would have reduced negative feelings of victimization as they would believe victimization commonly happened to both themself and others. On the other hand, if adolescents were frequently rejected by peers and bullied but did not witness it happening to others, more negative emotions regarding bullying would be developed due to believing this only happened to themself (Matsen et. al., 2013). While peer acceptance and rejection are more

common during adolescence, the impact of witnessing peer rejection or bullying is likely to instill a permanent belief system in an individual (Burns, Jackson, & Harding, 2010), and these beliefs might later impact an individual's emotional regulation when controlling emotions during a negative situation.

Peer victimization is a good fit as 'artificial trauma' because there is an abundance of research that suggests peer victimization is associated with dysregulation, specifically emotional dysregulation (McIver et. al., 2018). Due to the potential long-term effects trauma can have on an individual and their emotional regulation, it is important to further expand research on this topic and find interventions or practices which can help to improve emotional regulation and decrease negative effects of trauma, as well as enhancing academic success.

### *Journaling*

Reflective journaling offers the benefits of understanding and analyzing personal experiences and healing (Kelley et. al., 2015). The goal is not about skill but to provide a safe and open space to examine deep rooted emotions, experiences, and thoughts. A study of students with emotional and behavior disorders revealed that journaling was an outlet for assessing, reflecting, monitoring, and processing emotions (Lara, 2020). In essence, journaling helped to teach and/or improve social skills. The opportunity to freely divulge all thoughts and emotions without the fear any external person will read, provided the best situation for students to process without fear of punishment or consequences (Lara, 2020). It is important for students to have control and power of their journaling experience. Journaling is additionally considered a coping mechanism for those going through emotional turmoil (Lara, 2020; Pennebaker & Beall, 1986). Journaling in this study is defined as the free expression of all thoughts that can be written or drawn without any instruction. Individual journals were private and there was no expectation of

sharing. Journal writing is usually a prolonged experience that occurs multiple times in a week for 15 - 30 minutes for the duration of the intervention (Kliewer, et al., 2011; Pennebaker & Beall, 1986). Most interventions lasted a minimum of six weeks which seemed to be the minimal amount of time for an impact (Pennebaker & Beall, 1986).

*Emotional Stroop Task*

Stroop tasks are commonly used in many research studies to measure emotional or attentional regulation. Trauma is frequently looked at as an influencing factor of emotional regulation when completing Stroop tasks (Caparos & Blanchette, 2014; Wingenfeld et. al., 2011). This study used the emotional color word Stroop task to examine participants' emotional regulation before and after being exposed to negative or positive stimuli. The emotional color word Stroop task consists of presenting different words (positive, negative, or neutral) while displayed in different colors. Participants are asked to name the colors of words, by pressing buttons on a keyboard, while ignoring the meaning of the word. Longer or slower reaction times when responding to negative words compared to positive or neutral words are considered to be an indication of emotional dysregulation (Iffland et. al., 2019).

Caparos and Blanchette (2014) emphasized the use of the emotional Stroop task while studying trauma and personal experiences. In this study, it was believed that the impact emotional words had on an individual largely depended on personal experiences. If a word presented during the task was relevant to one's personal experiences, the stronger the effect was on an individual's emotional regulation (Caparos & Blanchette, 2014). These two studies highlight the use of emotional Stroop tasks when examining emotional regulation, and how well an individual can selectively filter out emotionally distracting stimuli. For this study, an

emotional color word Stroop task was used to assess emotional and attentional regulation when exposed to trauma and journaling.

### *Current Study*

In summary, studies suggest that exposure to trauma and the lingering negative emotions  associated with that traumatic experience reduces an individual's ability to self-regulate their emotion and attention. Additionally, studies suggest that journaling provides individuals the opportunity to explore emotions and heal, thereby improving ability to self-regulate emotion and attention. The association between trauma and emotional dysregulation, as well as the central role of regulation in academic learning and success creates a strong need for effective interventions to support individuals to regulate effectively.  The current study seeks to answer the following questions: 1) What effect does trauma have on emotional and attentional regulation? 2) What effect does journaling have on emotional and attentional regulation? The hypotheses are: 1) Participants exposed to a negative emotional situation when compared to those exposed to a neutral/happy emotional situation will have decreased ability to self-regulate emotion and attention, 2) Exposure to journaling will increase ability to self-regulate emotion and attention.

**Method**

**Sample**

Participants for this study included 9 graduate students (3 male and 6 female) at midwestern university. Participants were chosen based on their current enrollment in a fall 2020 Educational Psychology course (mode age range of 25-34 years old), as this was done for a class project. All participants were provided with an informed consent page before participating in the study. After reading the informed consent, if participants continued with the study, they were

agreeing that they had fully read and understood the instructions of the study and were freely participating. Five participants were assigned to the intervention group and four participants to the control group.

**Procedure**

Participation was completed simultaneously in a virtual environment. Participants were randomly assigned to one of two CANVAS pages that contained written instructions on how to complete the experiment. Before beginning the experiment, participants were advised of the risks of participating as it might elicit feelings of discomfort, and participants were free to exit the study at any time. All participants completed three, short emotional Stroop tasks (EST).

During the emotional Stroop tasks, participants were asked to respond to the color of the words presented by pushing buttons on their keyboard with their index and middle fingers. In order for participants to become familiar with which buttons to press on their keyboard, a practice emotional Stroop task was administered before the three, actual tasks.

Following completion of the first emotional Stroop task, participants were instructed to watch one of two short videos. Participants did not know which condition they were assigned to or which video they would be watching. Once the participants finished the video clip, they completed the second emotional Stroop task. After the second emotional Stroop task, participants journaled for five minutes and then moved on to the third and final emotional Stroop task. Following completion of the final emotional Stroop task, participants were asked to fill out a short survey to assess demographics as well as journaling and bullying history.

**Measures**

The emotional Stroop tasks asked participants to respond to the color of the word that appeared on the screen (eg. the word nice appearing in the font color red, or danger in the font

color blue). The words participants saw consisted of positive (e.g., nice, caring, love), negative (e.g., angry, hate, danger), and neutral (e.g., smooth, cabin, potato) words. The order in which the words were presented was random. Each word appeared for up to 2000 milliseconds and there was 750ms between each stimulus. This process continued for three administrations of the emotional Stroop task. This emotional Stroop task was adapted from an emotional Stroop task created by Dr. Carrie Clark in psychopy and hosted in 'pavlovia' for administration in a web browser.

Participants completed a practice trial to familiarize themselves with the task before beginning the first emotional Stroop task (11 neutral words). Once finished with the practice trial, participants began the first emotional Stroop task consisting of 24 words (7 negative, 10 neutral, and 7 positive). Following the first emotional Stroop task, participants were advised to watch one of two, short video clips. Both videos were around one minute and thirty seconds long. The video was either positive, showing happy moments in life (control group), or negative, showing the experience of a child who was bullied (intervention group). The video clips were found and taken from YouTube. The control group were assigned the Happy Moments in Life video. The intervention group was assigned Alone - A Short Bully Video, to present an artificial traumatic experience without causing harm or undue stress. The video for the intervention group was trimmed to be the same length as the control group's video and to cut out the extreme ending of the original video to reduce the risk for participants.

After watching either video clip, participants completed the second emotional Stroop task. This emotional Stroop task consisted of 22 words (6 negative, 10 neutral, and 6 positive). Once the second emotional Stroop task was done, participants were instructed to journal for five minutes. Participants were able to free journal without prompt and could journal in whatever

form they saw fit best (e.g., handwritten, typed, or drawn out). After the five minutes of journaling, participants completed the final emotional Stroop task. This emotional Stroop task consisted of 24 words (7 negative, 10 neutral, and 7 positive).

Once participants had completed the final emotional Stroop task, they were asked to fill out a short survey. This survey collected data regarding participants' age, gender, frequency of journaling, frequency of experiencing bullying, and frequency witnessing others being bullied.

## Results

### Data Analysis

Analyses were focused on participants' demographics, response times (RT), and accuracy. The analyses were completed by looking at the mean RT and accuracy of responses to the emotional Stroop tests, between groups. Time-1 of the EST was treated as baseline data for assessing the impact of the artificial trauma. Time-2 was treated as the posttest after exposure to artificial trauma and as the baseline for the journal writing intervention. Time-3 was treated as the posttest after the journal writing intervention.

Sixty-six percent of the participants were within the age range of 25 - 34 years old. Fifty-five percent of participants had experiences with being bullied. This experience was fairly even present in both groups. The intervention group had 60% of the participants that experienced bullying. The control group had 50% of the participants that were bullied. Of the nine participants (5 – intervention, 4 – control), 88% had witnessed someone else being bullied. There were 100% and 75% of participants reporting witnessing bullying in the intervention and control groups, respectively. Regarding journaling, 66% of participants spent no time journaling, 22% journaled 1 - 3 times weekly, and 11% journaled 1 - 3 times monthly over the last six months.

Eighty percent of the intervention group did not journal and the same was true for 50% of the control group.

**Emotional and Attentional Regulation and Trauma**

The average response times score (ART) for each participant were calculated on the three emotional states of the trials (negative, positive, neutral) for before and after the viewing of the assigned video. The ART was analyzed between groups. The overall ART was calculated for the intervention and control group in the pretest and compared to the ART after the intervention. Baseline ART for both groups were similar across word types with those in the intervention group having a quicker ART than the control group for neutral words (see Figure 1). After the
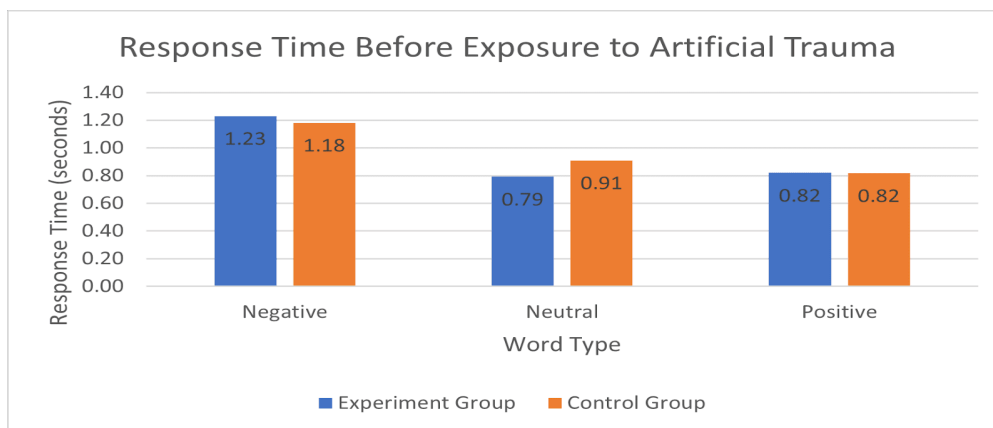


Figure 1:Response Times Before Exposure to Artificial Trauma. The average response times for groups was calculated using individual ART.

exposure to artificial trauma, participants in the intervention group had quicker ART across word types, except for positive word times where response times were slower (see Figure A2). The control group had quicker ART for negative words, slower ART to neutral words, and remained the same on positive words.

The average accuracy rate (AAR) was calculated for all participants. The group AAR was calculated based on individual averages. The AAR was compared between groups. Baseline AAR prior to watching the assigned videos was calculated (see Figure A3). The intervention

group's AAR across negative, neutral, and positive words were 100%, 98%, and 94.4% respectively. The control groups' AAR across negative, neutral, and positive words were 96.5%, 97.5%, and 96.5%, respectively. The AAR was calculated for both groups after watching the group-assigned videos (see Figure A4). The intervention group maintained 100% accuracy for negative words and was less accurate, relative to their baseline, for neutral and positive words which were 94% and 86.6%, respectively. The control group had slightly lower AAR on negative and neutral words, 91.8% and 95%, respectively. The control group increased AAR for positive words, 100%.

**Emotional and Attentional Regulation and Journaling**

The aggregated ART for all participants were calculated on the three emotional word types of the trial (negative, positive, neutral) for pre- and post-journaling. Prior to journaling, participants had ARTs of 1.01, 0.83, and 0.84 seconds for negative, neutral, and positive words, respectively. After journaling, all participants had slower ART for negative words, and quicker ARTs for neutral and positive words relative to their ART before journaling (see Figure 5). The
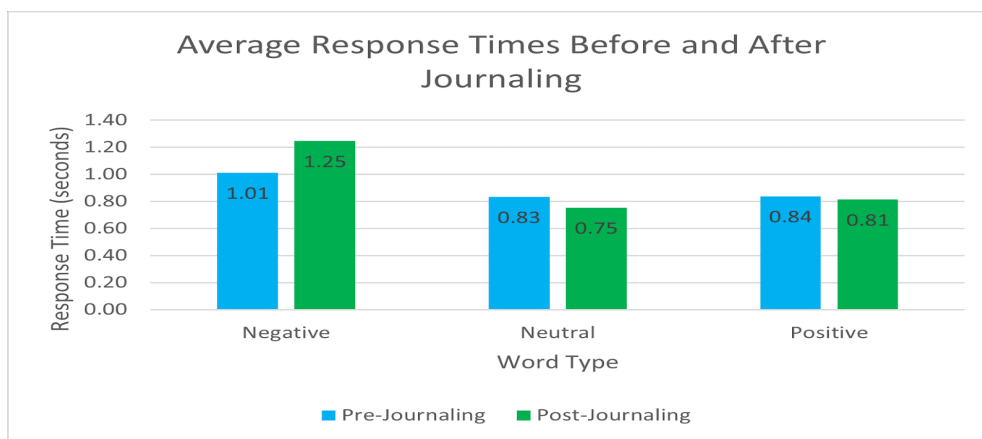


Figure 5: Response Times Before and After Journaling. The average response time for all participants was calculated before and after journaling.

AAR for participants prior to journaling were 96, 95, 93 percent for negative, neutral, and positive words, respectively. After journaling, there were increases in AAR across all word types (see Figure A6).

**Discussion**

In the current study, we examined the relationship between trauma and emotional and attentional regulation when completing an emotional Stroop task. We found that both trauma exposure and journaling exerted effects on Stroop tasks accuracy and response times. However, these effects were not specific to negative emotional trials.

We investigated whether there would be a difference in response time between the first and second emotional Stroop tasks after participants were exposed to trauma or no trauma. Exposure to trauma was done through random assignment of watching a video aimed to elicit either positive (control group) or negative (intervention group) emotions. It was expected that participants in the intervention group would have an increase in overall response time between the first and second administered emotional Stroop tasks. This prediction was based on the question of whether trauma had an effect on emotional and attentional regulation. The intervention group showed a quicker response time from the first Stroop task to the second when responding to negative and neutral words. These results are inconsistent with previous literature which suggested that negative or neutral words would act as a distractor during the emotional Stroop task and cause delayed response times (Caparos & Blanchette, 2014; Iffland et. al., 2019).

