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Using Mindfulness Through Doodling in Interactive Notebooking to Increase Student Achievement

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Using Mindfulness Through Doodling in Interactive Notebooking to
Increase Student Achievement

by

Michelle Brown

A Dissertation Submitted to the Education Faculty of Lindenwood University

In partial fulfillment of the requirements for the

Degree of

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Abstract

The SARS-CoV-2 pandemic, which unfolded from 2019 to 2021, disrupted education systems worldwide, leading to significant learning loss and inequities. The shift to digital learning, necessitated by the pandemic, presented challenges such as learning loss and social-emotional impacts. This study investigates the incorporation of Social Emotional Learning (SEL), with mindfulness, into the school curriculum to address these challenges.

The focus of the study is on the implementation of Mindful Doodling as a component of SEL within an interactive notebook in a middle school science curriculum to enhance student achievement. The study aimed to analyze how different amounts of Mindful Doodling in various settings impact achievement in a small, private middle school in the Midwest. The investigator assessed student achievement levels using pre- and post-assessment unit tests and evaluated the effectiveness of Mindful Doodling in different settings, including virtual, hybrid, and in-person learning.

The rationale for this study stemmed from the disruptive effects of the pandemic on traditional classroom structures and the resulting impact on student achievement and mental health. The shift to virtual learning created isolation and stress, prompting educators to seek ways to mitigate these effects. Mindful activities, including Mindful Doodling, were introduced into the curriculum to reduce stress.

The conceptual framework was grounded in the practice of mindfulness, emphasizing being present in the moment. Mindfulness has been associated with improved physical and mental health, reduced stress, and greater life appreciation. The study focused on the impact of Mindful Doodling on student achievement, exploring

whether the frequency of Mindful Doodling and the learning environment (virtual, hybrid, or in-person) played a role in this impact.

The study set forth four hypotheses to answer the research questions, exploring the relationship between Mindful Doodling and student achievement in different settings. The independent variables included Mindful Doodling practices, frequency of doodling, and the learning environment, while the dependent variable is student achievement.

The study's delimitations included a specific time frame and location, focusing on seventh-grade science students in a suburban private middle school during the 2020-2021 school year. The limitations involved the sample demographics and the use of instructor-created assessments.

In summary, this research sought to fill the gap in the understanding of how Mindful Doodling can positively impact student achievement, especially in a post-pandemic learning environment characterized by stress and isolation. The results of this study may provide valuable insights for educators and policymakers looking to enhance SEL practices and improve student outcomes, which includes the incorporation of Mindful Doodling across the curriculum, and expansion of further research, by expanding the study population, as well as expanding the Mindful Doodling practice.

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Chapter One: Introduction

Background of the Study

The global landscape underwent a profound transformation during the SARS-CoV-2 pandemic that spanned from 2019 through 2021. The repercussions were felt across various sectors, and one of the most significantly impacted domains was education. In the wake of the virus' rapid spread, nations worldwide resorted to various forms of lockdowns as recommended by the Center for Disease Control (CDC, 2022). The sweeping change necessitated a seismic shift in the traditional education paradigm where students and educators shared physical spaces for learning. The conventional classroom setup became obsolete, forcing educators, students, and the entire educational system to navigate uncharted territories and adapt to an unprecedented reality.

The shift towards digital learning, while a commendable response to the crisis, was not without its set of challenges and consequences. Educators and students found themselves thrust into a digital platform without adequate preparation or the luxury of a gradual transition (Schleicher, 2020, p. 4). The consequences of this abrupt shift were far-reaching, manifesting as significant learning losses and social-emotional impacts on students. The very fabric of education was strained, and the repercussions were particularly notable in the realm of social and emotional well-being.

As the world grappled with the educational upheaval, it became increasingly evident that the SARS-CoV-2 pandemic underscored the need for a holistic approach to education. The disruptions caused by the virus necessitated not only academic adaptations but also a heightened focus on students' social and emotional development. The term “learning loss” took center stage, with Schleicher (2020, p. 4, para. 5)

highlighting students endured a loss equivalent to one-third of a school year. The significance of this loss amplified when considering the profound impact of mental health on learning outcomes.

Recognizing the multifaceted nature of students' well-being, the United States Department of Education, as articulated by Cardona (2021), categorizes well-being into three dimensions: social, emotional, and behavioral (p. 1, para. 1). The pandemic elevated the importance of Social Emotional Learning (SEL) to a critical level, particularly in the context of virtual learning environments that became the norm for many schools. SEL, as a framework, encompasses the development of crucial skills such as self-awareness, self-management, social awareness, relationship skills, and responsibility. Consequently, when schools transitioned back to in-person learning, there was an inherent responsibility to expand and prioritize SEL for each student (Yorke et al., 2021, p. 2).

Amidst the challenges posed by the pandemic, educators and curriculum developers recognized the need to infuse SEL with innovative practices that could simultaneously address the academic and emotional needs of students. One such practice gaining prominence is mindfulness, a component seamlessly integrated into SEL curriculums. Mindfulness, as a practice, encourages individuals to be present in the moment, fostering a heightened awareness of one's thoughts and emotions (Watt, 2012). An intriguing addition to the SEL toolkit is Mindful Doodling, a practice that combines the art of being in the moment with the visual representation of ideas through doodling (Brown, 2015, p. 8, para. 1).

Mindful Doodling, as an aspect of SEL, holds immense promise, especially when implemented within interactive notebooks as part of a middle school science curriculum.

The innovative approach of combining Mindful Doodling within a curriculum not only aligns with the principles of SEL but also enhances student engagement and achievement. The interactive nature of Mindful Doodling fosters a creative and active learning environment, promoting deeper understanding and retention of scientific concepts.

The SARS-CoV-2 pandemic disrupted education on a global scale, necessitating a paradigm shift to digital learning. This transition, while essential for continuity, brought forth a myriad of challenges, including significant learning losses and social-emotional impacts on students. The recognition of the interconnectedness of academic and emotional well-being led to an increased emphasis on Social Emotional Learning (SEL), with mindfulness and Mindful Doodling emerging as valuable tools in this educational landscape. As schools strive to recover and rebuild in the post-pandemic era, the integration of SEL practices, including Mindful Doodling, remains a vital component in fostering a holistic and resilient educational system.

Purpose of Study

The investigator focused on the nuanced effects of Mindful Doodling on student achievement within a small, private, midwestern middle school science classroom. The primary objective was to scrutinize how varying durations of Mindful Doodling in different educational settings influenced academic outcomes. The investigator sought to position Mindful Doodling as a deliberate practice capable of augmenting student achievement in the realm of middle school science education in a positive manner. The assessment of student achievement levels was meticulously conducted through the administration of pre- and post-assessment unit tests.

Notably, the study's focus extended beyond mere observation of the effects of Mindful Doodling; it aimed to quantify the impact of different durations of this practice on student achievement across diverse settings. The investigator was motivated to ascertain whether Mindful Doodling could be considered a significant and positive tool for enhancing academic performance.

At the initiation of the study, the existing body of knowledge neither specifically supported nor refuted the potential influence of Mindful Doodling on student achievement within the middle school science classroom. However, existing frameworks on mindfulness implementation in education, such as those articulated by Watt (2012), lent credence to the investigation's premise.

The inception of Mindful Doodling practices in this educational context was a direct response to the transformative impact of the SARS-CoV-2 virus on teaching methodologies. As highlighted in the Education Week article "How Hybrid Learning Is (and Is Not) Working During SARS-CoV-2 Virus: 6 Case Studies," the hybrid learning format, necessitated by the pandemic, introduced challenges that extended learning resources for both teachers and students. This strain on resources, coupled with limitations on socio-emotional learning (SEL) expansion, prompted the investigator to formulate pertinent questions aimed at exploring the integration of Mindful Doodling as an integral component of SEL. This research was not only timely but also sought to address the evolving needs of education in the face of unprecedented challenges.

Rationale of the Study

Throughout history, the paramount focus of education has invariably been student achievement. The educational landscape underwent a seismic shift during the SARS-

CoV-2 pandemic, forever altering the traditional classroom structure and leaving an indelible mark on student achievement. During the height of the pandemic, the academic year 2020-2021 bore witness to a novel approach to learning, with students tethered to virtual classrooms through an array of electronic devices such as computers, Chromebooks, or other internet-accessible gadgets. The pandemic, a global disruptor, upended not only the educational system but also the dynamics of teaching and learning, all in response to government-enacted isolation mandates aimed at curbing the virus's spread. The abrupt alteration in learning methodology led to a cascade of repercussions, most notably the profound impact on students' mental health, prompting educational leaders to delve into investigations to unearth ways to minimize the deleterious effects of isolation on both students' mental well-being and their scholastic accomplishments.

The conventional middle school classroom was a model of collaboration, teamwork, and Social and Emotional Learning (SEL), serving as the bedrock of the educational paradigm at the study school. Critical thinking, a skill honed through collaboration with peers, thrived in this environment. Educators, cognizant of the importance of SEL, fostered it among students by facilitating open communication and collaborative work, thereby enriching their overall learning experiences (Collaborative for Academic, Social, and Emotional Learning, 2022).

The SARS-CoV-2 pandemic galvanized a global response, ushering in widespread isolation practices. Educational institutions were not impervious to these measures, necessitating an abrupt transition from the conventional physical classroom setting to a virtual realm where the interaction between students and teachers occurred solely through the confines of computer screens. The paradigm shifts in the learning

environment resulted in an unprecedented sense of isolation for students and educators alike, exerting a profound toll on their mental health (Center for Disease Control, 2021).

The ramifications of the isolation stemming from the SARS-CoV-2 response were acutely felt in the mental health arena of both students and teachers. The challenges that resulted due to SARS-CoV-2 became glaringly evident that not every student had equitable access to their virtual learning environment, introducing concerns about social-emotional well-being, manifested through heightened stress and anxiety (Yorke et al., 2021, pp. 5-6). These concerns precipitated a concerted effort by schools to explore avenues to alleviate stress induced by the isolation that resulted from the SARS-CoV-2 pandemic (May 2021 Mental Health Impact of the COVID-19 Pandemic, 2021). A prevailing approach in this endeavor involved the integration of mindful activities into the social-emotional learning curriculum, a strategy aimed at mitigating the adverse effects of isolation-induced stress (Watt, 2012).

Conceptual Framework

Mindfulness, as articulated by Watt (2012), serves as a profound outlet to heightened awareness in the present moment. Grounded in spiritual traditions, particularly within the foundational tenets of Buddhism, mindfulness guides practitioners to embrace the essence of 'being' in the here and now (Watt, 2012, p. 5). The practice extends beyond a mere acknowledgement of the surroundings; it necessitates a holistic immersion into the current moment, fostering qualities of awareness, presence, focus, embodiment, and acceptance (Watt, 2012).

Mindfulness finds its foundation in spiritual traditions that championed a profound awareness of the present, aligning seamlessly with the philosophical teachings

of Buddhism. The evolution of mindfulness is evident in structured programs like Mindfulness-Based Stress Reduction (MBSR), an eight-week transformative journey that empowers individuals to navigate the complexities of everyday life with reduced stress, leading to a fuller, more enriched existence. Mindfulness-Based Cognitive Therapy (MBCT), designed to address recurrent depression, stands as a testament to the adaptability and effectiveness of mindfulness, particularly in mitigating negative thought patterns. MBSR and MBCT programs incorporate meditation as a formal practice, a dynamic tool that trains the mind to elevate awareness and presence (Watt, 2012).

The holistic benefits of mindfulness are profound, impacting both physical and mental well-being. As outlined by Watt (2012), engaging in mindful practices fortifies the immune system and alleviates chronic pain. On the mental health front, mindfulness emerges as a significant practice in diminishing the grip of depression, addiction, anxiety, and stress (Watt, 2012). Those who traverse the mindful path discover an augmented sense of enjoyment and a heightened appreciation for life itself (Watt, 2012).

Amidst the challenges posed by the SARS-CoV-2 pandemic, educators have turned to mindfulness in pursuit of solace and equilibrium (Tortella et al., 2021). Mindfulness becomes a beacon of hope, offering respite from the tensions wrought by the pandemic and serving as a transformative force in enhancing the overall well-being of individuals across diverse contexts.

Statement of Problem

The investigator sought to expand the understanding of student achievement within the middle school science classroom. This investigation sought to ascertain differences in assessment scores among students engaging in varied durations of Mindful

Doodling. The central inquiry focused on discerning whether the integration of Mindful Doodling had a significant impact on increasing student achievement.

A thorough analysis of student achievement levels was conducted, employing a meticulous pre- and post-assessment methodology. The investigator systematically assessed the effectiveness of Mindful Doodling as an intervention, meticulously dissecting summative differences to ascertain the potential positive impact of this practice on student achievement.

Acknowledging the existing gaps in literature, the current body of knowledge provides limited conclusive evidence either supporting or refuting the significant influence of Mindful Doodling on student achievement in the middle school science classroom. Despite this, a theoretical foundation emerges from various frameworks advocating for the integration of mindfulness practices within educational settings (Watt, 2012).

The investigation not only serves as an exploration of Mindful Doodling's impact but, also as a broader contemplation on the multifaceted landscape of mindfulness within the educational sphere. As the inquiry progresses, the overarching goal remains anchored in unraveling the potential keys to unlocking enhancing student achievement through the mindful incorporation of doodling practices.

Hypotheses

The investigator sought to answer the following overarching question and sub-questions, which resulted in four hypotheses: The following research question and hypotheses guide this quantitative study:

Overarching RQ1: How does Mindful Doodling impact student achievement?

Sub-question 1: How do differences in the frequency of Mindful Doodling increase student achievement within the middle school science classroom?

Sub-question 2: What are the differences in achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom?

Sub-question 3: What is the relationship between achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school classroom, and the frequency of students practicing Mindful Doodling?

Hypothesis 1

H1_a: There is an increase in growth in student achievement when students utilize Mindful Doodling within a middle school science classroom.

Hypothesis 2

H2_a: There is a significant difference in growth in student achievement when Mindful Doodling frequencies increase in the middle school science classroom.

Hypothesis 3

H3_a: There is a difference between the increase in achievement of virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom.

Hypothesis 4

H4_a: There is a relationship between the increase in achievement of virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling zero times, approximately 1-4 times, and approximately 5-10 times.

Independent variable

The independent variables of the study include the practice of Mindful Doodling in the middle school science classroom, the frequency students participate in Mindful Doodling practices, and the environment in which students participate, such as virtual, hybrid, and in-person learning.

Dependent variable

The dependent variable is identified as student achievement as a measure of growth and a difference in student pre- and post-assessment scores.

Delimitations, Limitations, and Assumptions

The scope of the study was bounded by the following delimitations:

Time Frame.

Existing data from pre- and post-assessments that were administered during October 2020.

Location of the Study.

The study takes place at a suburban private middle school in the Midwest.

Sample.

The sample was a heterogeneous mix of males and females, 11- to 14-year-old seventh-grade science students.

Criteria.

The sample included only students participating in the suburban private middle school seventh-grade science classes during the 2020-2021 school year.

The following limitations were identified in this study:

Sample Demographics.

The sample included seventh-grade students participating in seventh-grade science classes at a suburban private middle school.

Instrument.

The data from an instructor-created pre- and post-assessment is analyzed for the growth in student achievement.

Definition of Terms

For this study, the investigator defined the following terms:

Adolescent Learners Characteristics:

Adolescent 'learners' characteristics comprise the various attributes that shape the way individuals make meaning of their world. These attributes include specific skills, such as hypothetical-deductive reasoning and metacognition, which are tied to an individual's stage of cognitive development. They also include individuals' subjective views of the learning enterprise, for instance, their levels of motivation and mastery goals. All these attributes are shaped in important ways by the social environment in which the learning experience occurs. (Davis, 2012, para.1)

Assessment: "referred to the wide variety of methods or tools that educators use to evaluate, measure, and document the academic readiness, learning progress, skill acquisition, or educational needs of students" (Great Schools Partnership, 2015, para.1).

Doodling: meant "to draw pictures or patterns while thinking about something else or when you are bored" (Doodling, n.d., para.1).

Educator Roles: were defined by (Havighurst, 2020, para.1) as

Broadly speaking, the function of teachers is to help students learn by imparting knowledge to them and by setting up a situation in which students can and will learn effectively. But teachers fill a complex set of roles, which vary from one society to another and from one educational level to another. Some of these roles are performed in the school, some in the community.

Hybrid Learning: was defined by (Pennsylvania State University, 2009, para.1) as

A hybrid approach to course delivery combines face-to-face classroom instruction with online activities. This approach reduces the amount of seat time in a traditional face-to-face course and moves more of the course delivery online. During classroom instruction time, students can be engaged in authentic, collaborative learning experiences. The online components can include multimedia-enhanced content and channels for ongoing discussion.

In-Person Learning: referred to: "Students must be active participants. The experience should support social interaction, and the process needs to be meaningful. Blended Learning, personalized Learning, and differentiated instruction represent interrelated components that can support the achievement of those ideals" (Holland, 2018, para. 12).

Interactive Science Notebooks: was defined as "serve as a means for teachers and students to communicate with each other around specified content. The notebooks are also a tool for teachers to provide content information and students to wrestle with complex content concepts" (Westfall, 2018, p. 28-35).

Middle School Science Classroom: was defined by (Wormeli, 2016, para. 1) as: middle school, not a junior version of high school. To be effective in our teaching, we are developmentally appropriate for young adolescents, not for 16- to 18-year-olds nor for 8- and 9-year-olds. There is expertise to teaching middle-level students that is different from that needed to teach elementary or high school students, and our classrooms reflect that specific expertise.

Mindful Doodling: was defined by (Malchiodi, 2014, para. 7) as:

Doodling is not just a way to 'think differently,' it's a way to 'feel differently,' too. From emerging studies, we are learning that art expression may actually help individuals reconnect thinking and feeling, thus bridging explicit (narrative) and implicit (sensory) memory. The wonderful thing about Doodling is that it is a whole brain activity—spontaneous, at times unconscious, self-soothing, satisfying, exploratory, memory-enhancing, and mindful.

Mindfulness: was defined as "means becoming more aware of what's going on-right here, right now" (Watt, 2012, para. 2).

Next Generation Science Standards: was defined by (NGSS Lead States, 2020, para. 1) as:

The Next Generation Science Standards (NGSS) are K–12 science content standards. Standards set the expectations for what students should know and be able to do. The NGSS were developed by states to improve science education for all students.

Social-Emotional Learning: was defined by (Niemi, 2020, paras. 3-4) as:

Social and Emotional Learning (SEL) is an integral part of education and human development. SEL is the process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions. SEL advances educational equity and excellence through authentic school-family-community partnerships to establish learning environments and experiences that feature trusting and collaborative relationships, rigorous and meaningful curriculum and instruction, and ongoing evaluation. SEL can help address various forms of inequity and empower young people and adults to co-create thriving schools and contribute to safe, healthy, and just communities.