Response time between both groups was compared in examining whether participants in the intervention group showed slower response times than participants in the control group due to the exposure of trauma. Participants in the intervention group showed a slower response time

to negative words during the emotional Stroop task compared to the control group. This finding is consistent with previous research studies where individuals with histories of peer victimization or trauma have a longer response time than individuals with no history of peer victimization or trauma (see Iffland et. al., 2019 as a reference), but they showed quicker response time to positive words compared to participants in the control group.

Regarding accuracy, participants in the intervention group declined in accuracy from the first Stroop task to the second when responding to neutral and positive words which goes against predictions suggesting negative words would act as a distractor, and lead to a longer response time and smaller accuracy. It is possible that the intervention group had quicker responses to negative words because a negative schema may have been activated, meaning participants in the intervention group were attending more and responding faster to the negative words.

This study also examined the effect journaling had on emotional and attentional regulation. It was predicted that journaling would increase emotional and attentional regulation, which was measured by response time between the second and third Stroop tasks. Participants had slower response times for negative words, and quicker response times for neutral and positive words from the second to the third Stroop task. Based on previous literature (Lara, 2020), journaling can act as a coping mechanism for individuals who experience emotional distress. Journaling in our study found improvement in emotional regulation for neutral and positive words but not for negative words. It was also predicted that journaling would increase attentional regulation which was measured by accuracy rate between the second and third Stroop task. Accuracy for participants increased across all word types between tasks and after journaling. These findings may indicate that journaling improves attentional regulation by helping individuals shift their attention away from negative emotions. Findings on the effects of

journaling on emotional and attentional regulation in this study are consistent with previous literature (Lara, 2020).

Our research study had several strengths to its proposed design. First, to adhere to ethical guidelines and reduce harm to participants, we used the bullying video in the intervention group to represent trauma. We conceptualized bullying/peer victimization as an 'artificial trauma'. Second, our research design utilized the use of pre and posttests to allow us to easily compare group differences and to examine whether trauma or journaling had an effect of emotional and attentional regulation. Lastly, our study randomly assigned participants to the treatment or control group. This allowed for an equal chance of participants being assigned to either condition. Random assignment was done by using an online randomized group generator. By using this tool for random assignment, it kept the selection of groups impartial.

**Limitations**

While this research study had several strengths, it also has limitations which should be addressed. First, this study had an extremely small sample size (N=9). This small sample size leads this study to have low statistical power, meaning the ability to detect relationships in the real world is extremely low. Due to the small sample size of the study, findings are not generalizable to larger populations. A second limitation was the number of times participants took the administered emotional Stroop task. The emotional Stroop task was taken four times, including the practice trial at the beginning of the experiment. Using this task repeatedly throughout the experiment causes a threat to internal validity. Reasons for this threat to internal validity is that participants were able to practice and become familiar with the administered emotional Stroop task. Repeated exposure and practice could have allowed participants to better their performance rather than being a true measure of emotional and attentional regulation.

Participants might have also felt tired or lost interest in the task after repeatedly completing the same task. The third limitation of this study was missing data from the final emotional Stroop task. This limitation could have influenced the results of the effects of journaling on emotional and attentional regulation. Additionally, using the WEDP as a point of reference, the current study's intervention was too short and the dosage of journal writing creates issues for validity. Participants were also not guided to write on a specific emotional/stressful experience. The writings were not shared, therefore, the nature of the journaling experience could not be reported or included in the analysis. Finally, the limitation of truly eliciting a trauma-response form participants in the intervention group was not truly assessed. Ethically, participants cannot be at risked for harm, however, an assessment for trauma-feelings for participants could have been assessed to gauge the possibility the study is mimicking the concept being evaluated.

**Directions for Future Research**

This study did not take into consideration gender and cultural background differences regarding emotional and attentional regulation. Future studies on the effects of trauma and journaling on emotional and attentional regulation should examine how gender influences the impact of trauma and journaling on emotional and attentional regulation. Accounting for gender differences is important because it might impact how emotions are processed and the overall journaling experience. Along with gender differences, future studies should seek to examine how cultural background influences the effects of trauma and journaling to emotional and attentional regulation. Furthering knowledge on this topic can help to create interventions, such as journaling, aimed at improving emotional and attentional regulation and decreasing the negative effects of trauma that an individual might endure. Another recommendation is to increase the length of the intervention, the dosage of journal writing experiences, and specific writing

prompts provided to participants. This will be important to understanding the required minimum threshold of writing experiences necessary to counteract the effects of traumatic experiences on attentional and emotional regulation. Additionally, it would provide better evidence of the types of prompted or unprompted writing experiences that makes a significant difference. Similarly, it would be beneficial to engage participants beyond the writing to get a deeper understanding of how journal writing is or is not helping the individual. Finally, it would also be worthwhile for future research to include follow-up after the intervention to understand the duration of the effects that occurred during the intervention.

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**Appendix**

The appendix includes the figure of the average response times and accuracy of participants at Time-1, Time-2, and Time-3.

Figure A1. Response Times Before Exposure to Artificial Trauma. The average response times for groups was calculated using individual ART.
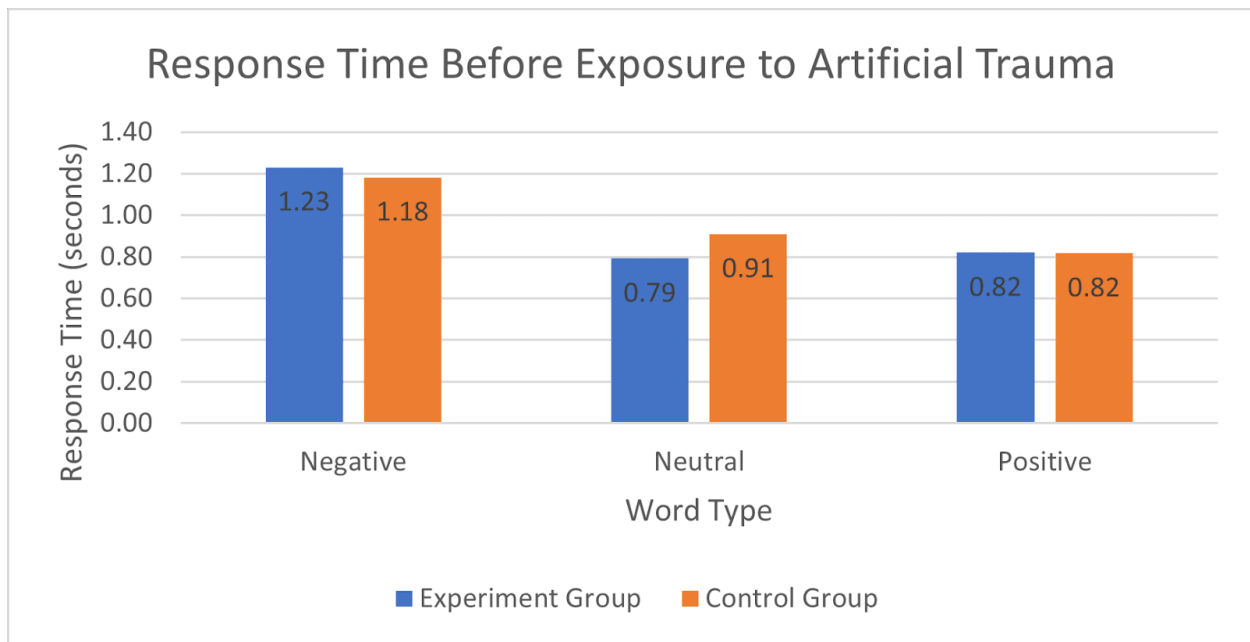


Figure A2. Response Times After Exposure to Artificial Trauma. The average response times for groups was calculated using individual ART.
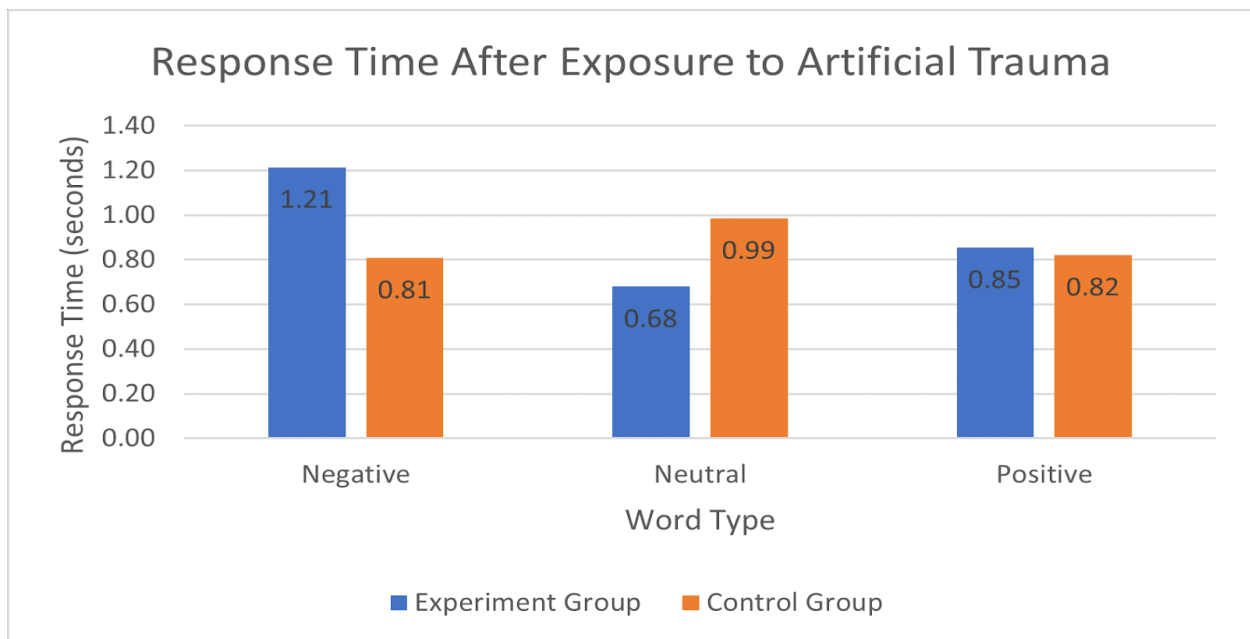
Figure A3. Accuracy Rates Before Exposure to Artificial Trauma. The average accuracy for the group was calculated using individual means of group participants.
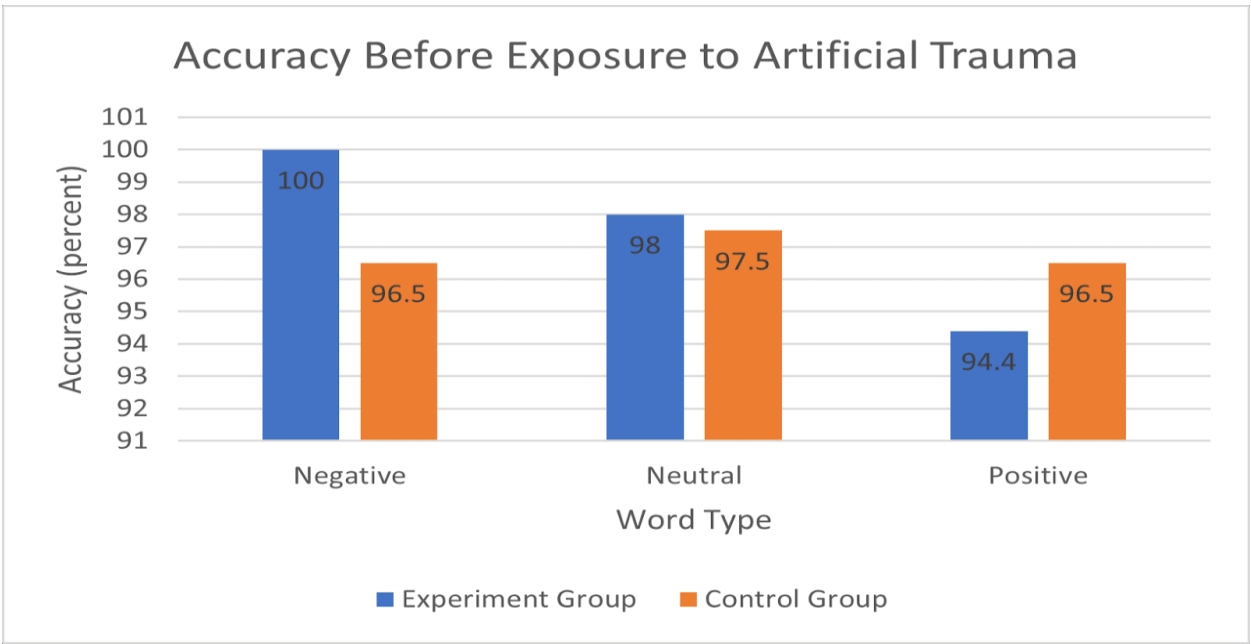


Figure A4. Accuracy rates After Exposure to Artificial Trauma. The average accuracy for the group was calculated using individual means of group participants.
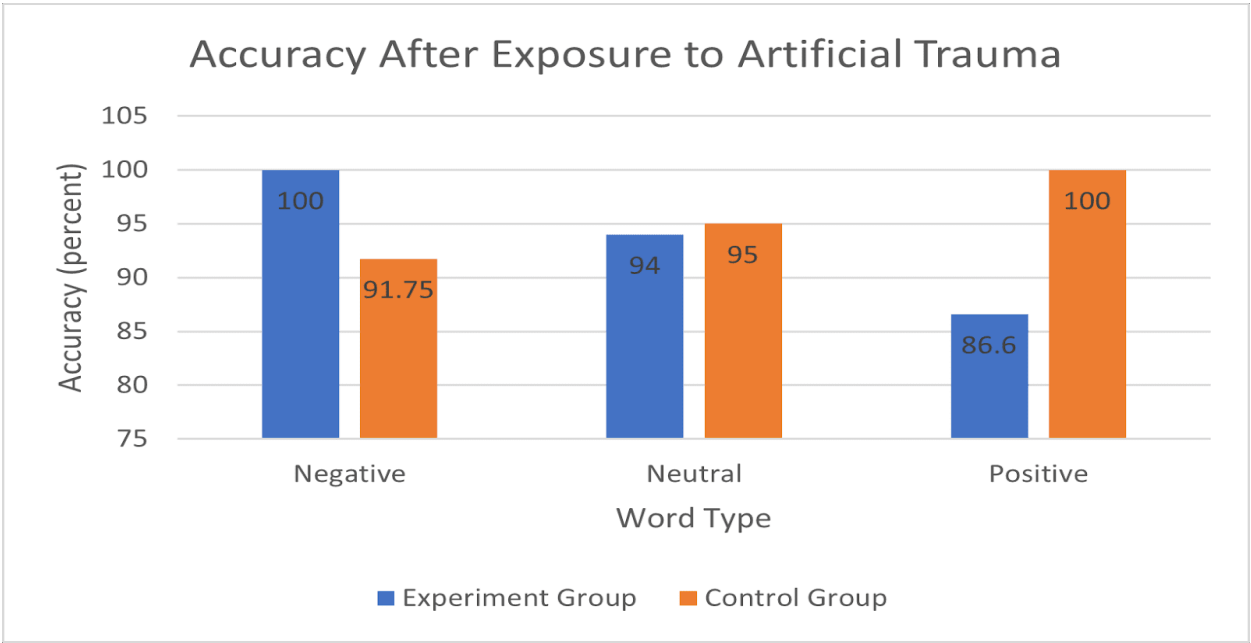