Student Achievement: was defined as "academic achievement, attainment of learning objectives, acquisition of desired skills and competencies, satisfaction, persistence" throughout their Learning (York et al., 2015, p. 5, para. 5).

Summary

The investigator analyzed differences in pre- and post-test data on an instructor-created assessment to determine the impact of Mindful Doodling practices on student achievement. The SARS-CoV-2 virus spread, creating a worldwide response, resulting in long isolation periods in many communities (CDC, 2022). In the educational setting, students and teachers rapidly transitioned from in-person learning to virtual learning (Schleicher, 2020). The combination of vast isolations associated with the worldwide response to SARS-CoV-2, and the immediate shift in learning, increased stress levels in both students and teachers. (Schleicher, 2020).

The administrative team at the study school began exploring ways teachers could reduce the stress levels that the students and teachers experienced. The study investigator focused on examining Mindful Doodling data from science students in a small midwestern school since the study school participated in activities such as doodling to alleviate some of the stressors associated with the pandemic. The investigator wanted to determine if the practice increased achievement based on the amount of doodling. Additionally, the investigator wanted to determine how virtual, hybrid, and in-person learners who practice Mindful Doodling compared in science achievement.

Educational institutions began examining mindful practices within their SEL curriculum that focused on reducing stress levels among students and teachers. These

concepts are expanded and explored further in a literature review in the following chapter.

Chapter Two: Review of Literature

Chapter One outlined the responsibility of educators and discussed different components that comprised middle school science classrooms. One example included how educators became responsible for teaching students about Social Emotional Learning or SEL and the subject content. One feature of SEL included mindfulness. Mindfulness is the practice of being present for what is happening here and now, it includes being in the moment (Watt, 2012, p. 1). The SARS-CoV-2 pandemic caused isolation and stress over the previous two years. The stress caused by the SARS-CoV-2 pandemic led educators to investigate additional ways to increase student achievement, such as Mindful Doodling (CDC, 2022).

Mindful Doodling allowed students to be present for the lesson's content. Doodling enabled students to connect with their learning by drawing their attention to their thoughts in the current instead of being focused on the stressors around them. Generating doodles using the entire brain has benefits to the practitioner (Malchiodi, 2014, para. 3). First, doodling encourages deep thought and enhanced the ability to focus. Secondly, doodling helped foster problem solving skills, improves memory, retention, and enhances mindfulness.

The literature review provided evidence that supported the implementation of Mindful Doodling to enhance student learning in middle school. The review includes an analysis of the current research on how the middle school can be analyzed as a structure to support student learning. As a result of the SARS-CoV-2 outbreak, the learning environment shifted to in-person, virtual, or hybrid learning (CDC, 2022). Each learning type within the middle school science classroom centers on student achievement grounded in the

Next Generation Science Standards, which utilize student assessments and interactive notebooks for evaluation. Students doodle within the interactive notebooks to enhance their understanding of their scientific content. The doodling practices support student SEL with the supporting concepts of mindfulness and Mindful Doodling to enhance student learning within the student interactive notebook. The connections between the ideas of doodling and SEL to increase student achievement were solidified through the analysis of the effects of Mindful Doodling on student achievement within the middle school science classroom, as this concept lacked information.

Organization of the Literature Review

The literature review was structured in a way in which middle school achievement was the focal point. The first portion discussed the format and structure of the middle school as it supports the achievement of students. The function of the middle school was to serve as a support to student achievement in academics and social interactions. The review then delved into the impact the cognitive development of the adolescent had on their achievement. After the discussion of the impact cognitive development had on achievement the focus then shifted to the impact of Social Emotional Learning on student achievement. As a part of Social Emotional Learning (SEL) the concept of mindfulness was analyzed as a support for student achievement within a Social Emotional Learning curriculum. Within the SEL curriculum students were encouraged to utilize various mindful practices one of the practices included Mindful Doodling to enhance student achievement.

Student Achievement in Middle School

The middle school concept or definition is essential in understanding student achievement within the middle school, and the implementation mindfulness through doodling in interactive note booking to increase student achievement. The middle school is defined as:

middle school, not a junior version of high school. To be effective in our teaching, we are developmentally appropriate for young adolescents, not for 16-to-18-year-olds nor for 8- and 9-year-olds. There is expertise in teaching middle-level students different from the expertise needed to teach elementary or high school students. Our classrooms reflect that specific expertise. (Wormeli, 2016, para. 1)

The middle school movement, which began in the 1960s, advocated for an environment where teachers focused on the "middle" developmental age of students that fell between the ages of 10 and 15.

The experts in middle school achievement from the Association for Middle Level Educators included Wormeli, Bishop, and Harrison. According to Wormeli, Bishop, and Harrison the successful middle school focused on curriculum, instruction, Social Emotional Learning (SEL), organization, and adolescent development (Wormeli, 2016). Students' developmental age influences their ability to understand and comprehend the world. Adolescent understanding influences the structure and decisions educators make to impact student achievement within a middle school significantly. The entire middle school concept integrated specific components of the middle school theory, including

advisory, teaming, and exploratory classes, emphasizing critical thinking, collaborative learning, and a SEL curriculum (Wormeli, 2016).

The middle school's advisory concept includes a small group of students that an adult leads. During this time, students form close relationships. The adult or advisor fosters the student's social and emotional development during this period. Often it is a designated class, but it can also be a time during the week for students to gather for developmental activities (Muth & Alverman, 1999, p. 6).

The concept of teaming at the middle school level includes a group of teachers that work together with a specific group of kids. All the teachers on the team teach the same grouping of students, allowing them to implement intervention strategies by identifying student weaknesses within their classes (Muth & Alverman, 1999, p. 5). The Exploratory class encompasses any course that is not mathematics, social science, science, or language arts.

Critical thinking is the capability to think rationally, clearly, and comprehend logical relationships between ideas. Additionally critical thinking means examining, making comparisons, evaluating, examining, measuring aspects, and then making choices to resolve issues centered on these skills (Forte & Horvath, 2011, pp. 4-5). Utilizing reasoning abilities is an intellectual process that can be as simple as being aware of one's environment or as complicated as declaring choices that result in behavior. The recommended integration of critical thinking skills asserts that they are not taught in isolation and are incorporated throughout the curriculum.

The ability of students to work within a collaborative team teaches civility. Students must understand the foundations of communicating civilly among their peers to

work within a group effectively. The basis of understanding this is as follows:

Collaborative groups are composed of diverse students. Norms of cooperation are set and expected. They periodically ask students to pause and reflect on their comfort, and the comfort of others, in settings where there may be tension or disagreement. (Muth & Alverman, 1999, p. 7).

SEL is the central focus of the middle school concept. The Collaborative for Academic, Social, and Emotional Learning (CASEL) website reads:

We believe it is most beneficial to integrate SEL throughout the school's academic curricula and culture, across the broader contexts of schoolwide practices and policies, and through ongoing collaboration with families and community organizations. These coordinated efforts should foster youth voice, agency, and engagement; establish supportive classroom and school climates and approaches to discipline; enhance adult SEL competence; and establish authentic family and community partnerships.). Each of these competencies is essential to the overall Learning within the middle school. (CASEL, 2022, para. 7)

Each sub-component of the middle school builds upon itself as the foundation for the education of adolescents. As an essential component of adolescent learning and growth advisories, teaming, critical thinking, collaboration, and SEL are crucial in supporting the overall development of the adolescent learner.

Educator Roles

The middle school educator had a pivotal role in the educational environment of middle school students. They were responsible for developing learning environments that met the specific needs of young adolescent learners (Martens & Caskey, 2018). The

educator of middle school students was able to meet the young adolescents' learning needs through a comprehensive understanding of middle school philosophy, organization, curriculum, planning, delivery, assessment, collaboration, and content knowledge (AMLE, 2021).

The foundation of an effective middle-school educator began with an understanding of middle-school philosophy. The middle-school concept placed the development of adolescent learners at the forefront, recognizing the middle-school student's distinctive needs and characteristics (Bishop & Harrison, 2021). Within the middle-school philosophy, student centeredness took precedence, emphasizing the importance of addressing the Social Emotional Learning of students. This transformative approach significantly shifts the educator's role within the classroom from being the focal point of instruction to becoming a facilitator and coach who guides students in their learning journey.

Familiarity with the organizational structure of middle-schools was another essential aspect of the educator's role. Middle schools had a structure that explicitly catered to the needs of adolescent learners (Muth & Alvermann, 1999). This structure encompasses elements such as an integrated curriculum, advisory programs, exploratory programs, interdisciplinary teams, and educators who possess specialized knowledge about young adolescents (Muth & Alvermann, 1999). The integrated curriculum plays a critical role in connecting students to the concepts they are learning by incorporating multiple disciplines throughout the school day. This approach promoted a holistic understanding of subjects, supported the adolescents' learning and development, and addressed their questions and concerns (Atkin et al., 2002).

An integrated curriculum extends beyond academic content and includes the Social Emotional Learning (SEL) of adolescents. SEL focuses on the development of students' social and emotional skills, which are essential for their overall well-being and academic success (Atkin et al., 2002). Through the integration of SEL into the curriculum, educators create an educational environment that nurtures the emotional intelligence and resilience of students, fostering positive relationships, self-awareness, and responsible decision making.

Middle-school educators had to be skilled in curriculum planning and delivery to effectively fulfill their roles guiding students through the learning process. Educators should have designed and implemented curriculum that was not only academically rigorous but also relevant and engaging for middle school students. A well-designed curriculum took into account the developmental needs and interests of students, encouraged critical thinking, problem solving, and inquiry-based learning, and fosters a love for lifelong learning (Bishop & Harrison, 2021). The curriculum should provide opportunities for students to explore different subject areas in depth and make connections between disciplines, promoting a comprehensive understanding of the world.

Collaboration was another key aspect of the middle school educator's role. Educators needed to work collaboratively with their colleagues, administrators, and other support staff to create a positive and supportive learning environment for students (Atkin et al., 2002). Collaborative efforts can take the form of team planning, interdisciplinary projects, and shared professional development opportunities. Fostering a culture of collaboration, educators enhance the educational experience for middle school students and create a sense of belonging within the school community.

Assessment was another vital component of the middle school educator's role. Middle school educators employed a variety of assessment strategies to gather data about student's learning and growth. Assessments in the middle school can include traditional tests, performance tasks, projects, presentations, and portfolios. With the use of a diverse range of assessment methods, educators obtain a comprehensive understanding of students' strengths, challenges, and areas for growth. Educators should not have used assessments for the sole purpose of measuring academic growth, but assessments provided opportunities for students to demonstrate their creativity, critical thinking, and problem-solving skills (Kelier, 2018).

Lastly, middle school educators had to possess strong content knowledge in the subjects they taught. A solid foundation in content knowledge allowed educators to provide accurate information, answer students' questions, and guide student learning effectively. The strong content knowledge of an educator allows students to be enabled to create meaningful connections between concepts and real-life applications, fostering a deep understanding of the subject matter. Middle school educators stayed updated with current research and best practices in the educator's respective fields allow for the delivery of high-quality instruction and incorporation of relevant and engaging content into their lessons (AMLE, 2021).

In summation, middle school educators play a crucial role in supporting the educational development of middle school students. Educators can create a positive and impactful learning environment for students by understanding middle school philosophy, being familiar with the organization of middle schools, designing and implementing an integrated curriculum, promoting collaboration, employing effective assessment

strategies, and possessing a strong content knowledge (AMLE, 2021; Atkin et al., 2002; Bishop & Harrison, 2021.; Martens & Caskey, 2018; Muth & Alvermann, 1999).

Adolescent Learning

Adolescence was between childhood and adulthood, divided into early and late adolescence (Muth & Alvermann, 1999, p. 12). "Physically, young adolescents undergo more change than at any other time of their lives except infancy" (Muth & Alvermann, 1999, p. 20). The changes adolescents underwent were physical and mental developmental changes. The dramatic changes that occurred during adolescent development directly influenced the ability of the student to process and retain the information taught.

The physical changes adolescents experienced during early adolescence can have psychological and social impacts on co-occurring learning and cognitive developments. Cognitive development is:

concerned with the activities that occur in the mind between the time of the stimulus and the time of the response. Cognitive development refers to how these activities become more sophisticated as a person gets older and gains more experience. (Muth & Alvermann, 1999, p. 29)

Piaget developed a theory of cognitive development where the individual constructs their understanding, and thus, the teacher became a facilitator of knowledge rather than the transmitter of information (Muth & Alvermann, 1999, p. 29). The theory of cognitive development asserts that learning occurs in four stages as an individual progresses in the developmental process, sensorimotor thought, preoperational thought, concrete operational thought, and formal operational thought. The two stages that impact

adolescent learning significantly are concrete operational thought and formal operational thought. Each stage is entered based on individual development and varies among individuals. Adolescent learning typically centers on concrete operational thought from ages 6 to 12, transitioning to formal operational thought beginning at 11. The concrete operational thought stage focuses on learning-centered physical manipulation or direct experiences the learner has with the content. Formal operational thought centers around the learner's abstract thought process centered on hypothetical deduction (Muth & Alvermann, 1999, p.30).

The structure of the middle school at its foundation was structured in such a way that the cognitive development of adolescent learners was at the forefront. The educator's focus within the middle school structure includes adolescent development at the center, which results in a very intentionally focused curriculum (Bishop & Harrison, 2021). During the SARS-CoV-2 outbreak, educators were forced to shift their teaching methods to accommodate the educational shutdown.

The sudden transition to virtual learning presented a significant challenge for adolescent learners, as the structured environment that was designed to support their cognitive development was disrupted. The middle school structure, with intentional focus on adolescent development, was forced to adapt quickly to ensure students' cognitive needs were still being met (Schleicher, 2020, p. 4).

One of the primary concerns during this period was the impact on the social development of adolescents. Middle school is a crucial time for social interactions and the development of social skills (Jones & Dolittle, 2017). The sudden shift to virtual learning left many students isolated from their peers, leading to feelings of loneliness and

disconnection (Yorke et al., 2021, p. 2). The absence of face-to-face interactions and the limitations of online platforms made it difficult for students to engage in the collaborative and interactive learning experiences that were vital for their social development.

Furthermore, the transition to virtual learning posed challenges to the cognitive development of adolescents. As mentioned earlier, Piaget's theory of cognitive learning emphasizes the importance of hands-on experiences and direct interactions with the content being learned. However, virtual learning relied heavily on digital tools and passive forms of learning, which may not have provided the same level of engagement and cognitive stimulation for students. The absence of hands-on activities and direct experiences could hinder the development of critical thinking skills and abstract reasoning that are fostered during the concrete operational thought and formal operational thought stages.

Educators and schools made efforts to adapt and provide alternative strategies to support the cognitive development of adolescent learners during virtual learning (National Education Association [NEA], 2021). They implemented online collaborative platforms and interactive virtual tools to foster peer interactions and engagement. Educators also had to adjust their instructional methods to create meaningful learning experiences through online platforms. Classes utilized video conferencing, discussion forums, and multimedia resources to encourage active participation and critical thinking (NEA, 2021).

As the world gradually recovered from the pandemic and returned to in-person learning it was important to reflect on lessons learned during this time. Educators could integrate the best practices from virtual learning into their teaching methodologies,

combining the benefits of face-to-face interactions with the effective use of technology (Bonderud, 2021). The use of traditional and digital resources allows for schools to create a more inclusive and flexible learning environment that supports the cognitive development of adolescent learners.

The shift to virtual learning during the SARS-CoV-2 pandemic presented significant challenges for the cognitive development of adolescent learners. The absence of structured middle school environments limited social interactions, and reliance on technology affected adolescent cognitive and social development (Schleicher, 2020, p. 4). However, educators and schools made efforts to adapt and provided alternative strategies to support students' cognitive growth. As the educational landscape evolved, it was crucial to continue prioritizing the cognitive development of adolescents and integrating the lessons learned from virtual learning to create a more inclusive and engaging learning environment.

In-Person Learning

In-person learning is known as traditional or classical learning, which occurs within a school where the learner and educator are simultaneously in the exact physical location. The educator is responsible for creating an academic environment where learners feel academically supported (Suleri & Suleri, 2018, p. 3). In-person learning environments allow for communication between the learner and educator, which is essential in allowing the educator to evaluate student understanding. The evaluation enables the educator to identify gaps in student understanding via conversations (Suleri & Suleri, 2018).

The curriculum centered on the principle of education through significant real-world experiences and tests in classical school learning. It may appear weird if a teacher or student used virtual learning in the classroom. Traditional educational methods in school have several advantages. One of the essential advantages of classroom learning is that it teaches students how to negotiate, solve problems collectively, and be aware of their actions and effects on others (Suleri & Suleri, 2018, p. 3).

The in-person learning model required the educator to arrange the physical learning environment for the learners, "establishing rules and procedures, maintaining students' attention to lessons and engagement in activities" (Suleri & Suleri, 2018, p. 3). The interactions between the learner and the educator strengthened the learning environment and made in-person learning much more effective. A study by Suleri and Suleri in 2018 found that in-person learning was much more effective for adolescent learners where educators had more opportunities to identify gaps in learner understanding (p. 3).

In-person learning has additional benefits to student learning that contribute to its effectiveness as an educational practice. One significant benefit includes the immediate feedback students are given from the educator (Suleri & Suleri, 2018). Additionally, the educator gives personalized face-to-face attention to each student which serves as a major facet of the learning environment established by the educator.

The traditional classroom setting included educators that were able to provide instant feedback to students based on their understanding and performance. Through face-to-face interactions, educators can gauge students' comprehension levels, identify areas of confusion, and tailor their teaching approach accordingly (NEA, 2021). The real-

time feedback allows for timely interventions and adjustments in instructional strategies to meet individual students' needs.

The physical presence of educators fosters a sense of accountability and responsibility among students. When learners knew that their teacher was physically present, they are more likely to actively engage in the learning process, stay focused, and participate in class activities (Suleri & Suleri, 2018). The accountability that is created cultivates a sense of discipline and commitment, which are valuable attributes for academic and personal growth (Ragozzino et al., 2003, p. 169).

Another advantage of in-person learning was the opportunity for peer interaction and collaboration. In a classroom environment, students can engage in face-to-face discussions, group work, and collaborative projects. These activities promote teamwork, communication skills, and the development of social bonds among students. Working together on assignments and projects encourages the exchange of ideas, diverse perspectives, and mutual support, enhancing the overall learning experience (Suleri & Suleri, 2018).