Figure A5. Response Times Before and After Journaling. The average response time for all participants was calculated before and after journaling.
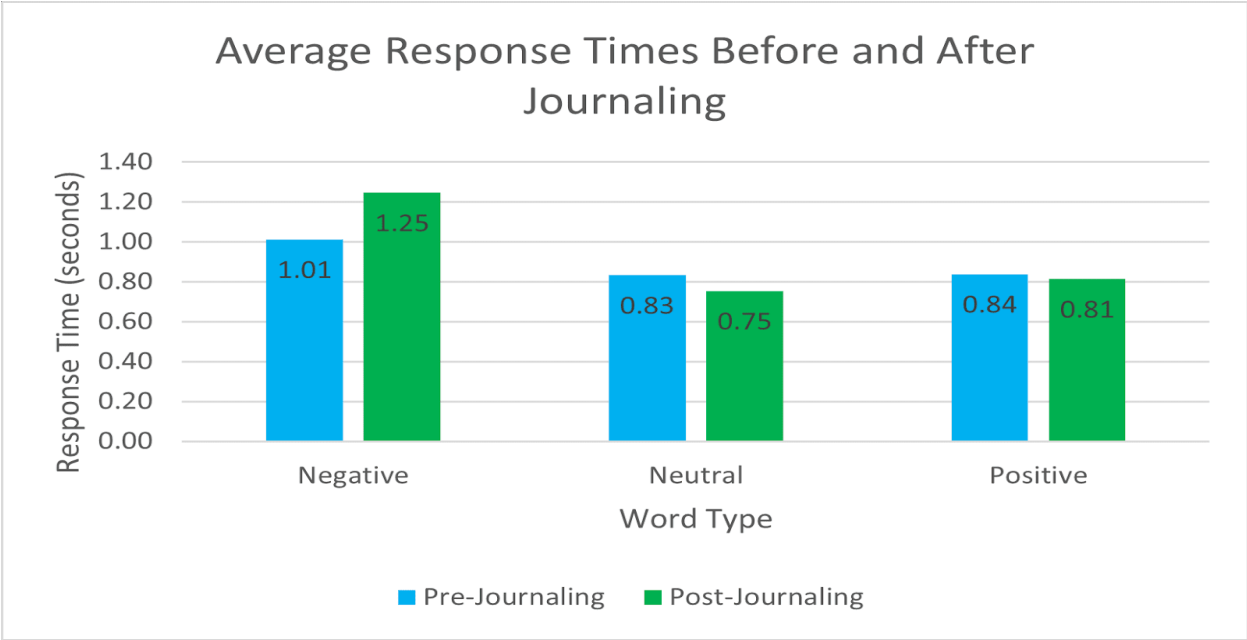
Figure A6. Accuracy Rates Before and After Journaling. The average accuracy rate for all participants was calculated before and after journaling.
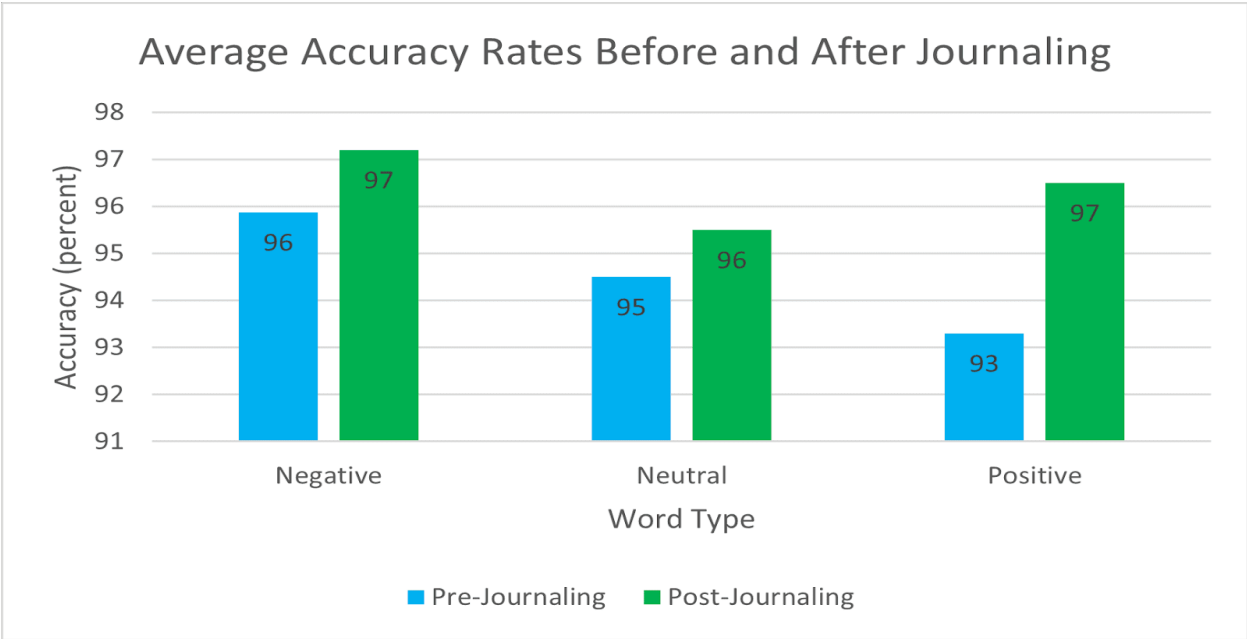
# From Active Learning Trigonometry to Lecture-Oriented Calculus: Student Interactions

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## Abstract

Active learning is an important component in many college mathematics classes. However, not all college mathematics classes are being taught using active learning-oriented methods. This phenomenological study examined how four undergraduate students' reflections on their recent experiences in a lecture-based Calculus I course compared to their reflections on their previous experiences in an active learning-oriented Trigonometry course. According to participants' reflections, certain prescribed classroom structures, such as large classroom sizes, seemed to negatively affect student interactions with both instructors and peers in Calculus I lecture, especially their ability to ask questions. Whereas feeling comfortable to ask questions in either Trigonometry or Calculus I recitation was not always a given for all participants, all participants remarked that the collaborative, group work environment, usually in addition to their instructors, in both Trigonometry and Calculus I recitation were helpful, approachable, or beneficial. Given these students' reflections, we emphasize the importance of establishing classrooms in which students are not only provided with opportunities to contribute their perspectives but feel that their perspectives are a welcome and important part of the classroom.

*Keywords:* active learning; mathematical transitions; student perceptions; calculus; trigonometry

Active learning is an important component in many college STEM classes, including mathematics classes (Freeman et al., 2014). We conceptualize active learning-oriented mathematics classrooms to be classrooms which encourage students to engage in mathematical reasoning and peer-to-peer interaction (Laursen & Rasmussen, 2019; Smith et al., 2016). In active learning classrooms, instructors focus on promoting student engagement and building upon student thinking while students pose questions, communicate reasoning, and share solutions (Laursen & Rasmussen, 2019; Smith et al., 2016). On the other hand, we consider lecture-oriented classrooms to be characterized by traditional, teacher-centered instruction. In their meta-analysis of 225 studies, Freeman and colleagues (2014) found that student performance on examinations was significantly higher in active learning classes compared to classes that emphasize traditional lecturing. Research also suggests that active learning may reduce achievement gaps for underrepresented students in STEM classrooms compared to traditional lecturing (Theobald et al., 2020). Thus, active learning has the potential to equitably increase student success in undergraduate mathematics classrooms.

Not all college mathematics classes, or even sections of the same mathematics course within the same mathematics program, are taught using active learning-oriented methods, however. A natural question arises: How might the transition between active learning-oriented and lecture-oriented mathematics classrooms affect students? Smith and Star (2007) defined a mathematical transition as a significant change on two or more dimensions of mathematical experience, which they operationalized as an interacting product on four dimensions-achievement, disposition toward the subject, perceived differences between current and past mathematics programs, and approach to learning. Currently, most research addressing

mathematical transitions focuses on student achievement, but achievement does not capture the whole picture. In order to broaden our understanding of how mathematics programs affect students, we must account for other dimensions of student experience (Smith & Star, 2007).

Although there are many aspects of student experience that we could study, we chose to focus on students' perceptions of interactions with instructors or peers. Research suggests that students' perceptions of their learning environment are a predictor of learning outcomes, such as the development of skills (Lizzio et al., 2002). Hence, if students' perceptions of their interactions in their mathematics classes are negative, then students may not be developing important skills, such as productive struggle, which, in turn, may hinder opportunities for conceptual development in mathematics (Hiebert & Grouws, 2007). Research also suggests that students' perceptions of their interactions with instructors or peers may be influenced by the instructional methods adopted by their mathematics instructors (Star et al., 2008). More generally, we recognize that students' perceptions of interactions are influenced by personal factors, prescribed environmental structures, or classroom behaviors (Bandura, 1986). Hence, we seek to better understand how students' perceptions of prescribed environmental structures or classroom behaviors may differ between classes taught with different instructional methods, such as lecture or active learning, and how some of these differing prescribed environmental structures or classroom behaviors might lend themselves to more opportunities for meaningful student interactions with instructors and peers than others.

The purpose of our study is to investigate the phenomenon of students' mathematical transition between active learning-oriented classrooms and lecture-oriented classrooms by examining students' perceptions of the prescribed environmental structures or classroom behaviors in one classroom compared to the other. We aim to address the following question:

How might students' reflections on their recent experiences in a lecture-oriented mathematics course compare to their reflections on their previous experiences in an active learning-oriented mathematics course? Examining reflections is important because it is through reflection that students develop their perspectives about practices in both the setting before and after the transition (Akkerman & Bakker, 2011). For our phenomenological study, we examine the reflections of four college students who are experiencing a mathematical transition from a small active learning-oriented Trigonometry classroom to a large lecture-oriented Calculus classroom on their perspectives of classroom structure and interactions between peers and instructors within the classroom.

## Literature Review

As previously mentioned, most of the research literature concerning mathematical transitions focuses on student achievement. Since we are interested in the effects of mathematical transitions on students' perceptions, our review includes research literature that examines the perceptions of students who are (or are likely to be) transitioning between lecture-oriented and active learning-oriented mathematics classrooms. Although much of this literature was published during the mathematics reform (or standards-based, active learning-oriented) era of the 90s, we find that many of these studies' findings are still relevant to today's classrooms and students. Though not a monolith, 90s reform mathematics programs tended to be grounded in a constructivist philosophy (von Glasersfeld, 1991) and characterized by higher-order thinking, problem solving, cooperative learning, and the use of manipulatives (National Research Council, 1989). These calls for student-centered, active learning-oriented practices and programs in the 90s are similar in spirit to the calls for reform from traditional lecturing to active learning today.

**Student Attitudes**

While there is a distinction between attitudes and perceptions, there is also enough overlap to incorporate studies of student attitudes in our review. Research shows mixed results when considering students' attitudes towards reform mathematics programs at the collegiate, as well as K-12 levels (Armstrong et al., 1994; Bay et al., 1999; Bookman & Friedman, 1994, 1998; Brown, 1996; Reys et al., 1998). For instance, multiple studies indicate that, initially, some students react with resistance and negativity towards mathematics reform programs (Armstrong et al., 1994; Bookman & Friedman, 1994; Reys et al., 1998). However, the students in these studies are followed over time (approximately one to two years) and their attitudes towards mathematics reform programs and mathematics learning improve in many cases (Armstrong et al., 1994; Bay et al., 1999; Bookman & Friedman, 1998) but not in every case (Brown, 1996). Hence, there is promising evidence that students may view active learning favorably over time, although the conditions under which these attitudes are developed is not well understood.

**Student Perceptions**

Small-scale studies have found positive student perceptions towards active learning-oriented mathematics programs, at least in comparison to more traditional ones, in both K-12 and collegiate settings. Students transitioning from lecture-based to active learning-oriented mathematics classrooms have reported valuing their active engagement (Boaler & Greeno, 2000; Holt et al., 2001; Love et al., 2015), which they believe keeps them focused and helps them remember course material better than in a traditional lecture course (Love et al., 2015). Students have also described appreciating a more democratic classroom environment (Holt et al., 2001) and opportunities to collaborate with peers (Boaler & Greeno, 2000; Holt et al., 2001; Love et

al., 2015), which they perceive as offering access to others' reasoning and collective, conceptual understanding (Boaler & Greeno, 2000). For students who had a prior history of disliking and/or feeling unsuccessful in mathematics, an active learning-oriented classroom was a welcome change (Holt et al., 2001). Moreover, some students perceived lecture-based classes that emphasize memorization and getting the right answer as restrictive of both their engagement and their learning (Boaler & Greeno, 2000). In contrast, we note that, while most students in Love and colleagues' (2015) study preferred the flipped/IBL course over the lecture course, four out of 27 students preferred the lecture course, citing reasons such as, wanting the instructor to do more example problems and finding the video instruction insufficient to learn the material. Hence, students' roles as learners of mathematics, which seemed to vary considerably between more traditional classrooms and more active learning-oriented ones, seemed to influence their perceptions of and engagement with mathematics.

A few large-scale studies have provided broader understandings of students' perceptions of traditional versus active learning-oriented classrooms. In the Mathematical Transitions Project (MTP), Smith and colleagues (2001) followed the experiences of high school and college students transitioning between reform and traditional mathematics programs for a little over two years, analyzing many aspects of students' experience, perceptions included, such as achievement, content learning, daily experiences, beliefs about mathematics and self as a learner, personal goals, education and career, and strategies for adjusting to changing expectations. Some of their general findings included that students' experiences varied widely in range and depth, students' ability to articulate about differences within their mathematical experience was limited, and students' experiences were better described and interpreted when collected on multiple

occasions. Further results were given in site-specific papers (Burdell & Smith, 2001; Jansen & Herbel-Eisenmann, 2001; Lewis, Lazarovici & Smith, 2001; Star, 2001).