Additionally, in-person learning facilitated the development of essential non-academic skills, such as emotional intelligence, empathy, and social awareness. Peer and educator interactions in a physical setting allows for students to learn to navigate social dynamics, resolve conflicts, and understand the perspectives of others. Interpersonal skills are crucial for personal growth, building positive relationships, and functioning effectively in society (Suleri & Suleri, 2018).

Furthermore, the physical classroom environment offered various resources and materials that supported hands-on learning experiences. Students can access books,

manipulatives, laboratory equipment, art supplies, and other educational tools that enhance their understanding and engagement. These resources provide opportunities for tactile, sensory, and experiential learning, which can be particularly beneficial for students with diverse learning styles (Suleri & Suleri, 2018).

In-person learning also creates a structured routine and dedicated learning space, separate from distractions at home. The physical separation of school and home environments helped students establish a focused mindset and associate the classroom with learning and intellectual growth. This separation can contribute to better time management, increased productivity, and improved academic performance (Brown, 2020).

While virtual learning has become more prevalent in recent times, the advantages of in-person learning remain significant. The combination of immediate feedback, personalized attention, peer interaction, social skill development, access to resources, and a structured learning environment makes in-person learning a highly effective and holistic approach to education. Embracing the strengths of in-person learning and integrating them with emerging technologies, educators can create dynamic and enriching educational experiences for students (Suleri & Suleri, 2018).

Virtual Learning

Virtual learning emerged as an essential component of education in the face of the SARS-CoV-2 pandemic. The integration of information and communication technology has revolutionized education by introducing diverse options for students, educators, and staff. This innovation in virtual learning has the potential to be an effective tool for

education, facilitating advancements in organizational, educational, and economic realms (Suleri & Suleri, 2018, p. 2).

A notable initiative in virtual learning was observed in the state of Missouri. In an effort to provide flexible learning opportunities, the Missouri Course Access and Virtual School Program (MOCAP, n.d.) was introduced in the 2019-2020 academic year, previously known as MoVIP (MOCAP). The MOCAP program enables students from kindergarten through 12th grade to access educational resources and instruction in a variety of environments, 24 hours a day, seven days a week, thus breaking down barriers of time and place. MOCAP (n.d.) offers students the chance to learn at their own pace and according to individual needs.

In addition to the state-level program, Missouri public school districts had the option to implement Alternative Methods of Instruction (AMI) as an alternative form of virtual learning (Missouri Revisor of Statutes, n.d., 171.033). This approach allows students to continue their education virtually during periods of inclement weather, emergencies, or other circumstances that prevent in-person instruction. By leveraging virtual learning, public schools in Missouri can ensure that students receive continuous education, even in challenging circumstances.

However, it is important to note that private schools in Missouri were not bound by the same mandates as public schools. As a result, private schools had the freedom to adopt virtual learning models that blend in-person and online instruction, offering a more flexible approach that suits their unique requirements. This flexibility enables private schools to leverage the advantages of virtual learning while also incorporating traditional

face-to-face interactions, creating a hybrid learning environment that best meets the needs for their students.

The introduction of virtual learning in Missouri, both through state initiatives like MOCAP (n.d.) and the implementation of AMI in public schools, as well as the flexibility afforded to private schools, reflected the recognition of virtual learning's potential to enhance educational opportunities. These initiatives acknowledge the importance of adapting to the evolving needs of students and society. Virtual learning not only addresses the challenges posed by the pandemic but also lays the groundwork for future educational advancements.

Virtual learning became an indispensable tool in the field of education. The integration of information and communication technology paved the way for the innovative approaches to teaching and learning, offering benefits at various levels – organizational, educational, and economic. In Missouri, the introduction of initiatives like MOCAP (n.d.) and the implementation of alternative methods of instruction in public schools, as well as the flexibility enjoyed by private schools, exemplified the state's commitment to leveraging virtual learning to meet the diverse needs of students and ensure continuous education. These initiatives serve as a model for other regions and highlight the potential of virtual learning to shape the future of education (Suleri & Suleri, 2018, p. 2).

Hybrid Learning

As many school districts shift from in-person instruction to remote learning models that combine in-person and virtual learning, the SARS-CoV-2 pandemic presented new obstacles for educators. As a result, educators faced introducing new

learning models and might have done so simultaneously. Teachers must include help from other experts within their school or district in developing and implementing distance learning to satisfy students' intellectual, physical, social, and emotional requirements (NEA, 2021).

One model that many educators relied upon is hybrid learning. In a hybrid learning environment, in-person instruction combines with online activities. This strategy reduced sitting time in a standard in-person learning environment by moving some of the classroom activities to an online platform. Students participated in authentic, collaborative learning activities during classroom teaching time. Multimedia-enhanced content and conversation were in the online components (PennState, 2019). Hybrid learning offered the advantage of combining the benefits of in-person learning with the flexibility and accessibility of online learning.

In the face of continuing and unanticipated issues from the SARS-CoV-2 pandemic, K-12 schools have had to get creative and devise innovative approaches to facilitate distance learning, maintain student engagement, and offer consistent performance. Education Week's data revealed the constantly shifting, state-by-state nature of the United States' SARS-CoV-2 response: Some school districts reopened, while others had instructions to remain closed entirely, leaving many to fend for themselves in finding a functional balance between in-person and virtual learning (Bonderud, 2021). These challenges have necessitated the exploration of various learning models to adapt to the changing circumstances and ensure students' educational needs were met.

Each model of learning, whether it is in-person learning, hybrid learning, or fully virtual learning, was designed to support and foster student achievement and academic success. While in-person learning provided direct interaction between teachers and students, hybrid learning combined the benefits of face-to-face instruction with online resources and activities. Fully virtual learning allowed for flexibility and accessibility, enabling students to learn from anywhere with an internet connection. Educators carefully considered the strengths and limitations of each learning model and selected the approach that best suited the specific needs and circumstances of their students (Bonderund, 2021).

Implementing virtual learning successfully required collaboration and support from various stakeholders. Educators collaborated with other experts within their school or district, such as instructional designers, technology specialists, and curriculum coordinators, to develop effective virtual learning materials and strategies. By leveraging the expertise of these professionals, educators enhanced the quality of instruction and ensure that students' intellectual, physical, social, and emotional requirements are addressed effectively (PennState, 2019).

The shift to remote and hybrid learning environments in response to the SARS-CoV-2 pandemic posed significant challenges for educators. By collaborating with other experts and leveraging innovative approaches, such as hybrid learning, schools adapted to the changing circumstances and ensured students' educational needs were met. As education continued to evolve in the face of the SARS-CoV-2 pandemic, it was essential to prioritize the well-being and academic success of students by employing strategies that promote engagement inclusivity, and personalized learning experiences (NEA, 2021).

Achievement

Achievement, academic success, or student achievement was a way for educators to measure student success in school. Hattie and Guskey (2020) defined achievement, in its simplest terms, as "the accomplishment of something" (p. 3). Additionally, Hattie and Guskey outlined significant points that outlined achievement components: learning objectives (and the outputs of those objectives) divided into three categories: cognitive, emotional, and psychomotor objectives. As a result, performance evaluations could concentrate on cognitive, affective, or psychomotor outcomes (or any combination of those outcomes.) While the school curriculum frequently stressed cognitive accomplishment objectives, achievement in the emotional and psychomotor domains was just as significant. Educators had recognized the relevance of affective outcomes, especially in recent years. Achievement was considered a summative construct that spanned numerous content areas. The examination of achievement within a specific content area was a summative construct; an example included core content areas.

Moreover, there was some variation in content areas taught and assessed across countries. Achievement was the attainment of knowledge or skills (i.e., what a student had acquired at a specific point in time) or the improvement of knowledge or skills (i.e., what a student had learned over time) (i.e., changes in academic performance over time). Both attainment and progress were desirable ends, but they were distinct forms of performance that had to be evaluated separately (Hattie & Guskey, 2020).

Additionally, educator instruction and assessment were designed to evaluate achievement, and included opportunity for students to experience an integrated curriculum. The integration of curriculum included cross curricular and project-based

assessments to adequately assess student achievement (Bishop & Harrison, 2021, pp. 35-42).

Hattie & Guskey's (2020) discussion of the key points that outlined achievement provided the foundation for educators to evaluate and measure the students' ultimate success in addition to the effectiveness of teaching practices. Achievement was the evaluation of student mastery of specified standards, and the Next Generation Science Standards were the ones that are the focal point of the middle school science classroom.

Next Generation Science Standards

The Next Generation Science Standards, or NGSS, were a set of science standards developed by a collaborative group of states within the United States to create a set of expectations for what students should understand from a scientific perspective.

According to the NGSS: "

The Next Generation Science Standards (NGSS) are K–12 science content standards. Standards set the expectations for what students should know and be able to do. The NGSS were developed by states to improve science education for all students. A goal for developing the NGSS was to create a set of research-based, up-to-date K–12 science standards. These standards give local educators the flexibility to design classroom learning experiences that stimulate students' interests in science and prepare them for college, careers, and citizenship (the NGSS Lead States, 2021).

The implementation of the NGSS allowed educators and students to enhance and shape their understanding of scientific principles. NGSS recommended the three-dimensional approach to implementing the standards within instructional practices, which

included crosscutting concepts, science and engineering techniques, and disciplinary core ideas.

Crosscutting Concepts help students explore connections across the four domains of science, including Physical Science, Life Science, Earth and Space Science, and Engineering Design. When these concepts, such as "cause and effect," are made explicit for students, they can help students develop a coherent and scientifically based view of the world around them. Science and Engineering Practices describe what scientists do to investigate the natural world and what engineers do to design and build systems. The practices better explain and extend what "inquiry" means in science and the range of cognitive, social, and physical practices required. Students engage in practices to build, deepen, and apply their knowledge of core ideas and crosscutting concepts. Disciplinary Core Ideas (DCIs) are the key ideas in science that have broad importance within or across multiple sciences or engineering disciplines. These core ideas build on each other as students' progress through grade levels and group into the following four domains: Physical Science, Life Science, Earth and Space Science, and Engineering (the NGSS Lead States, 2021).

Assessment

Assessment was a way for educators to evaluate student learning and shape the educational system. Additionally, assessments fall into two categories, either formative or summative. Formative assessments served to enhance teaching and learning practices and Summative assessments held students and teachers accountable for what was learned and

taught (Atkin et al., 2001, p. 20). These assessment types required specific engagement from both the educator and the learner.

The educator's role in the assessment process focused primarily on evaluating the implementation of teaching practices of the standards taught. The outcomes of assessments allowed educators to be reflective in their teaching practices and adjust the curriculum. Reviews also evaluated student progress and developed learners who could problem solve (Atkin et al., 2001, p. 15).

The student's role in the assessment process varied from that of the educator. Their role provided the feedback needed for educators to make informed decisions about curriculum and lesson plans. Additionally, assessments gave students essential information required to reflect on their learning process. Reflective learners were more engaged with their learning (Atkin et al., 2001, p. 17).

Effective assessment practices guided and influenced student learning and shaped the content taught. The most effective results from assessments supported students in effectively managing and organizing their time, analyzing their strengths and weaknesses, and enhancing their overall understanding of the content. Assessments allowed students to tailor their knowledge of quality work (Atkin et al., 2001, p. 18). One form of assessment practice used by educators was the interactive notebook.

Interactive Notebooks

Interactive notebooks were spiral-bound notebooks, composition notebooks, or binders. Middle school science students entered information into the notebook to enhance their understanding of the learned content. The notebook setup allowed students to make connections across the pages, improving their content knowledge. The learning

documents include notes, diagrams, laboratory reports, and other activities (Mallozi & Heilbronner, 2013, p. 6).

Students' interactions with the content they were learning were within the pages of their notebooks. Engagement by the students with their learning was essential and facilitated by note booking techniques. The interactive science notebooks illustrate the students' understanding or misunderstanding of the content. The organizational skills of students improved by keeping an interactive notebook. The interactive notebook also provided the structure and support to individualize instruction for students (Marcarelli, 2010, pp. 2-4).

The educator designed and created notebook guidelines, which served as an organizational tool for students to process the taught objectives. The notebook served as a formative and summative assessment for students. Additionally, educators provided feedback on the contents of the notebook. Educators could then evaluate student needs and differentiate their instruction based on the contents of the student notebook (Marcarelli, 2010, p. 4).

The interactive notebook served as a highly effective way for the educator, student, parent, and all others supporting the student to communicate. The notebook demonstrated students' understanding of the content and assessed student performance. The notebook and the process of developing the content allowed for individualized instruction (Marcarelli, 2010, p. 4).

Doodling

Doodling or drawing without intentionally thinking or when bored was a way the mind was distracted (Doodling, n.d., para.1). The act or process of doodling allowed the

brain to process information. The cognitive functions required while creating a doodle were significant, whether out of boredom or an attempt to make connections to the content.

According to Pillay (2016), the fight-or-flight system of a person would do everything possible to keep you aware while bored. Doodling was a type of fidgeting that could be the body's last-ditch effort to stay awake and focused. Doodling prevented the individual from falling asleep or staring blankly after your brain had shut down. Allowing doodling kept the individual's mind active for longer. Furthermore, paying full attention puts a burden on the brain, and doodling might provide the break the brain required to continue paying attention without losing interest. Doodling helped people stay awake by maintaining healthy levels of alertness or lowering the excessive levels of autonomic arousal associated with boredom.

The cognitive processes involved in doodling extended beyond simply staying awake and focused. Doodling also impacted how our memory functions including working memory, short-term memory, and long-term memory. Research conducted by Andrade (2010) revealed that when individuals engage both their auditory and visual senses, the individual could retain information more effectively. In other words, when someone doodles while listening to information, the people were more likely to remember and store that information.

The act of doodling helped maintain an optimal level of arousal in the brain, which was conducive to the retention and storage of new information. Doodling helped prevent the mind from wandering too far or becoming disengaged, as it provides a

secondary point of focus. By doodling, individuals could keep their cognitive processes active and enhance the individual's overall learning experience (Brown, 2015).

Doodling was not merely a mindless activity, but rather a cognitive process that allows the brain to process information. Individuals who doodle stay awake and focused by preventing excessive autonomic arousal associated with boredom. Additionally, doodling enhanced memory functions by engaging both auditory and visual senses, facilitating better retention and storage of information. Therefore, rather than being discouraged, doodling should be recognized as a valuable tool to improve cognitive engagement and learning outcomes (Brown, 2015).

Social-Emotional Learning

Social Emotional Learning, or SEL, has undergone extensive transformations over the years. SEL was referred to as character education, education of the whole child, personality education, 21st-century skills, non-cognitive skills, or soft skills. This extensive topic under the educational domain made it challenging to develop a specified definition and was consistently changing. Investigators agree that students in an SEL curriculum learned to manage their own emotions and managed their interactions with others in a manner that benefits them and those around them (Jones & Doolittle, 2017).

As schools decided and developed their SEL programs, the development of the program had to be centered and focused on developmentally appropriate content and delivery. Developmentally students changed significantly in their emotional intelligence as they progress through their school-aged years (Jones & Doolittle, 2017). During adolescence, student relationships among peers became a significant part of shaping their emotional development and thus had to be accounted for when developing or selecting an

SEL curriculum. SEL curriculum was designed by supportive adults who understand the need for adolescents to have autonomy, and their point of view is considered. Within these SEL curricula centered on adolescents, the adults delivering the program were most effective as advisors (Jones & Doolittle, 2017).

The development of the SEL curricula included emphasis on self-awareness, social awareness, self-management, relationship skills, and responsible decision making (Ragozzino et. al., 2003, p. 169). The application of the emphasized competencies allowed for students not only to enhance their learning through connections with those around them, but it allowed for them to connect in a deeper meaningful way to the content they were learning (Ragozzino et. al., 2003, p. 171). The connections students make through SEL curricula became crucial as the SARS-CoV-2 pandemic response forced schools to take a drastically different approach to learning which included learning virtually. The virtual learning resulted in emphasis needing to be placed due to the isolation experienced by students due to the SARS-CoV-2 crisis (Yorke et al., 2021, p. 2). One specific practice utilized by educators to assist students in coping with the unprecedented and challenging circumstances surrounding the SARS-CoV-2 pandemic response was the practice of mindfulness.

Mindfulness

According to Watt (2012), "Mindfulness means becoming more aware of what's going on right here, right now" (Ch.1 para. 2). The teachings of mindfulness are centered on the individual being aware, present, focused, embodied, and accepting. In practice, mindfulness is centered on meditation practices, influenced by modern medicine and psychotherapy. When implementing mindfulness, the practice can be formal or informal.

The origins of mindfulness can be traced back to Buddhist beliefs and traditions. Many mindful meditation practices, which aim to enhance awareness and presence in the moment, have direct roots in Buddhist meditation practices. The meditation practices have been handed down from monks who established the practices thousands of years ago. In the early 1900s psychologists began adapting meditation practices for mental health therapies and psychotherapy. The adaptation led to the development of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT), which integrate mindfulness practices into mental health practices (Watt, 2012).

Watt's research highlights the numerous benefits of mindfulness practice on mental and physical health, as well as overall well-being. Multiple studies have supported the beneficial nature of mindfulness practices. Neuroscience research demonstrated that meditation, as a key component of mindfulness, reduces stress and anxiety while strengthening neural pathways associated with happiness (Watt, 2012, Ch. 1). The practice of mindfulness, therefore, contributes to improved health outcomes.

Furthermore, mindfulness extends its benefits to physical health. Studies have shown that mindfulness-based interventions can reduce chronic pain, improve immune system functioning, lower blood pressure, and promote better sleep (Watt, 2012, Ch.1). The mind-body connection is integral to the practice of mindfulness as it recognizes the interconnection between mental and physical well-being.

In addition to the formal practice of mindful meditation, there are also informal practices that can reduce stress. A stress reducing practice is doodling. Research suggests that engaging in doodling, which involves spontaneous and unstructured drawing, can

help individuals relax, focus their attention, and alleviate stress (Watt, 2012, Ch.1).

Doodling serves as a form of mindful practice by redirecting attention to the present moment and promoting a sense of calm and relaxation.

Mindfulness as defined by Watt (2012) involves cultivating awareness of the present moment. The foundation of mindfulness is in Buddhist traditions, and psychologists have adapted it for mental health therapies. The benefits of mindful practices are supported by research, including improved mental and physical health, enhanced well-being and stress reduction. Meditation as a key component of mindfulness, strengthens neural pathways associated with happiness and reduces anxiety. Additionally, informal practices such as doodling can be utilized to reduce stress and promote mindfulness. The practice of mindfulness offers a holistic approach to well-being by acknowledging the mind-body connection and encouraging individuals to be fully present in their lives (Watt, 2012).