Smith and Star (2007) subsequently provided a complete analysis of the results from the MTP introduced in Smith et al. (2001). Moreover, Smith and Star (2007) argued for a broader conception of impact of transition between reform and traditional mathematics programs to understand more fully the nature of students' experiences in both programs, calling for researchers to examine students' specific kinds of mathematical proficiency, to clearly define and explore one or two affective constructs in students' experience, and to pay attention to the interaction between achievement and affective student experience, especially among different groups of students. Overall, studies on the MTP emphasized potential variation in students' experiences and a need to carefully examine only a few aspects of students' experiences over time in order to better understand students' transitions.

Consistent with the findings from smaller-scale studies, Sikko & Pepin's (2013) study of hundreds of students at two universities found that "students perceive the most important learning to take place when they are working with the mathematics themselves and in particular when they are working together with their colleagues in small groups" (Sikko & Pepin, 2013, p. 7). Additionally, they found that "the social and socio-mathematical norms (Yackel & Cobb, 1996, as cited in Sikko & Pepin, 2013) of the lectures they experienced did not help them to understand and engage in the mathematics" (Sikko & Pepin, 2013, p. 9). Their research suggests that certain prescribed environmental structures or classroom behaviors within active learning-oriented classrooms may be viewed as more helpful to learning mathematics than the prescribed environmental structures or classroom behaviors within lecture-based classrooms.

While these studies have found more positive student perceptions towards active learning-oriented classrooms compared to lecture-based ones, there is important variation and nuance to understandings of student perceptions in the literature. For instance, Star, Smith, and Jansen (2008) analyzed 93 high school and college students' perceptions of differences between reform and traditional calculus programs. They found, for example, that teacher-student relationship was perceived as a major difference for no participants in one high school, 18% of participants in one university, 30% of participants in another high school, and 38% of participants in another university. Causes for diversity in students' perceptions of teacher-student relationships are not well understood and merit further investigation.

Another important example comes from Deslauriers and colleagues' (2019) experiment, which found that science students in active classrooms wish their classes were taught using teacher-centered instruction. However, the increased cognitive effort required of students in active classrooms may negatively impact their perception of learning. Deslauriers and colleagues suggest that early intervention to mitigate negative students' perceptions of active learning is an important component in student perceptions of learning. By analyzing student perceptions after experiencing both active and teacher-centered instruction, Deslauriers and colleagues found that students perceived greater benefit from teacher-centered instruction.

The students in these studies (except half of the students in Deslauriers et al. (2019)) were transitioning from a lecture-based environment to an active learning-oriented environment. It is not well researched or understood how students experience re-entering a lecture-based environment after experiencing an active learning-oriented one. Given abundant evidence of students valuing active learning-oriented classrooms over lecture-based ones, typically over time, it is important to understand how students perceive returning to a mathematics environment they

may not ultimately prefer. In addition, given the importance of establishing positive classroom relationships and that little is known about the conditions that influence students' perceptions of classroom interactions (Star, Smith, & Jansen, 2008), we set out to study students' perceptions of classroom interactions after transitioning from active to instructor-centered instruction.

## Methods

This phenomenology utilized student interviews as part of a pilot study seeking to understand students' perceptions of their active learning-oriented Trigonometry course compared to their instructor-centered Calculus course. We aim to address the following question: How might students' reflections on their recent experiences in a lecture-oriented mathematics course compare to their reflections on their previous experiences in an active learning-oriented mathematics course? Following Smith and Star's (2007) recommendations, we decided to focus our study primarily on students' perceptions of student-peer and student-instructor interactions.

We chose a phenomenological study design because our goal is to describe the common meaning of the lived experiences (Creswell & Poth, 2018) of students who are experiencing a mathematical transition between active learning-oriented classrooms and lecture-oriented classrooms. We acknowledge that students both have shared experiences in common with each other, as well as experiences unique to them. Therefore, we primarily aimed to identify common themes from students' reflections, but also highlight unique student perspectives.

### Data Collection

Data were gathered from students enrolled at a large public midwestern university following the university's institutional review board approval in the Spring of 2018. Eligible participants for our study consisted of students who were currently enrolled in Calculus I at the research site in the Spring 2018 semester and were previously enrolled in Trigonometry at the

research site in the Fall 2017 semester. At the research site, Trigonometry is taught using active learning-oriented methods, including an emphasis on group work and class discussion. Trigonometry courses are typically capped at 35 students. On the other hand, Calculus involved large lectures capped at 148 students. Calculus lecture is held three days a week and is accompanied by smaller recitation/discussion sections two days a week. These recitation/discussion sections typically involve students working through a set of mathematics exercises with assistance from the recitation instructor, whereas Calculus lecture typically involves the instructor introducing mathematics concepts and the instructor completing mathematics exercises. Calculus lecture is instructor-centered, while Calculus recitation tends to be more student-centered.

We recruited participants by asking Calculus lecture and recitation instructors to inform their students of the study and by sending follow-up recruitment emails to eligible students after visiting each Calculus recitation section. A total of four students were eligible and interested: three white males and one white female. We individually interviewed and audio recorded each participant after they had signed a consent form. The interviews took place in a private room on their university's campus, where they could not be overheard, approximately seven weeks into the Spring 2018 semester, after the first Calculus exam. Each semi-structured interview lasted about thirty minutes, during which we asked students to describe the structure of a typical class, their interactions with their instructor and peers during class, and their experience with learning the course material, first for Trigonometry, and then for Calculus lecture and recitation (see Appendix for interview questions). We interviewed each participant once. We then transcribed each of the audio recordings for analysis. All participant names are pseudonyms.

**Data Analysis**

In considering researcher positionality and phenomenological reflection (Creswell & Poth, 2018), we note that the primary researcher has experienced mathematical transition back and forth between lecture-based and active learning-oriented classrooms at the collegiate level. She has reflected on her own experiences as a learner of mathematics and how they have shaped her preferences for an active learning-oriented classroom. For example, she valued the emphasis on doing mathematics herself and with others both outside and inside the classroom. She acknowledges her biases and bracketed these out (Creswell & Poth, 2018) when analyzing student interviews to better understand students' perspectives. This entailed reading and re-reading student interviews for alternative interpretations and reviewing these with colleagues to ensure that the interpretations of students' experiences were based on evidence from the transcripts.

Given the findings from our literature review, we expected to hear both positive and negative reflections. After an initial read through of the transcripts, we developed a codebook—we coded students' reflections as encouraging or hindering interactions with instructor(s) or peers based on whether a remark regarding interactions displayed a positive or negative affect (see Table 1).

**Table 1. Codebook**

| Code | Description |
|---|---|
| **Encouraging student-instructor interactions** | Remarks regarding student-instructor interactions suggested positive affect. E.g. words like good, nice, enjoyable, pleasant, personable. Statements suggested engagement with instructor, belonging, or empowerment. |
| **Hindering student-instructor interactions** | Remarks suggest student felt distant from the instructor, lost, disengaged, or intimidated. |
| **Encouraging student-peer interactions** | Remarks regarding student-peer interactions suggested positive affect. E.g. words like good, nice, enjoyable, pleasant, personable. Statements suggested engagement with peers, belonging, or empowerment. |

| **Hindering student-peer interactions** | Remarks suggest student felt distant from peers, lost, disengaged, or intimidated. |

For example, in response to a question asking him to describe interactions with both his instructor and peers in Trigonometry, Jay shared an overall positive collaborative experience,

> It was nice, usually by the time we'd open up and had any questions, we'd answer them with each other. And then if we couldn't answer each other's questions, it was about the time that the teacher got to our table and then she'd be there to help us, guide us, and kind of push us in the right direction.

On the other hand, Ryan felt "intimidated" about asking his Calculus lecture instructor questions. When followed-up on this, he replied that it was because he didn't want to ask questions that were "blatantly obvious" or not "smart enough."

Using this coding scheme, each author coded all the transcripts independently. We first coded all student responses to questions about their Trigonometry class and then coded all student responses to their Calculus lecture and recitation. Coded transcripts were then discussed and differences in coding were resolved to reach complete agreement. For each student we used their coded reflections to assist in horizonalization (Moustakas, 1994)—"identifying 'significant statements', sentences, or quotes that provide an understanding of how the participant experienced the phenomenon" (Creswell & Poth, 2018, p. 79). We then developed clusters of meaning (Creswell & Poth, 2018) from these significant statements, and used these themes to write descriptions of the affect experienced and how they experienced it for each student. We synthesize similar experiences across participants to capture the essence of their perceived interactions between classes.

## Results

### Comfortable in Small Groups: Jay

#### *Trigonometry Interactions*

In discussing his experience in the active-oriented Trigonometry class, Jay indicated that he felt "totally relaxed" asking his instructor questions and perceived his instructor as a helpful resource during group work. As quoted in the previous section, Jay shared an overall positive collaborative experience. For Jay, it appeared that the "open" group work environment and the accessibility of his instructor may have encouraged both student-instructor and student-peer interactions. In addition, Jay found it "beneficial" that "there was always somebody at the table who had some idea of what was going on," which suggests that certain classroom behaviors may have had an encouraging effect on student-peer interaction.

We did not code any of Jay's comments as hindering student-peer interactions. However, in contrast with group discussion, Jay may have perceived whole class discussions or copying the instructor's board work as hindering his interactions with his instructor when he got lost or confused,

> In group discussion I was a lot more open, but in class discussion if I didn't really know what was going on, I just kind of sat back and tried to watch her put everything on the board and just write down notes. I didn't really participate vocally, I was just copying down everything. I didn't feel like it was helpful, cause I didn't know what was going on.

Personal factors and prescribed environmental structures also may have interacted together to hinder student-instructor interactions. Jay expressed discomfort at the general notion of asking questions during the parts of class that he perceived as lecture. He stated, "I don't

really want to look stupid, so I do prefer (asking) questions (at) tables" and "I'm not much for asking questions out loud, because I'm just not very comfortable in math... I'm not much of an open lecture asking questions (person)". Hence, a perceived lecture environment in conjunction with his low self-confidence in mathematics may have hindered Jay's interactions with his instructor.

### Calculus Interactions

Jay indicated some comfort with going to peers when he experienced difficulty learning material, but it is unclear whether he was referring to peers enrolled in Calculus or to students who had already passed Calculus. Otherwise, Jay made no comments on encouraged student-peer interactions in lecture or recitation. Jay also had little to say regarding encouraged student-instructor interactions in lecture, except his frequent remarks on the freedom to ask questions, such as "you're free to really ask (questions) whenever." However, such statements were always immediately contrasted by claims that no one ever did. Moreover, Jay claimed that he doesn't ask questions in lecture, because he would rather not "waste anybody else's time in a hundred-person lecture." Compared to lecture, Jay perceived recitation as a smaller environment, where it is "a lot easier to ask questions" and "easier to relate with people." Hence, classroom size was perceived by Jay as hindering interactions with his instructor in lecture, while encouraging (or at least not hindering) interactions with his instructor in recitation.

Jay also perceived encouraging student-instructor interactions with his recitation instructor due to perceived characteristics of his instructor. He noted that "she's pretty casual, so I'll tell her right away if I don't understand something." On the other hand, his peers in recitation were "not as friendly as the last group in Trig." Hence, perceived friendliness may be a classroom behavior or personal factor influencing Jay's interactions with his instructor and peers.

In addition, he would "barely talk to anybody in lecture," except possibly with neighbors during clicker questions, suggesting that prescribed environmental structures in lecture may be hindering Jay's interactions among his peers. Jay also expressed that he sometimes felt uncomfortable during class, although it was not clear whether he was referring to lecture, recitation, or both. Hence, we coded this comment as hindering student-instructor, as well as student-peer interactions in both lecture and recitation.

Overall, Jay expressed comfort with working in small groups in both Trigonometry and Calculus recitation during his interview. He described feeling more open in those moments, especially when he perceived his peers and instructor as friendly, and perceived the open communication among him, his peers, and his instructor during small group work as beneficial. On the other hand, spaces or moments in Trigonometry or Calculus lecture that Jay referred to as "lecture" were not perceived as opportunities to interact or engage with instructors or peers despite knowing that he's free to ask questions. For Jay, this sometimes meant just taking notes and disengaging from the material, rather than actively working out his confusion.

**Working with Others to Learn Better: Kam**

*Trigonometry Interactions*

We coded a few of Kam's comments as encouraging student-instructor or student-peer interactions. While describing the structure of her classroom, she noted that her instructor would "come around and help us make sure we were getting it." When asked to describe her level of comfort with asking her instructor questions, she felt that her instructor was "good at explaining problems to me whenever I had a question." Kam's attention to positively perceived instruction suggests that the instructor might have played a significant role in encouraging student-instructor

interactions. None of Kam's comments were coded as hindering student-instructor or student-peer interactions.

### Calculus Interactions

None of Kam's comments were coded as pertaining to encouraging student-instructor interactions in lecture or in recitation. However, one comment was coded as hindering interactions between students and instructors when comparing lecture to recitation. Kam perceived it to be "harder" to answer a question asked by the instructor in lecture than in recitation. She explained that the instructor didn't get a response because she believes that people "don't like talking in front of 200 people." Hence, Kam mentioned that she would wait until recitation to ask questions if she had them, because she personally doesn't like asking questions in front of a lot of people, finding it to be "a scary thing." Thus, classroom size is again an environmental structure that may be influencing student-instructor interactions.

Interactions with peers on the other hand seemed to depend on her perceptions about the group of peers with whom she worked. In Calculus recitation, Kam felt that her peers in her first group "weren't comfortable working with other people," whereas in her second group she felt it was "a lot nicer" to work with "people who enjoy working with other people." Moreover, she perceived them to "need to work with other people in order to understand and learn better." At the very least, Kam found herself to be one such person, as she commented that despite her difficulties in learning calculus, she thought that working with other people helped her a lot. Thus, personal factors relating to Kam's perceptions of her peers' collaborative beliefs may have influenced interactions with her peers.

In summary, Kam expressed a much higher level of comfort interacting with her instructor in Trigonometry than in Calculus lecture. Like Jay, Kam seemed to attribute this

difference in comfort to the class size. However, despite having similar class sizes in Trigonometry and Calculus recitation, Kam also expressed a higher level of comfort and enjoyment interacting with her peers in Trigonometry than in Calculus recitation. Her reflections on her interactions in Calculus recitation revealed that group work ceases to work if she's not with "people who enjoy working with other people." For Kam, group work is an effective means to learn, but only if everyone in her group feels the same way.

**No Negative Energy: John**

*Trigonometry Interactions*

John found that asking his instructor questions in general was "pleasant" and asking his peers questions was "extremely comfortable." He felt that he could trust them to accept when he was having trouble in class and that they would offer help. No other comments were coded regarding encouraging or hindering student-instructor or student-peer interactions.