Mindful Doodling

Mindful Doodling as a practice, combined the principles of mindfulness with the act of doodling or creating drawings. The practice involved being fully present in the moment while engaging in the creative process (Watt, 2012). The integration of mindfulness into doodling, practitioners could maintain a state of focused attention and prevent their minds from wandering. The approach to doodling as a mindful practice has been found to have cognitive benefits, as demonstrated in Jackie Andrade's study.

Andrade discovered that doodling helped keep cognitive processes actively engaged in the task at hand, rather than allowing the mind to wander or daydream

(Andrade, 2010). The findings suggested that doodling could enhance concentration and prevent cognitive lapses during activities that require sustained attention.

Moreover, Cora et al. (2021) explored the use of concept maps as a form of doodling to improve memory and recall. Concept mapping involved visually organizing and connecting information using diagrams or drawings. The investigators found that students who utilized concept mapping as a doodling technique showed positive retention outcomes. The findings suggested that the act of doodling, particularly through concept mapping, could facilitate the encoding and retrieval of information.

Further support for the benefits of doodling in learning can be found in “The Doodle Revolution” by Brown (2015). Brown emphasized the significance of student-created doodles and visual representations in increasing engagement and retention of knowledge. According to Brown (2015), when learners actively translated their understanding into visual formats, they reinforced their comprehension and make connections between ideas more effectively.

The incorporation of doodling as a mindful practice allowed individuals to improve their productivity and overall success. Mindful Doodling allowed for the simultaneous cultivation of mindfulness and creative expression, enabling individuals to remain focused, engaged, and mindful of their current experiences. The act of doodling served as an anchor for the mindful practitioner, grounding them in the present moment and enhancing their ability to stay attuned to their surroundings (Watt, 2012).

Mindful Doodling combined the benefits of mindfulness and doodling to foster increased focus, engagement, and retention. Through the integration of mindful awareness and creative expression, practitioners could enhance cognitive processes, such

as attention and memory. Whether through concept mapping or other visual representations, doodling as a mindful practice offered a valuable tool for learners seeking to optimize their learning experiences and outcomes (Brown, 2015; Cora et al., 202).

Summary

The concept of Mindful Doodling gained attention in recent years, especially within educational settings. This study aimed to explore the potential benefits of Mindful Doodling, which involved the intentional focus on doodling as a means of enhancing learning experiences. Through examining the implementation of Mindful Doodling within an interactive science notebook in a seventh-grade science classroom, this research sought to shed light on its impact on middle-school learners.

Mindfulness, a state of being fully present and engaged in the current moment, has been widely acknowledged for its positive effects on various aspects of well-being. The application of mindfulness to education the practices has shown promise in improving attention, reducing stress, and enhancing cognitive abilities. In the context of middle school learners, who were in a critical stage of development, intentional focus became particularly significant. Middle-school students often faced challenges in maintaining attention and might have benefited from strategies that cultivate their ability to concentrate.

Doodling, typically perceived as a mindless and unfocused activity, has been recognized for its potential cognitive benefits. Research suggests that doodling can aid concentration, boost memory retention, and promote creative thinking. Mindful Doodling takes this concept further by combining the act of doodling with the intentional focus and

awareness. Educators aimed to provide students with a tool for enhancing student learning experiences, though encouraging students to engage in Mindful Doodling practices.

The specific context of this study involved the integration of Mindful Doodling within an interactive science notebook in a seventh-grade science classroom. The science notebook served as a platform for students to record their observations, thoughts, and reflections related to scientific concepts and experiments. The investigators aimed to investigate the impact of Mindful Doodling on student engagement, attention, and compensation of scientific content through integrating Mindful Doodling.

Data collection was a crucial component of this study. The investigators planned to gather quantitative data through pre- and post-assessments, which would measure students' attention span, comprehension, and recall abilities.

The analysis of the collected data provided valuable insights into the effectiveness of Mindful Doodling as a learning tool for middle-school learners. The data collected will also contribute to the existing literature on the intersection of mindfulness and education. Through understanding the impact of Mindful Doodling in the context of science education, educators can make informed decisions about incorporating this practice into their teaching methodologies.

The study aimed to explore the concept of Mindful Doodling and its implementation within an interactive science notebook in a seventh-grade science classroom. Through focusing on intentional focus and awareness during the process of doodling, investigators hoped to enhance middle-school learners' learning experiences. Through data collection and analysis, this study sought to provide valuable insights into

the potential benefits of Mindful Doodling as a tool for enhancing student engagement, attention, and comprehension in the science classroom.

Chapter Three: Research Method and Design

The primary focus of this comprehensive study was to delve into the intricate dynamics surrounding the influence of Mindful Doodling on the academic achievements of seventh-grade students in the context of a middle school science classroom. The backdrop for this exploration was set within the framework of an academic year, where Mindfulness emerged as a central theme within the curriculum, capturing the attention and dedication of science instructors within the middle school science classroom. The intentional integration of Mindfulness paved the way for a captivating research endeavor, seeking to unravel the potential impact of Mindful Doodling on student success.

At the outset of this investigation, a crucial foundational step was taken by the instructor involved—they administered a pre-assessment to their respective classes. The foundational step of assessment practices established a baseline against which subsequent academic progress could be measured. The preliminary data allowed the instructor to introduce students to the concept of Mindful Doodling. The teaching strategy of Mindful Doodling was not haphazardly implemented; rather, it was intentionally divided into distinct categories based on frequency, recognizing and accommodating the diverse range of student preferences and learning styles.

The study's structure was meticulously designed to expose different classes to varying frequencies of Mindful Doodling activities integrated within the science curriculum unit. Two classes engaged in Mindful Doodling exercises on two separate occasions, offering insight into the impact of moderate exposure to such activities on student achievement. In contrast, another two classes experienced Mindful Doodling sessions a total of five times, intensifying the integration to explore the potential for

increased frequency to yield more substantial academic benefits. The intentional diversity in the implementation of Mindful Doodling activities added layers to the research, providing a significant understanding of its effects on student achievement.

One unique component of this study was the role played by the fifth class, which served as the control group. Distinct from the other groups, this class did not participate in any Mindful Doodling activities as part of their science curriculum. Instead, they functioned as a benchmark against which the outcomes of the study could be rigorously compared. This control group played a crucial role in isolating the potential impact of Mindful Doodling from other confounding variables, enhancing the accuracy and reliability of the study's findings.

The study's methodology reached another level of sophistication through the meticulous data collection and analysis techniques employed by the investigator. Academic progress was tracked and evaluated with precision, utilizing a combination of post-assessments and supplementary evaluations. The multifaceted approach allowed for a comprehensive evaluation of the potential correlation between Mindful Doodling and student achievement, adding depth and reliability to the study's findings.

In essence, this investigation embarked on a journey to unravel the nuanced effects of Mindful Doodling on student achievement within the specific context of middle school science education. The deliberate structuring of the study to encompass varying frequencies of these activities, coupled with the inclusion of a control group, demonstrated the investigators' commitment to providing valuable insights into the efficacy of this innovative teaching approach. The potential implications of the study's findings extended beyond the realm of educational research, holding the promise of

providing educators with a versatile strategy to enhance student engagement and elevate academic performance.

Problem and Purpose Overview

In the pursuit of elevating student achievement, educators continuously seek innovative methodologies that resonate with learners, fostering a conducive environment for academic growth. One such avenue of exploration investigated the efficacy of Mindful Doodling as a pedagogical tool to enhance student achievement. This study employed a comprehensive approach, utilizing an investigator-created pre-and post-assessment to assess the impact of Mindful Doodling on academic performance.

The research sought to unravel the intricate dynamics between the incorporation of Mindful Doodling and its influence on student achievement levels within the middle school science classroom. Through a meticulous examination of the pre-and post-assessment results, the investigator gauged the effectiveness of Mindful Doodling as an intervention to positively impact student achievement. Existing literature offers limited insights into the specific influence of Mindful Doodling on academic outcomes in the middle school science domain, broader frameworks, such as the work of Watt (2012), advocate for the integration of mindfulness practices in educational settings.

Watt's research provides a foundational perspective, endorsing mindfulness as a valuable pedagogical approach. However, the current study uniquely contributes to the academic discourse by focusing specifically on the application of Mindful Doodling in the middle school science context. The deliberate concentration of the application of Mindful Doodling within a middle school science classroom allows for a specific

exploration of the potential benefits or limitations that Mindful Doodling may present in enhancing student achievement within this particular academic domain.

As educators increasingly recognize the importance of holistic approaches to learning, the investigation into Mindful Doodling serves as a pioneering effort to bridge the gap between creativity and academic performance. While acknowledging the existing support for mindfulness practices, this study refines the scope, shedding light on the specific implications of Mindful Doodling in the context of middle school science education. The endeavor to unlock innovative pathways to elevate student achievement remains at the forefront, and this research contributes valuable insights to this ongoing pedagogical conversation.

Independent variable.

The independent variable within the study is the frequency students practiced Mindful Doodling within their interactive science notebook.

Dependent variable.

The dependent variable within the study is student growth in achievement.

Questions and Null Hypotheses

Overarching RQ: How does Mindful Doodling impact student achievement?

Sub-question 1:

How do differences in frequency of Mindful Doodling increase student achievement within the middle school science classroom?

Sub-question 2:

What are the differences in achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom?

Sub-question 3:

What is the relationship between achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school classroom and the frequency of students practicing Mindful Doodling?

Null Hypothesis 1:

There is no difference in growth in student achievement when instructors utilize Mindful Doodling within a middle school science classroom.