*Calculus Interactions*

Given that John "didn't really interact with anybody" in lecture, it is not too surprising that no comments were coded as regarding hindering or encouraging student-instructor or student-peer interactions in lecture. In recitation, however, we coded comments regarding encouraging interactions only. John perceived his recitation instructor as helpful and held similar notions about his peers in recitation. When asked to describe his interactions with his peers, he provided a positive description of his perceived classroom environment saying, "they're pleasant… if somebody's not understanding anything, then we're willing to help… there's no negative energy that I feel that's in the class… they're all willing to help." Overall, John's reflections on his interactions in both Trigonometry and Calculus were positive. He described a pleasant environment in both Trigonometry and Calculus recitation, and only seemed to not

describe one for Calculus lecture because he couldn't recall interacting with anybody. Unlike Jay and Kam, John hardly made any critiques and did not comment on feeling uncomfortable in any of his classes. For John, it seemed that instructors and peers who had no negative energy and were willing to help contributed to his overall positive experiences interacting with peers and instructors across the board.

**Personable is to Open as Intimidated is to Closed: Ryan**

*Trigonometry Interactions*

Ryan described interactions among his instructor and his peers together as "all pretty much positive." He felt "it was never really negative, cause they want to help. And it was nice to have that." But despite Ryan's overall positive perceptions of his interactions with his instructor and his peers, he still perceived some interactions as hindering. When asked to describe interactions with just his instructor, he replied that interactions were very limited, but more "personable" than lecture, because it was group-based. Hence for Ryan, working in groups did not necessarily mean more time interacting with the instructor.

Ryan also felt nervous about asking his instructor questions in general, though he said that he eventually grew more comfortable and felt more able to ask questions over time. Yet at the same time, Ryan did not feel comfortable interacting with the second group he worked with towards the end of the semester, and hence did not want to interact with them. He elaborated on his discomfort, explaining that "it was a jumble," they "weren't frequently there," and he was "always trying to explain it to them."

*Calculus Interactions*

Ryan felt that his interactions with his lecture instructor were limited but felt in comparison that he really enjoyed "very personable" interactions with his recitation instructor.

He felt that it was nice that he could get help from her if he ever had questions. In addition, he perceived her as helpful when he had questions and felt "pretty open" about asking her questions in general. On the other hand, Ryan felt "intimidated" about asking his lecture instructor questions. When followed-up on this, he replied that it was because he didn't want to ask questions that were "blatantly obvious" or not "smart enough."

Regarding Ryan's interactions with his peers, Ryan reported that he always sat by the same person in lecture and they would help each other, while in recitation he had a small, "personable," helpful group, where peers would "help each other understand more," and in which he experienced what he deemed "high-level engagement" with his peers.

In general, Ryan expressed comfort interacting with instructors and peers in both Trigonometry and Calculus when he perceived them as "personable" and helpful. For Ryan, these conditions may have contributed to him feeling more open to asking his instructor questions in Trigonometry, despite being nervous at first. However, these factors may have been absent or insufficient to make Ryan feel comfortable enough to do the same in Calculus lecture. Instead, Ryan described feeling closed off from interacting with his instructor out of fear of how he would be perceived.

**Comparative Summary**

Our analysis suggested that these four students' perceptions of student-instructor and student-peer interactions varied somewhat across students between Trigonometry and Calculus lecture and recitation during the interviews. All four students remarked on some aspect of student-instructor and student-peer interactions in Trigonometry as encouraging, while Kam was the only student who did not remark on any student-instructor interactions in Calculus as encouraging in her interview. We also note that two out of four students remarked on some

aspect of student-instructor or student-peer interactions in Trigonometry as hindering, whereas all four students remarked on some aspect of student-instructor or student-peer interactions in Calculus as hindering during their interviews.

Both John and Jay expressed comfort with interacting with their instructor and peers in small groups. Kam expressed anxiety about interacting with her instructor in Calculus lecture and with small groups depending on who was in the group. Ryan indicated he felt intimidated regarding interactions with his instructor in both Calculus and Trig, but the feelings of intimidation diminished in Trig over the course of the semester. Kam also expressed feelings of intimidation regarding interacting with the instructor in Calculus lecture. Overall, these students appeared to generally perceive the smaller, group work-focused Trigonometry classroom with friendly, motivated peers as more welcoming for communicating with both peers and instructors than the large Calculus lecture.

## Discussion

Several limitations deserve particular attention. First, the students who were eligible and willing to participate only consisted of white students with one female. Second, the data for this study only include interviews of students enrolled in Calculus. Furthermore, the interviews represent student perceptions at a point in time and these perceptions can be subject to change. Third, while grounded in evidence from the interviews, the overall findings reflect the interpretations of the researchers. Nevertheless, the students' experiences in this study may provide helpful insight for instructors or departments considering a phased implementation of active learning into undergraduate mathematics sequences.

We examined how four undergraduate students reflected upon their recent experiences in a lecture-based Calculus I course in light of their experiences in an active learning-oriented

Trigonometry course. According to participants' reflections, certain prescribed classroom structures, such as large classroom sizes, seemed to negatively affect interactions with both instructors and peers in Calculus lecture, especially their ability to ask questions. Whereas feeling comfortable to ask questions in either Trigonometry or Calculus recitation was not always a given for all participants, all participants remarked that the collaborative, group work environment, usually in addition to their instructors, in both Trigonometry and Calculus recitation were helpful, approachable, or beneficial. We need learning environments where students are not only provided with opportunities to take risks and contribute their perspectives but feel that their perspectives are a welcome and important part of the classroom (Horn, 2012). While setting up these types of classrooms may take some time and effort on the behalf of the instructor (or the college/university department), our data suggest that doing so may help tear down the barriers to learning that come from feeling too "intimidated," "scared," or "stupid" to engage in a mathematical discussion with the instructor or peers.

This pilot study sought to understand how perceptions of a lecture-based classroom compared to previous experience in active learning classrooms. Our findings suggest that students may generally perceive smaller, group work-focused environments with friendly, motivated peers as more welcoming for communicating with both peers and instructors than large, lecture-based environments. Future work might compare the experiences of students entering a lecture-oriented course but coming out of an active learning-oriented course with the experiences of students entering a lecture-oriented course from another lecture-oriented course and seek to understand how the previous course format impacts subsequent classroom interactions.

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**Appendix**

Interview Questions

Note: I asked students the following questions about their experiences first with respect to Math 102 (Trigonometry) and then with respect to Math 106 (Calculus) lecture and recitation.

1. Describe the structure of a typical class in (Math 102/106).
    a. On average, how much time did/does your instructor spend lecturing or guiding whole class discussions (yesterday, or recently)?
    b. On average, how much time did/does your instructor allow for group work?
    c. Did/Does your instructor allow for opportunities to contribute to lecture or class discussions?
2. Describe your interactions with your instructor during class.
    a. Do you feel that you had/have opportunities to ask your instructor questions during class?
        i. (If yes), what opportunities were/are given and how were/are they given?
    b. How frequently did/do you ask your instructor questions during class?
        i. Every class period, weekly, monthly, rarely, never?
        ii. (If you did/do ask questions), in what manner did/do you typically ask questions?
            1. In front of the entire class, in front of other students at your table, or off to the side or at the end of class?
    c. How frequently did/does your instructor ask you questions inside of class?
        i. Every class period, weekly, monthly, rarely, never?
        ii. (If they did/do ask questions), in what manner did/do they typically ask questions?
            1. In front of the entire class, in front of other students at your table, or off to the side or at the end of class?
    d. Describe how you felt/feel about asking your instructor questions in general.
        i. Can you describe your level of comfort with asking your professor questions?
    e. How frequently did/does your instructor engage you or your table in discussion?
3. Describe your interactions with your peers during class.
    a. How frequently did/do you interact with your peers?
    b. How frequently did/do you ask your peers questions?
        i. Can you describe your level of comfort with asking your peers questions?
    c. How frequently did/do your peers ask you questions?
4. Describe interactions among you, your peers, and your professor.
    a. How long did/do the interactions typically last?

        b.  Did/Do you contribute to discussions?

        c.  Did/Do you feel included in discussions?

5.  Describe your experience with learning the Math 102/106 course material.

      a.  Was there ever a moment(s) when you encountered difficulty understanding a concept, definition, or example given by your instructor in class?

          i.(If yes), think back on a moment(s) when you encountered difficulty understanding a concept, definition, or example given by your instructor in class. Can you describe the moment that you encountered difficulty?

             1.  How did you respond to these difficulties?

             2.  Who did you interact with?

                 a.  Did you ask a classmate for help inside or outside of class, ask the instructor or learning assistant for help inside or outside of class, go to the MRC (Math Resource Center), ask someone else for help, study notes individually or with others after class, or ignore it?

                    i.(If they sought help), did you find the interaction helpful? Why or why not?

                    ii.(If they did not seek help), why did you choose to (parrot response choice)?

             3.  Is this how you typically respond to this type of difficulty in class?

                 a.  (If not), how do you typically respond?

          ii.(If no), why do you think that is?

      b.  Was there ever a moment(s) when you encountered difficulty solving a problem in class?

          i.(If yes), think back on a moment(s) when you encountered difficulty solving a problem in class. Can you describe the moment you encountered difficulty?

             1.  How did you respond to these difficulties?

             2.  Who did you interact with?

                 a.  Did you ask a classmate for help inside or outside of class, ask the instructor or learning assistant for help inside or outside of class, go to the MRC, ask someone else for help, study notes individually or with others after class, or ignore it?

                    i.(If you did seek help), did you find the interaction helpful? Why or why not?

                    ii.(If you did not seek help), why not?

             3.  Is this how you typically respond to this type of difficulty in class?

                 a.  (If not), how do you typically respond?

          ii.(If no), why do you think that is?

A few final questions:

  1.  List the last three math courses you have taken, including any repeats, and where you have taken them.

  2.  Have you taken Calculus before? Where and when?

# Maximizing Student Citizenship Education

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## Abstract

Increasingly, global statistics have pointed out that young citizens are disengaged from democratic participation. This has captured public attention and led some countries to start creating educational policies as an attempt to implement educational citizenship programs to prepare young citizens to be active participants in a democratic society. Nevertheless, little is known regardless of the impact of those programs on democratic countries like Ecuador and the role of active citizenship at the educational level. It has led Ecuadorian younger population to avoid engaging in active social and political participation. Therefore, some national policies, international reports, specific topics related to citizenship education, and classroom practices will be analyzed in this literature review. The main goal is to invite not only policymakers but also teachers to increase their awareness about citizenship aspects so that they can truly invite students to maximize student citizenship education and active participation.

*Keywords:* educational policies, citizenship, democracy, classroom practices

Democratic societies have assumed that one of the main goals of public schools is to prepare citizens to become active participants and let their voices be heard to challenge social and political inequalities and provoke some changes (Kretchmar, 2014). As such, schools have been considered as appropriate places to provide an education that can help students become active members of a society, especially if they live in democratic countries. However, this overarching goal has not been fully accomplished by all democratic countries, like Ecuador.

Consequently, Ecuadorians' lack of active citizenship and democratic engagement has increased and been critiqued lately (Villafuerte et al., 2018). The criticisms revealed in this study is connected to previous personal teaching experiences where young students from public high schools and universities expressed having no desire to improve society issues. During our conversations in class, most of them shared they have opted to be mere observers of societal and political inequalities. Besides, since Ecuador has experienced a challenging economic crisis due to unjust policies that are affecting people, especially the ones from middle and low socioeconomic status, it has been difficult to see students show engagement in a democratic participation to abolish them as it used to be some years ago (Donoso et al., 2011)

Since then, there have been complains that schools are not providing effective citizenship knowledge and skills to help students learn early on how to be active participants in a democratic society, engage in social and political discussions, and see themselves as agents of change to advocate for better policies. In addition, there has been a general concern pointing out that there are neither great politicians nor inclusive government policies that benefit the public good (Carrion-Alves, 2014), so every year, more young people are disengaged from democratic participation and demonstrate little or no responsibility when selecting and voting for candidates.

Therefore, seeing this tension in a democratic society like Ecuador has been devastating, not only as a citizen but as an educator. It clearly shows that citizenship education needs to be carefully analyzed since it is not inviting young students to see themselves as active citizens who have the power to express their ideas to challenge social and political issues and create projects to help a democratic country keep moving forward.

Due to these democratic tensions in Ecuador, there is a need to analyze international reports and national policies related to citizenship education and review literature from several scholars and practitioners who have provided significant information about it. It presents studies to better understanding international concerns while providing an explanation of Ecuadorian context and exploring citizenship education in depth. Besides, this review provides definitions of key terms, such as citizen, good vs. active citizens, the role of local and global citizenship, schools' responsibility in democratic countries, and successful teaching practices.

This review aims to invite not only policy makers, but teachers to join efforts to examine the benefits and implications of creating educational policies, as well as designing an implementation plan to help students develop active citizenship and maximize their democratic engagement. It emphasizes that it is about time to acknowledge that complex social and political situations that democratic countries are facing require immediate actions. As such, it is important to keep encouraging not only committed politicians but teachers to see citizenship education from a deep perspective so that they can collaborate with each other to improve democratic societies and contribute to shaping well-grounded students who can provoke and be the change this world needs.

**International Concerns**

During the last seventeen years, there have been increasing statistics around the world showing that young citizens are disengaged from civic and democratic activities, and those have pushed some countries to create national policies at the educational and social levels to reinforce the implementation of citizenship programs to better educate people. For instance, Torney-Purta and Amadeo (2004) describes how some leaders and policymakers from United States, and some Latin American countries have started to put some emphasis on the education for democratic citizenship to ensure the preservation of democracy, liberty, and social justice.

These scholars provide a descriptive analytic report to show how several countries have applied some national policies to provide citizenship education and what challenges they had encountered when implementing them. Although this report shows that several countries have adopted national policies and standards to advocate for democratic citizenship education, not all of them have effectively implemented them, and unfortunately, Ecuador is one of those countries. Even though it has a national policy and educational standards to provide education for democratic citizenship, it has experienced some challenges in their implementation, training, and monitoring (Amadeo and Cepeda, 2008).

**Ecuadorian Context**

It is necessary to start mentioning that before the approval of the Ecuadorian national policy related to education for democratic citizenship, students only received this kind of education as part of their social studies class. However, in 2008, based on the Ecuadorian information from the specific curriculum guidelines, students began to receive democratic citizenship education as a transversal standard in all subjects and grades (Ministerio de Educación del Ecuador, *n.d.*a ; Ministerio de Educación del Ecuador, 2010, Ministerio de

Educación del Ecuador, 2011a; Ministerio de Educación del Ecuador, 2012a). It means that all teachers have been called to include topics related to democratic citizenship as part of their lesson plans starting at the primary level.

This educational policy also explains that students, apart from the general exposure to democratic citizenship education in all subjects and grades, must advance in their learning about citizenship and democracy in their first and second high school years (eleventh and twelfth grade). Thus, they must take two specific courses: Developing Philosophical Thinking and Education for Citizenship. In these courses, students need to learn several topics, such as: rights and responsibilities as citizens, equality and diversity, constitutional rights, politics and participation, citizenship, as well as well-being principles. Although high school students need to take four hours a week of these courses, they also need to do two hundred hours of community service by the end of their third high school year (twelfth grade) as a requirement for graduation (Ministry of Education, 2012a). Therefore, based on these educational reforms, it is assumed that by the time students finish high school, they are ready to have a clear understanding of democracy and are fully prepared to take an active role as citizens of a democratic country.

Although having that specific citizenship curriculum from K-12 seems rigorous and progressive on paper, its implementation is complicated and not universal. As Amadeo and Cepeda (2008) highlight in their *National Policies on Education for Democratic Citizenship in the Americas'* study, Ecuadorian authorities recognized that applying the established citizenship curriculum was challenging since they were not able to provide effective methodological support due to some financing and continuity problems. This shows how policy makers often offer quick solutions to prioritize and approve a progressive curricular plan for providing relevant citizenship education without even having a complete implementation process.

What is more, this report's findings are connected to multiple critiques made by Ecuadorian researchers who do not only rely on educational policy approvals as means to appropriately teach citizenship education to young students. To illustrate, the study, *Challenges of the basic education system in Ecuador the voices of the future teachers,* reports teachers' concerns about the lack of assenting policies to foster students' citizenship competencies (Villafuerte et al., 2018). This study emphasizes that Ecuadorian teachers did not feel fully prepared to provide quality of democratic citizenship education.

Unfortunately, these research findings corroborate previous experiences encountered while teaching at different public and private institutions for twelve years where most of the teachers felt frustrated when seeing young students who neither had a clear idea of their role as citizens of a democratic country nor show interest to develop local or global citizenship.

**Exploring Democratic Citizenship Education**

Although some countries have attempted to provide democratic citizenship education through courses, such as Developing Philosophical Thinking and Education for Citizenship in the case of Ecuador, and civics and government courses in the case of United States, it is necessary to start by exploring the definition of the word 'citizen', what implies to teach citizenship education, as well as what it means to develop a local and global citizenship.

**Citizenship education**. Providing about democratic education implies helping and preparing students for democratic participation so that they can possess the necessary knowledge and skills to take part in public decision-making and be agents of change (Parker, 1996). This broad approach of citizenship education brings some questions, such as: What does it mean to be active participants? What does it mean to be a good citizen and/or an active one? Is it enough for

a citizen to be well-informed of local and community issues? Or is it necessary for a citizen to be aware of both national and global problems and have a global citizenship?

It seems that Ecuadorian policy makers and teachers do not have the answers for these questions yet since the level of democratic participation, especially of young people has decreased.

**Defining "citizen".** According to UNESCO (2010a), the word "citizen" has a Latin root 'civitas' which means "people united in a city or community" (p. 1). Heater's (1990) definition also explains that a citizen is a person who is "equipped with skills to participate in the public arena" (p. 336). McIntosh (2012/2005), on the other hand, provides a broad definition by saying that "a citizen is generally defined as a person having duties, rights, responsibilities, and privileges within a political unit that demands loyalty from that person and extends protection in return" (p. 339).

Unfortunately, it has been difficult to use these definitions to describe most of the Ecuadorian citizens, especially the youth, since they have neither the skills nor the desire to be involved in the public political domain to demand their rights while admitting their responsibilities. As such, it clearly shows the importance of having devoted policy makers and teachers to work on the implementation phase of the current educational laws related to citizenship education to provide better opportunities to awake young students' consciousness and recognize their crucial role of being a citizen in a democratic country, like Ecuador.

**Being active citizens.** According to Parker (1996), preparing students to be active citizens implies inviting them to see themselves as participants of a society who can identify, analyze, reflect on, and act upon unjust situations. However, it requires students to be able to go beyond the superficial understanding of how society functions, voting, and campaigning.

Additionally, Banks (2008) emphasizes that students can accomplish this goal of being active actors in a democratic society if they receive a transformative education which allows them to develop critical thinking skills to unveil societal inequalities and take actions to solve them.

It is worth noticing that this kind of transformative citizenship education, proposed by Parker (1996) and Banks (2008) to encourage students to be active citizens, is indeed connected the main Ecuadorian goals of the citizenship education policy. They emphasize the high school students must be able to think critically and do reflective analysis about social life controversies in order to come up with their own positions and be ready to work with other people to exercise participatory citizenship for protecting their rights (Ministry of Education, 2012a).

Along with Bank (2008) and Parker (1996), Ecuadorian educational written documents from the Ministry of Education have highlighted that the overarching goal of citizenship education is to teach students to be active and functioning citizens of society. However, there have been major concerns not only in Latin America but in North America about how much democratic education programs are actually helping students acquire democratic knowledge and understand their role as citizens.

For instance, in the case of Latin American countries, Amedo and Cepeda (2008) and Quaynor (2012) emphasize that citizenship education programs have not been properly implemented, so citizens' civic and democratic knowledge is low. It has also been noticeable in Ecuador where the current social, political, and economic crisis shows that some young students do not only have a low level of civic knowledge, but also stay and leave high school with the idea of neither engaging themselves in political movements nor participating in voting. Besides, during multiple conversations in the past, high school students considered themselves as good citizens as long as they are not trapped in corruption and that limited perception of what it means

to be an active citizen was thought-provoking since it did not match with what is written in the Ecuadorian educational standards. Actually, those students' actions and descriptions are considered as an inactive citizenship rather than an active (Ministry of Education, 2012a).

When talking about North American countries like the United States, Schulz et al. (2009b) use results from the International Association for the Evaluation of Educational Achievement study to report that American students ninth grade had good civic knowledge. They stressed that American students had been educated to see voting and respecting the law as essential characteristics of being good citizens as part of their citizenship education.

Nevertheless, some researchers like Spring (2012) critiques American students' good civic knowledge since he considers voting as part of having a passive citizenship. Thus, he highlights that being a not only good but active citizens requires students to participate in political movements and organizations and keenly engage in community activities. Likewise, Bai (2001) and Civitas (2006) mention that being active citizens implies having the opportunity to participate in the governing of the society rather than only showing obedience of the law and respect for authorities.

This clearly show that while Ecuadorian youth believe that staying away from voting, politics, and corruption counts as being a good citizen, it seems that for American youth, voting and obeying the laws is what good citizens do. Therefore, it appears neither Ecuadorian students nor American students are not fully conscious of their role as active citizens, so they need better educational policies and effective preparation at the school level. As Parker (2008) states, being an active citizen is a challenging job since that it requires not only young students but citizens, in general to know about democracy and its history, as well as to be politically engaged to work together and do something against discriminatory policies. These perspectives show that young

students can become active citizens when they do not simply stay away from democratic practices or only comply with authorities and obey the law, but when they have the skills to become authorities, make their voice heard, and create laws.

**Analyzing a citizen role**. When seeing citizenship from an activist perspective, Flanagan and Levine (2010) explain that citizens need to have strong democratic education and civic engagement knowledge so that they can contribute to the good functioning of democracy and disrupt the status-quo and ensure spaces for all people's voices to be heard. However, it has been known that social class, race, and ethnicity among other factors have limited opportunities to show civic engagement and have political participation as it is the case of American students (Flanagan and Levine, 2010; Hess and McAvoy, 2014).

It is surprising to find that that not only Unites States but also other democratic countries like Ecuador have been dealing with similar problems. Thus, while teaching and engaging in conversations with Ecuadorian high school students, it is common to observe and hear that not many of them are interested in contributing with their voices and projects to disrupting the status-quo and help with democracy progress. They express that a lack of knowledge about democratic participation, as well as money and distance have pushed them to be away from social and political activism. To illustrated, they have been part of the marginalized population who have limited access to education and information, come from low-income families, live in rural and sometimes in isolated areas, and often belong to minority ethnic groups like Indigenous, Afro Ecuadorians, Shuars, among others. These circumstances explain why engaging and advocating for active citizenship roles has been challenging, so when a society does not provide citizens with appropriate materials and economic means for equal participation, there is not equal citizenship at all.

**Exploring local and global citizenship.** To analyze whether being active citizens requires to be well-informed of local and community issues and/or national and global concerns, scholars such as Kirkwood (2004), McIntosh (2012/2005), and Pike (2001) emphasize that teachers need to take an active role and help students develop a global citizenship. It can allow students to explore and understand wider world events, challenge their ignorance and tolerance, embrace humanity, find ways to live and work together, and respectfully collaborate with people from different personal, family, economic, and sociocultural backgrounds across the globe. They argue that globalization in the twenty-first century requires conscious citizens who can see citizenship beyond a national commitment, and teachers are the ones called to help achieve this goal.

Moreover, to provide a more detailed explanation, McIntosh (2012/2005) highlights that teaching students to become global citizens requires to develop in them *habits of mind, heart, body and soul* so that they can observe and find out commonalities and differences, see power relations, and show respect for themselves and the world (p. 339). She adds that helping students achieve this goal of being global citizens and engaging in national and worldwide participation requires appropriate school contributions to encourage students to experience pluralism, justice, and participation.

The idea of teaching young students to demonstrate global citizenship is currently challenging since most of them have opted to limit or avoid participating at the local or national level. However, the overarching goal of helping students meet these researchers' criteria to become global citizens seems difficult but not impossible to accomplished in the near future if teachers receive adequate curricular resources and policy support from higher educational authorities.

**Seeing Schools as Spaces to Improve Society**

Apple (2013) and Kovacs (2009) explain that schools may be adequate places to help improve society if teachers use their professionalism to provide democratic education that works against repression and discrimination. They emphasize that if teachers see teaching as a platform to provide socially responsive education, they can put emphasis on educating students towards democracy and transformation and prepare them with the necessary knowledge and skills to provoke important social and political improvements.

Nonetheless, Apple (2013) and Kovacs (2009) clearly point out that little is known about the effectiveness of democratic education in schools since there is not enough information about teachers' perspectives related to this kind of education. As such, it has been difficult to know how their teaching practices are impacting the way students learn about democracy and helping them become civic and politically engaged.

Therefore, Apple (2013) suggests that it is relevant to start by analyzing how much freedom schools have in order to provide transformative education to teach students to develop critical civic participation since schools might not be able to change society if there is no transformation in their educational programs, curriculum, and pedagogy. Therefore, if schools continue to have strong emphasis on technocratic models that emphasize standardized testing, it is most likely that aspects like equity, social justice, freedom, and others can be omitted not only in civic and government courses, but in all courses in general.

Although Apple's (2013) suggestion of having less technocratic teaching and learning approaches to welcome transformative education can be seen as a wishful thinking. While in Ecuador, there are not enough educational policy implementations due to a national economic crisis, in the United States, big publishing companies and testing centers continue to portrait

constantly district and state testing as the only solution for students to be able to compete and hopefully succeed.

Additionally, Ladson-Billings (1995), Love (2019), and Spring (2012) state when a country has an educational approach that is only oriented towards grades, it affects what, how, and by whom information should be taught. It leads schools to continue failing to provide democratic education and limiting students' possibilities to consider themselves as powerful and responsible citizens who can use their knowledge and actions to disrupt inequalities.

What is more, Ladson-Billings (1995) underscores that if schools avoid using culturally relevant pedagogy, it restricts students' abilities to consider deliberation to improve democracy and limits their opportunities to discuss political and social issues, interact with each other, and show tolerance when having debates with people whose experiences differ from their own views.

Dewey (1916/1997) also explains that if schools really want to contribute to society progress, they must see citizenship education as a process to help students effectively function inside and outside their classroom. As such, what they are learning needs to adequately prepared them as critical thinkers who have the knowledge and skills to participate and improve a society to have a better life rather than survive.

Having the top-down approach has pushed Ecuadorian schools to remain as restrictive places where both teachers and students are constantly struggling to support each other inside of the classrooms, so it has been even harder to demand them to contribute to a larger society. Therefore, teachers and students have been doing their best to survive with the limiting resources and support they have been granted.

**Analyzing Classroom Practices regarding Democratic Citizenship**

As the previous literature points out, everything that happens in schools can have an impact on students' democratic citizenship education, therefore, it is essential to analyze some successful teaching practices to provoke positive impacts and be able to prepare students to become active citizens rather than passive.

Hess and McAvoy (2014) highlight the importance of inviting teachers to include political discussions so that students from diverse backgrounds can learn fundamental strategies to take part in a real deliberation process and see it as a means to keep improving democracy. Otherwise, if those discussions are kept out of class, students will no longer acquire knowledge and skills to deliberate about their differences and will become passive citizens who avoid provoking some important society improvements.

Although Hess and McAvoy (2014) advocates for having political discussions where any voices are excluded, they also mention that they can be challenges. As such, teachers must be knowledgeable and skillful enough when designing those discussions in class so that students who see themselves as "elite" and "ordinary" citizens can share their ideas and contribute to each other's grow. It is essential to let them acknowledge that they bring relevant information about political issues and policies to the discussions since they are based on concerns that they have personally observed through their daily interactions as members of the society. It can lead them to be willing to listen to each other, open their mindsets to understand and respect different opinions, and even better learn from each other since not all of them have interacted with specific policies at the same level.

As it has been briefly described, designing and implementing relevant discussions is a challenging job, so it demands teachers to see themselves as transformative leaders who do not

only plan to help students identify, explore, and discuss about controversial social and political issues, but ensure that their own personal and professional opinions will not interfere with their students' interactions.

Consequently, Hartnett and Naish (1993) point out that teachers must create classroom activities where students can identify, reflect on, and deliberate about societal issues. However, they clearly state that before inviting students to engage in this critical thinking process, teachers need to examine their own assumptions about social, cultural, and political diversity. It can guide them to have a better understanding of their own perspectives and how they might help or limit their ability to connect with students from multiple sociocultural backgrounds. Likewise, Hartnett and Naish (1993) invite teachers to acknowledge that their own perspectives play a crucial role since they can influence what and how they are going to teach, as well as how they ask students to deliberate about society issues. Thus, when classroom activities are effectively implemented, it will allow both teachers and students to learn and improve knowledge and skills to transform not only their lives but the lives of others.

Although most of Ecuadorian teachers may not have enough school resources and policy support, it has been amazing to observe some of their classes and see them finding multiple forms to include controversial social and political discussions to invite students to move from critical thinkers to problem solvers and doers. Besides, if there is something that must be highlighted, it is the Ecuadorian teachers' abilities to respect and establish connections with students from different sociocultural backgrounds. Their altruism allows them to even devote extra time, energy, and money in their attempts to "level the field" so that students feel welcome and valued in their class. Nevertheless, living with a limiting school support and working individually against national educational policies have decreased teachers' willingness to create

classroom activities, such as problem analysis and reflection, debates, and action projects to help students from diverse backgrounds overcome their academic and economic limitations to improve and transform their lives. What is worst, sometimes, teachers end up leaving their jobs.

**Conclusion**

The body of literature described here highlights that students' lack of commitment to actively participate in society is widely seen in several democratic countries, but it also provides some hope since some educational policies and standards have been created to deal with this issue. However, those texts from the official documents related to citizenship education need to be not only beautifully written but applied. Therefore, not only the national but the international reports and studies point out that both policymakers and teachers need to continue joining efforts to provide education so that students can learn how to engage in civic discourse and be part of a democratic life. Only then, they can argue that they are indeed contributing to the participatory social and political education that goes beyond the classroom walls.

As for now, several researchers and scholars have already provided some guidance to continue advocating for the effective implementation of those policies at the classroom level to better support teachers and students. Thus, they underline the importance of having a better understanding of different aspects related to democratic citizenship education to help students see themselves as active citizens. It can allow them to recognize that it is not enough to be a good and passive citizen who is informed about policies and shows respect for authorities and the law. Instead, society needs them to be citizens who are ready to talk about politics, engage in meaningful deliberations, and see themselves as agents to improve democracy, disrupt inequalities, and design plans to improve or change their life conditions.

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# Masked or Unmasked? The Impact of Hidden Facial Expressions on Interpretations of Emotion

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**Abstract**

Researchers are still exploring the impact of the novel COVID-19 disease. This global pandemic has altered daily life, including how we interact with others. One radical change is the wide use of cloth or disposable face masks that cover people's faces from the nose down. The current paper explores issues related to the diminished ability to identify others' facial expressions and what impact that may have on people's ability to perceive emotions and the social cues attached to those emotions. To further explore this issue, an exploratory, experimental study was conducted, participants (n = 7) were asked to complete a facial recognition task in which their reaction time and accuracy were measured for three different blocks of trials. There was no difference in reaction time between trial type, but there was a difference in accuracy which may be related to the costs of switching between masked vs. no mask conditions. Implications of these findings are further discussed.

*Keywords:* Facial expression, Theory of Mind, ToM, non-verbal communication, facial covering, eyes test

Prior to the outbreak of COVID-19 in the United States, it was very unusual for individuals to wear respiratory masks/facial coverings outside of hospital/surgical settings. During the height of the COVID-19 pandemic, it has been commonplace for institutions to require the use of face masks or facial coverings in public and private spaces. The Washington State Coronavirus Response (2020) states that facial coverings include cloth face masks; bandanas; and scarves. While there has been controversy and politicization around the effectiveness of facial coverings, thereby questioning the need to wear them (Peeples, 2020), many institutions of education, businesses, government agencies, and public spaces require the use of a mask or facial covering. However, despite their efficacy in hindering the spread of the COVID-19 virus, it is possible that face masks have a negative effect on social cues such as a person's ability to identify facial expressions. Such social cues might be especially important in academic settings where students intermingle with many peers throughout the day. Masks not only hamper verbal communication by muffling speech, but they may also hinder non-verbal communication such as facial expressions (e.g., smiling, frowning). As Hall, Horgan, and Murphy report, "Nonverbal communication is the common denominator in social life" (2019, p. 1). The interaction between verbal and non-verbal communication (NVC) affects both the language and thought processes of the sender and the receiver.

## Literature Review

Theory of Mind (ToM) is the ability to perceive mental states of others, including emotions from facial expressions (Olderbak et al., 2015). The first stage of ToM attribution involves the identification of a stimulus's relevant mental state (Olderbak et al., 2015), which is frequently measured using the Reading the Mind in the Eyes Test (the Eyes Test). In this assessment, participants view the eyes of a person and then choose which of four options most

likely describes the mental state of that person, and this is usually done in terms of emotion. Recent research has questioned the internal consistency and potential normalcy violations of the Eyes Test (Vellante et al., 2012), with an alternate short-form Eyes Test showing better psychometric properties (Olderbak et al., 2015).

ToM holds a certain universality due to the ability of facial expressions to convey personal emotions without the necessity of words. Personal emotion from facial expressions can give humans the ability to understand one another regardless of age, gender, ethnicity, verbal language ability, etc. Seven emotions are commonly accepted across many cultures - anger, fear, sadness, surprise, joy, contempt, and disgust (American Psychological Association, 2011). There are many implications in the ability to successfully read the emotions of another person, whether it be interactions between parent and child, teacher and student, colleagues, etc., how much of this ability hinges on signals originating below the eyes, i.e., the masked portion of the human face?

**Theoretical Framework**

Perhaps the most salient implication for ToM is that of the educational context. Children's ability to understand the mental state of someone else is critical to their success in learning (Wang, 2015). At many primary, secondary, early-childhood, and higher education centers across the United States, students are returning to in-person learning, and are encountering peers and educators whose lower faces are masked. This could confound the socio-emotional growth of learners who have not yet mastered the understanding of another person's emotional state. Additionally, social settings like schools are highly adaptive and require speed to understand and respond appropriately to the emotional state of another person (Hoonhorst et al., 2011). Not being able to quickly ascertain the emotion of another via facial expression could

hinder relationships among students and even between teachers and students. These relationships are foundational to an effective learning environment, and when these relationships begin to deteriorate because of unclear communication, students may suffer academically (Ebner & Johnson, 2009). In other words, wearing facial coverings might have consequences beyond just not being able to see the lower half of another person's face.

The current study will utilize a facial expression recognition test to explore the possible effects a face mask may have on participants' ability to identify a target expression quickly and accurately. The context of this study is in an institution of higher education, on a population of graduate students. Facial expressions are used as a proxy for emotions in this measure. ToM applies to a graduate-school setting as this is also a highly adaptive environment, with students needing to understand the emotional state of fellow students and of faculty. Our research questions, and their null hypotheses, are as follows:

RQ #1: Do face masks significantly affect a person's ability to identify facial expressions on a masked person's face when compared to an unmasked face?

$H_0$: There is no significant difference in accuracy scores between masked trials and unmasked trials.

RQ #2: Do face masks significantly affect a person's reaction time when identifying a masked person's facial expression when compared to an unmasked face?

$H_0$: There is no significant difference in reaction time between masked trials and unmasked trials.

## Methods

### Participants

Participants (n = 7; female = 5) were graduate students in an advanced cognitive psychology class at a large Midwestern university. As a part of the course, students were asked to participate in fellow students' in-class research projects. Most of the participants (57.1%) were between the ages of 25 to 31 years old when they completed the survey. All participants were enrolled under the College of Education and Human Sciences in the Educational Psychology Department with four participants in the department's doctorate program, and three in the master's program. Participants were not compensated for their participation in the experiment.

### Procedure

This study employed a quasi-experimental post-test only one-group design, as randomization to conditions is not possible with our participant pool. Participants were asked to complete an emotion recognition task using PsychoPy software hosted by Pavlovia.org. All participants completed the experiment on their personal computers or a public-accessible computer via a web browser. First, participants were presented with a screen with directions on how to complete the task. Once participants indicated that they have read the instructions by pressing the space key on their keyboard, the experiment began. There was a total of 96 trials across blocks. Participants were instructed to select the emotion that is expressed in a picture. Results were assessed by two parameters: accuracy and reaction time. Then, we compared average accuracy and reaction time for pictures with masked and unmasked faces.

### Measures

#### *Facial Expression Recognition*

The facial expression recognition task was created using PsychoPy (version 2020.2.4; Peirce, et al., 2019). PsychoPy is an open source, online tool used to create behavioral science

experiments. Facial expression pictures used in the study were pulled from NimStim, a reliable and valid database of pictures of different facial expressions (Tottenham et al., 2009). Because the pictures used in the experiment did not initially have medical face masks, the researchers used Adobe Photoshop to apply face masks to the pictures for the masked and mixed trials.

There were three blocks of 32 trials each – unmasked faces, masked faces, and a mix of unmasked and masked faces. Each trial within a block showed two pictures of the same woman on the left and right side of the screen with each displaying a different facial expression. Facial expression pairs were counterbalanced such that each possible combination of two different facial expressions were present in each block. Please see Appendix A for sample trials from the masked and unmasked blocks. Mixed trials were composed of a combination of masked and unmasked trials thus no example picture is provided. The emotions portrayed through facial expressions included anger, sadness, surprise, happiness, and a neutral expression. Target and distractor pictures were standardized to 5x4 inches and presented side-by-side with two inches of blank space between them. The prompt for which facial expression was the target for each trial was presented in Times New Roman (black lettering, 50-point font) across the top of the screen. Participants were instructed to press the "A" key if the target expression was on the left and press the "L" key if the target expression was on the right.

### *Demographic Information*

A short, researcher-created demographic survey was provided to participants to complete. The survey was created and distributed via Google Forms, a free online tool that can be used to create, administer, and collect survey data. None of the questions were required to complete the survey, so participants only provided information they were comfortable providing. Please see Appendix B for the questions and response options of the demographic survey.

*Planned Analyses*

Data will be analyzed using IBM SPSS 27.0. Aggregate data for accuracy and reaction time across blocks will be analyzed using two ANOVA. If the omnibus F of the accuracy or reaction time ANOVA is significant ($p < .05$), post hoc t-test contrasts will be conducted to compare each block type to see where the significant difference lies.

## Results

All data are deidentified and no personal information was collected from participants that could be connected back to the participant. Only complete data were used in the following analyses. Two participants had missing data due to technical difficulties and therefore the number of participant data analyzed was reduced to five. Of these five participants, average scores were calculated for accuracy and reaction time in milliseconds for each block type separately (see Table 1). Data were reorganized into a long format to conduct the following analyses, thus resulting in the degrees of freedom to increase to 15.

**Table 1**

*Descriptive Statistics*

|  | Average Accuracy (SD) | Average Reaction Time (SD) |
|---|---|---|
| **No Mask** | 31.20 (.84) | 1377.49ms (231.07) |
| **Masked** | 30.40 (1.82) | 1701.27ms (427.33) |
| **Mixed** | 27.60 (.90) | 1553.47ms (323.18) |
| **Total Trials** | 29.73 (1.99) | 1445.68ms (524.64) |

**Analysis of Variance**

There were two ANOVA tests conducted on this data. The first test analyzed whether there was a significant difference present in reaction time between the three different types of trials. The average reaction time for each trial type was used in the analysis. There was no

significant difference in reaction time between trial types ($F = 0.184$, $p = .834$). That is, the amount of variance accounted for by trial type was not significant, and other factors that were unaccounted for in this analysis would explain more of the variance in reaction time. Therefore, these data do not provide evidence that a medical face mask has a significant effect on a person's reaction time when identifying facial expressions. Please see Table 2 for the full results of this analysis. However, these results are not robust and must be reviewed in the context of the limitations of the sampling. The number of participants (i.e., lack of participants, lack of diversity in participant demographics) increases the probability of committing a Type 2 error. A Type 2 error is defined as a false negative, that is, incorrectly accepting the null hypothesis. This issue is discussed further in the limitations section.

**Table 2**

*Analysis of Variance for Mean Reaction Time (milliseconds).*

|  | SS | df | MS | F | Sig |
|---|---|---|---|---|---|
| **Between Groups** | 114904.649 | 2 | 57452.324 | .184 | .834 |
| **Within Groups** | 3738614.86 | 12 | 311551.239 |  |  |
| **Total** | 3853519.51 | 14 |  |  |  |

The second ANOVA was conducted to determine if there was a difference in accuracy scores across trial type. Average accuracy scores for each trial type were used in the analysis. According to the results, there was a significant difference between mean accuracy scores depending on the trial block type ($F = 11.167$, $p = .002$). That is, the type of trial accounted for a significant amount of variance in mean accuracy scores. Therefore, there is evidence that wearing a face mask had an impact on participants' ability to accurately identify facial expressions. Please see Table 3 for the full results.

**Table 3**

*Analysis of Variance for Mean Accuracy.*

|  | SS | df | MS | F | Sig |
|---|---|---|---|---|---|
| **Between Groups** | 35.733 | 2 | 17.867 | 11.167 | .002 |
| **Within Groups** | 19.20 | 12 | 1.60 |  |  |
| **Total** | 54.933 | 14 |  |  |  |

To further explore where the differences in accuracy between trial types lie, three t-tests were conducted to compare each combination of trial type: mask vs. no mask, no mask vs. mixed, and mask vs. mixed. Two of the t-tests showed a significant difference between mean accuracy scores: no mask vs. mixed trials ($t(8) = 6.573$, $p < .001$, 95% CI[2.34,4.86]) and mask vs. mixed trials ($t(8) = 3.092$, $p = .015$, 95% CI[.712,4.89]). These results suggest participants were significantly more accurate when identifying facial expressions on masked ($Macc = 30.40$) and unmasked ($Macc = 31.20$) than when they had to switch between identifying facial expressions on masked and unmasked faces in the mixed ($Macc = 27.60$) block.

## Discussion

The results of the current study indicate that wearing face masks does not affect people's reaction times in the identification of facial expressions, but there is evidence that accuracy is affected. The unmasked condition had the fastest reaction times and the mask condition had slower reaction times. While there was no significant difference between trials with congruent pictures throughout the entire trial (i.e., all pictures were masked or unmasked), there was a difference when compared to trials with incongruent pictures (i.e., pictures switched between masked and unmasked). Our results provide evidence that there is a switching cost to perceiving facial expressions when observing both masked and unmasked faces. This could be related to

cognitive factors such as cognitive load and executive function. More research is needed to understand this outcome more fully.

These results may point to a trained effect for preference of where to look for emotional cues on the face of another person. It seems that our participants were using a person's entire face to determine emotional state during trials of the unmasked faces. When the lower portion of the face became unavailable, as in the masked-face trials, participant accuracy did not suffer according to our ANOVA results. Only when participants had to switch between the two conditions within a same trial were there significant differences between group means of accuracy, but not reaction time. This indicates that participants preferred to use the whole face to determine emotion but made their decision very quickly regardless of whether the face was masked or not.

As research has suggested, social situations such as academic settings require a quick measure of another's emotional state and an appropriate response (Hoonhorst et al., 2011). Our results indicate difficulties to accurately identify the emotion of another person in mixed-group situations, where some individuals have their faces covered and others do not. Having to switch between reading the emotions of masked and unmasked peers and teachers could undermine relationships that are necessary to the success of all within institutions of education (Ebner & Johnson, 2009). Beyond this, there might be a higher emotional burden on students who are on campus and may encounter people who are both masked and unmasked - and masked people may be masked to different degrees. That is, there are masks that cover just the nose and mouth while others cover the nose, mouth, and neck. Additionally, confounding variables such as whether someone is wearing sunglasses was not examined in the current study. Based upon this pilot study, more research is needed, but considerations should be made regarding an "all or

nothing" policy, meaning a strict approach to all individuals wearing a facial covering, or not.

The implications for this type of policy could best be informed by physicians and other

healthcare and public health professionals.

Furthermore, additional considerations need to be taken regarding factors such as age and

cognitive development of the prefrontal cortex and other neural structures that aid in perceiving

the emotions of another person. As noted, our sample included graduate students and we assume

that all of our study participants have fully developed cognitive capacities. As such, we are

unable to make inferences about effects of potential cognitive differences/deficiencies on reading

masked and unmasked facial emotions for someone who is younger. Someone who has a fully

formed prefrontal cortex may be able to make decisions quicker and not have as large of a

cognitive load when faced with a situation in which they need to interpret a masked face.

However, a younger person who does not have a fully formed prefrontal cortex may need to use

more of their cognition, and therefore use more of their cognitive load, to interpret emotions.

Allocating cognition to interpreting facial expressions can take away from students' ability to

focus on schoolwork or learning a new concept.

**Limitations**

The results presented in this paper should be viewed in the context of its

limitations. The main limitation of these results is the lack of participants. Because of the

convenience sample and lack of access to other participants, the results of the analysis are not

robust. A larger sample of participants would increase the power of the analyses and in turn

increase the reliability and validity of the current findings. In addition to the small sample size,

this group of participants is not representative of the population. That is, these results are unable

to be generalized to a wider population, lacking external validity. Finally, our research approach

was necessarily simple, utilizing a single face to convey facial expressions during experimentation. While there is utility in this approach for a pilot study of our small sample size and narrow window for experimentation, on a "typical" day even during COVID-19 times, an individual would likely communicate with more than one other person - see future study directions. This further limits our inferences about the ability to perceive others' emotions in masked and unmasked situations.

### Future Directions & Conclusion

As this was an exploratory study, the results of this paper provide a small look into how face masks have changed the way people are able to identify others' emotions, there are more questions which need to be answered. Additional testing with larger, more representative samples is an important step forward. Further, including pictures of different people with and without masks (e.g., different genders, races, and ages) to represent a diverse population more accurately may lead to interaction effects in results. Future researchers might also consider manipulating the independent variables (e.g., mask vs. unmasked) in a pre- and post-test designed to ensure there are no confounding factors affecting the results. Overall, the results reported in the current paper suggest facial masks have no significant impact on the amount of time it takes for someone to identify a facial reaction, but it does have a negative impact on the accuracy of that identification.

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# Happy



Masked Trial with "Happy" as the target emotion

# Happy



Unmasked Trial with Happy as the target emotion

**Appendix B**

Participant Demographic Survey

Instructions:
"This demographic survey is for the collection of participant information for the EDPS 960 project. This data is non-identifiable and will not be used outside of the class project.

All questions are optional so if you are uncomfortable providing any information please skip that question. We [AUTHOR'S NAME] are available to answer any questions or concerns you may have regarding the survey or any part of the experiment.
Thanks for taking the time to complete this survey!

Questions and Responses:
1. Age
    0. 18 – 24
    1. 25 – 31
    2. 32 – 38
    3. 39 – 45
    4. 46 – 52
    5. 53+


1. Gender Identity
    0. The response to this question was formatted as a short answer so participants were able to respond directly with their gender identity.


1. What is your current year in graduate school?
    0. Master's (Year 1)
    1. Master's (Year 2)
    2. Master's (Year 3+)
    3. PhD (Year 1)
    4. PhD (Year 2)
    5. PhD (Year 3)
    6. PhD (Year 4)
    7. PhD (Year 5)
    8. PhD (Year 6+)
    9. Post-doctorate (any position after completing a doctorate degree)


1. What department are you getting your degree from? (Ex: Psychology Dept.)
    0. The response to this question was formatted a short answer so participants were able to respond directly with their program department.

# Bridging Metacognition and Executive Function: Enhancing Metacognition Via Development of the Dorsolateral Prefrontal Cortex

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## Abstract

Currently, there is a gap between the psychological concept of metacognition and the neuroscientific construct of executive function (EF). The following research proposal attempts to bridge this gap with an argument that component parts of "cold EF" like working memory and cognitive flexibility closely overlap with the component parts of metacognition that include planning and regulation. Additionally, the dorsolateral prefrontal cortex (dlPFC) and the superior longitudinal fasciculus (SLF) are strongly associated with working memory and cognitive flexibility. The proposed research strategy in this article then offers a way to potentially evaluate metacognition through means beyond psychological measures. If the parallels between the concepts of metacognition and EF can be established, it would mean that metacognition could be evaluated using EF components. This has implications for both the research on metacognition and EF but also, potentially, for the evaluation of programs designed to enhance metacognitive skill.

*Keywords:* metacognition, executive function, dorsolateral prefrontal cortex, superior longitudinal fasciculus, educational programming

# Introduction

## Metacognition

In 1979, John Flavell's landmark work *Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry* offered a "Model of Cognitive Monitoring" as a formalized definition of metacognition. This construct quickly took hold in psychology. Subsequent work from Ann Brown, Janis Jacobs, and Scott Paris in 1987 further refined this definition. These authors divided metacognition into two dimensions. The former labeled these dimensions "knowledge of cognition" and "regulation of cognition" (Brown, 1987). The latter preferred "self-appraisal of cognition" and "self-management of thinking" (Jacobs & Paris, 1987). While the terms differ, there was convergence in the sub-components of each dimension. The authors recognized that the dimensions "regulation of cognition" and "self-management of thinking" could be further subdivided into three components: planning, regulation, and evaluation. The first two of these will be addressed in this proposal. Planning typically involves the initial selection and sequencing of cognitive strategies and the allocation of resources. Regulation involves the monitoring of progress toward a goal and the revision, refinement, and further sequencing of cognitive strategies (Diamond, 2013; Allan, McMinn, & Daly, 2016).

Contemporary research suggests that direct instruction of metacognition (Bruning, Schraw, & Norby, 2011) and strategy learning (de Haan, 2013) may be beneficial for learners. To this end, this proposal assumes that a metacognition training program, like the one being developed by Brooks (in press) would be successful in improving student metacognition through the development of planning and regulation skills.

While metacognition and its benefits are well-established, discussions of the construct primarily remain within the field of psychology. It is the opinion of this author however, that there exist parallel constructs within neuroscience and that an important goal of educational neuroscientists is to help bridge the gap between these two fields.

**Executive Function**

Executive function (EF) can be conceptualized as a collection of higher-order processes that, through effort, enable top-down control of other cognitive processes (Allan et al., 2016). Essentially, it is the control system that modifies and adapts the cognitive and emotional responses of an organism to its external environment and internal state (Allan et al., 2016; Diamond, 2013). EF can be further divided into "hot" and "cold" dimensions depending on the low-order processes being modified. Hot EF is associated with modifying emotional and motivational processes. Cold EF—which will be addressed in this proposal—is associated with modifying the senses, attention, and perception (Allan et al., 2016; Diamond, 2013). The structure of cold EF is further divided into three core components: working memory, cognitive flexibility, and inhibitory control (Diamond, 2013). Skills like planning and regulating cognitive strategies are built from these higher-order EFs. As a practical example, think of students completing an assignment for class; they must hold the directions of the assignment in memory, manipulate prior knowledge in new ways to answer questions or complete the activity, and inhibit distracting behaviors of classmates or irrelevant information. All these processes are working dynamically and affecting what they are seeing, hearing, and how they might respond. Improving the capacity of students within these core components could have a wide-ranging effect on student performance and behavior generally. This is a broad example, but these components constantly affect our daily experiences.

Working memory is understood to be the capacity by which an individual can hold information and mentally work with it in the mind. It is involved in sequencing tasks, relating one thing to another, and using information to solve a problem (Diamond, 2013). An everyday example might include a student remembering and understanding the steps required to write an effective introductory paragraph for an essay. Cognitive flexibility is the capacity to change perspectives or strategies used to complete a task. It allows for flexible revision of strategies to respond to new rules or priorities (Diamond, 2013). Imagine a student that forgot a backpack for the day. With that act comes a whole host of adjustments and solutions that may need to be found for an otherwise routine day. Inhibitory control includes the ability of an individual to self-control behavior and to manage attention (Diamond, 2013). Picture any student that happens to be seated next to a snoring classmate or a buzzing fluorescent light. While cold EF is comprised of the dynamic interplay of these three components, inhibitory control is typically associated with a slightly different region of the brain than the other two. Inhibitory control is strongly associated with the ventrolateral prefrontal cortex (vlPFC). Working memory and cognitive flexibility are strongly associated with the dorsolateral prefrontal cortex (dlPFC) (Allan et al., 2016; Diamond, 2013). This proposal will narrow its focus to the dlPFC and thus, will only be addressing working memory and cognitive flexibility.

**Dorsolateral Prefrontal Cortex (dlPFC)**

The dlPFC has been suggested to function as a regulator of input and output pathways. The firing rates of neurons has been shown to increase as information is maintained in working memory (Allan et al., 2016). It may be posited then, that the dlPFC would show increased activation during tasks that involved planning and regulation. Additionally, the dlPFC has been implicated in cognitive flexibility as shown by increased functional activation in response to

shifting rule or set changes during a task. This ultimately produces different responses from an individual depending on the external and internal environment (Allan et al., 2016; Diamond, 2013).

While this proposal is narrowed to focus on the role of the dlPFC in working memory and cognitive flexibility, it is important to remember that the dlPFC is a highly connected cortical region. This means that it frequently works in concert with other cortical and sub-cortical regions of the brain as a part of larger networks and pathways. In working memory, for example, the dlPFC is involved in a larger frontoparietal network and is connected by a white matter tract called the superior longitudinal fasciculus (SLF). Research done with Diffusion tensor imaging (DTI) has shown that increased fractional anisotropy (FA) integrity of the SLF is positively correlated to working memory (Hummer, Wang, Kronenberger, Dunn, & Matthews, 2015). Furthermore, other neuroimaging research in EF has also shown that structural differences in cortical thickness and volume of prefrontal areas—including the dlPFC—is linked to performance on EF tasks (Allan et al., 2016).

## Research Proposal

To date, metacognition research has been limited to psychological measures of the construct. These measures frequently consist of self-report questionnaires and interviews. This proposal draws parallels between two commonly recognized components of metacognition, planning and regulation, and EF of the dlPFC that enable these metacognitive components, specifically working memory and cognitive flexibility. If these parallels are established, it would allow for metacognition research to be additionally informed by a neurobiological perspective. This would expand how metacognition may be measured, namely through assessing EF components.

Additionally, it has been suggested that EF can be improved through training (de Haan, 2013; Diamond, 2013; Allan et al., 2016). If links between metacognition and EF can be made, this has implications for the benefits of metacognition training on personal health and performance (Allan et al., 2016; Diamond, 2013) as well as its use as an intervention for individuals with ADHD, DBD (Hummer et al., 2015). Along with the base of evidence potentially bolstered by this research proposal, a well-designed metacognition program, such as the one proposed by Brooks (in press), could have wide-ranging benefits for individuals.

The following study proposal seeks to use neurobiological measures of the dlPFC to evaluate EF performance after participants engage in a metacognition training program. The author presents the following hypotheses:

1. Participants in the experimental group receiving metacognition training will show higher FA integrity in the SLF, post-intervention, when compared with the control group.

2. Participants in the experimental group receiving metacognition training will show cortical thickness and volumetric differences in the prefrontal cortex, post-intervention, when compared with the control group.

3. Participants in the experimental group receiving metacognition training will show greater functional activation of the dlPFC during cognitive flexibility tasks, post-intervention, when compared with the control group.

**Proposed Study Overview**

The research would follow a pre- and post-test experimental design. An experimental group would be created in which participants would complete a metacognition training program.

A control group would be created in which participants would not receive the metacognition training program. Depending on the sample size, further sub-categories of participants (e.g., ADHD, gender, SES, etc.) may be created for additional analyses.

Prior to the treatment, all participants would undergo the same battery of tests and neuroimaging procedures. A wide-ranging battery of assessments of EF is encouraged. Assessments like the Cambridge Neuropsychological Testing Automated Battery (CANTAB) (de Haan, 2013; Diamond, 2013), the NIH Toolbox Cognition Battery (Ursache & Noble, 2016), and the Automated Working Memory Assessment (AWMA) (Diamond, 2013) each have components that measure EF.

Regarding neuroimaging, T1-weighted images of participants should be acquired to complete voxel-based morphometry (VBM) and DTI analyses. T2-weighted images should also be acquired through fMRI methods to measure and analyze BOLD (blood-oxygen-level-dependent) activation during EF tasks. Common EF tasks that could be used during scanning to measure functional activation could include, but are not limited to, digit-span tests (Hummer et al., 2015; Diamond 2013; de Haan, 2013), Stroop tests (Allan et al., 2016), and AX-CPTs (Diamond, 2013) but, in accordance with the hypotheses, the study should focus on tasks that specifically measure cognitive flexibility like the trail-making test (Allan et al., 2016), Dimensional Change Card Sort Task (DCCST) (Diamond, 2013), or various fluency (design, verbal, category) tasks (Diamond, 2013).

Following the treatment, the participants would undergo the same battery of tests and neuroimaging procedures so the data can be compared pre- and post-treatment. This proposal is narrowed to the dlPFC, so a region-of-interest (ROI) analysis is suitable. Other ROIs include related regions and brain structures like the SLF and the parietal lobe.

Beyond the scope of this proposal, the opportunity to include other assessments in the battery should not be lost. Psychological tests of metacognition, demographic information, and academic performance scores could all be included to assess both the efficacy of the metacognition program and to see if there are other relevant correlations to EF.

The previous sections present a brief overview of the proposed research study. It should be noted that, in the formalized proposal, the metacognition training program would be extensively discussed and examined. This author recognizes that the results of the research and the likelihood of confirming or disconfirming the hypotheses rests on the duration of the program in question. While the program was not broadly explained in this proposal, the assumption should be made that this would be a longitudinal study and that the program would last between 6-7 years. This length of time gives researchers additional opportunities to expand the study to include an analysis of data from a neuro-developmental perspective. A suitable program that fits these criteria and is designed to specially enhance metacognitive skill is currently being developed and proposed in an article by Brooks (in press).  Developmental considerations concerning the dlPFC and metacognition were not determined to be within the scope of the current proposal but should absolutely be pursued as a future direction of study.

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