Null Hypothesis 2:

There is no difference in growth in student achievement when the doodling frequencies increase in the middle school science classroom.

Null Hypothesis 3:

There is no difference between the increase in achievement between virtual learners and in-person learners who practice Mindful Doodling in the middle school science classroom.

Null Hypothesis 4:

There is no relationship between the increase in achievement of virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling zero times, approximately 1-4 times, and approximately 5-10 times.

Research Design

The investigator initiated a comprehensive examination to evaluate the impact of Mindfulness in the realm of science education. The investigation sought to gauge the effectiveness of Mindfulness by scrutinizing the scores obtained from teacher-created "pre-end-of-unit" and "post-end-of-unit" tests administered to 50-60 heterogeneous students. The study delved into the specified facets of student performance and explored the potential influence of Mindfulness practices on academic outcomes.

The investigator categorized students into three distinct doodling frequency groups: those who doodled 0 times, 1-4 times, and 5-10 times during the assessment period. The categorization according to doodling frequency allowed for a detailed understanding of the relationship between doodling frequency and academic achievement. Additionally, the investigation considered the learning mode of students, classifying them into three groups: virtual, hybrid, and in-person. The classification of learning modality aimed to capture potential variations in the impact of Mindfulness across different learning environments.

The investigator analyzed the potential benefits of incorporating Mindfulness practices in science education without specifically indicating a correlation. Scrutinizing the scores of students engaged in varying frequencies of doodling revealed insights into the potential advantages of Mindful Doodling in middle school science classes. Furthermore, considering the diverse learning modes underscored the adaptability and relevance of Mindfulness across virtual, hybrid, and in-person settings.

The investigation adds to the existing body of knowledge on the role of Mindfulness in enhancing student learning outcomes in science education. The findings

highlight the potential of Mindful Doodling as a strategy to foster academic achievement, offering implications for educators seeking innovative approaches to engage students in diverse learning environments.

Population and Sample

The study investigates the impact of Mindfulness on student achievement, utilizing a sample size drawn from 50 to 60 seventh-grade students in a suburban private school located in Missouri. The school's total population during the 2020-2021 academic year was 448 students, with the seventh-grade cohort constituting 11% of the entire student body. Within this seventh-grade population, 38% of the students self-identify as individuals of color. Furthermore, the school has an international student demographic, representing 5% of the total population. The seventh-grade classes are characterized by a diverse mix of male and female students, encompassing a heterogeneous range of ability levels.

Prior to and following a unit of instruction, student assessment scores were gathered. The investigator, recognizing the importance of privacy, treated the collected data as secondary data and ensured de-identification. This approach not only safeguards the confidentiality of participants but also adds credibility to the study's findings by minimizing potential biases associated with identifiable information. The diverse composition of the student body and the rigorous de-identification process contribute to the robustness and generalizability of the study's results.

Instrumentation

The study aimed to explore the impact of Mindfulness on student achievement in the context of seventh-grade science education. The sample comprised 50 to 60 seventh-grade students from a suburban private school in Missouri, ensuring a diverse representation of all genders and a heterogeneous mix of ability levels. The heterogeneous mix approach aimed to enhance the generalization capability of the findings across different student demographics.

The assessment tool utilized in this study was a comprehensive test developed by the investigator, focusing on student understanding of unicellular organisms, multicellular organisms, and microscopes. The assessment consisted of 30 multiple-choice questions (see Appendix A), and the investigator strategically administered the pre-assessment using Google Forms before the commencement of the instructional unit. The pre-assessment served as a baseline measure of students' initial understanding of the content.

The instructional intervention involved teaching the designated lesson to all students, with a unique emphasis on incorporating Mindful Doodling. The frequency of Mindful Doodling varied across classes, ranging from zero times in one class to one to four times in two classes, and five to ten times in two classes. The diversification of the doodling frequencies aimed to assess potential effects of varying frequencies of mindfulness practice on student outcomes.

After the completion of the instructional unit, a post-assessment (see Appendix A) was administered to gauge changes in student understanding. The investigator adopted a meticulous approach, calculating the difference between pre- and post-assessment data to

ascertain statistical significance. The analytical method allowed for a specific exploration of the potential impact of mindfulness on student achievement, considering variations in doodling frequencies. The use of Google Forms for pre-assessment distribution and the systematic design of assessment questions contribute to the robustness of the study's methodology, enhancing the reliability and validity of the findings. The inclusion of a diverse student population from a suburban private school in Missouri further strengthens the external validity of the study, providing insights that may be applicable to a broader educational context.

Data Collection

In the study conducted during the 2020-2021 school year, the investigator gathered secondary data consisting of pre- and post-test scores from seventh-grade science students. The primary focus was on the Science Unit that integrated Doodling. The investigator, serving as the science teacher for all participating students, treated Doodling as an element within the curriculum but did not grade it independently. Instead, attention was directed toward the difference in pre- and post-test scores, aligning with standard curricular grading practices.

The relationship between the investigator and the participants was that of a teacher and students. To maintain confidentiality, the investigator employed an honest broker within the school to assign numerical codes for students and alphabetical identifiers for the mode of learning (virtual or in-person). By de-identifying the data in this manner, the investigator ensured that individual student names were inaccessible, laying the groundwork for unbiased analysis.

After the de-identification process, the investigator incorporated coding to categorize doodling frequency, a pivotal variable in the study methodology. The coded data was stored in a secure document, isolated from any identifying information, and accessible only to the investigator. The school's encrypted database, protected by a passcode, facilitated this secure storage.

A stringent protocol was followed to safeguard the confidentiality of student information. The investigator exclusively accessed the data through a district-provided login and passcode, maintaining strict control over who could retrieve or view the information. As an additional layer of security, once the study concludes, the file is locked and encrypted, reinforcing the anonymity of the students involved.

The investigator's commitment to data security extends to ensuring that students' identifying information remains distinct from their study responses. This meticulous approach not only upholds ethical standards but also complies with privacy regulations. Ultimately, the data is accessible solely to the investigator and other authorized personnel designated by the school, underscoring the commitment to preserving the confidentiality and integrity of the collected information.

Data Analysis

The investigator rigorously assessed the efficacy of the pre and post-test data through the application of a t-test of two dependent means. The statistical analysis aimed to discern any statistically significant variations between the two test periods. Additionally, Tukey's Honest Significant Difference Test was employed to scrutinize the outcomes of the ANOVA post hoc, providing valuable insights into the specific classes where noteworthy differences materialized among the four distinct groups.

Furthermore, the investigator utilized the Scheffe Test as a supplementary post hoc analysis to explore the interrelationships between the groups at a significance level of 0.05. The multifaceted statistical approach contributed to a comprehensive understanding of the nuanced variations in student performance within and across the seventh-grade science classes.

To facilitate a meticulous examination of the data, the investigator organized it into distinct categories. The categories encompassed the frequency of students' engagement in doodling activities, the differentiation among seventh-grade science classes, and the various learning modes (virtual, hybrid, and in-person). Figures 1-5 in the research documentation encapsulated the graphical representations of these data categories, serving as essential visual aids for interpreting the results of the analyses conducted. The systematic approach of analysis not only enhanced the precision of the investigation but also fostered a more specific comprehension of the multifaceted factors influencing student performance in diverse learning environments.

Figure 1

Data Collection Tool: Group A: Doodled 2 Times: Class 1

Group A - Doodled 2 Times

Class 1								
Student Code	Virtual		Student Code	In Person		Student Code	Hybrid	
	Pre	Post		Pre	Post		Pre	Post
A1V.1			A1P.1			A1H.1		
A1V.2			A1P.2			A1H.2		
A1V.3			A1P.3			A1H.3		
A1V.4			A1P.4			A1H.4		
A1V.5			A1P.5			A1H.5		
A1V.6			A1P.6			A1H.6		
A1V.7			A1P.7			A1H.7		
A1V.8			A1P.8			A1H.8		
A1V.9			A1P.9			A1H.9		
etc			etc			etc		

Figure 2

Data Collection Tool: Group A: Doodled 2 Times: Class 2

Group A - Doodled 2 Times

Class 2								
Student Code	Virtual		Student Code	In Person		Student Code	Hybrid	
	Pre	Post		Pre	Post		Pre	Post
A2V.1			A2P.1			A2H.1		
A2V.2			A2P.2			A2H.2		
A2V.3			A2P.3			A2H.3		
A2V.4			A2P.4			A2H.4		
A2V.5			A2P.5			A2H.5		
A2V.6			A2P.6			A2H.6		
A2V.7			A2P.7			A2H.7		
A2V.8			A2P.8			A2H.8		
A2V.9			A2P.9			A2H.9		
etc			etc			etc.		

Figure 3

Data Collection Tool: Group B: Doodled 5 Times: Class 3

Group B - Doodled 5 Times

Class 3								
Student Code	Virtual		Student Code	In Person		Student Code	Hybrid	
	Pre	Post		Pre	Post		Pre	Post
B3V.1			B3P.1			B3H.1		
B3V.2			B3P.2			B3H.2		
B3V.3			B3P.3			B3H.3		
B3V.4			B3P.4			B3H.4		
B3V.5			B3P.5			B3H.5		
B3V.6			B3P.6			B3H.6		
B3V.7			B3P.7			B3H.7		
B3V.8			B3P.8			B3H.8		
B3V.9			B3P.9			B3H.9		
etc			etc			etc		

Figure 4

Data Collection Tool: Group B: Doodled 5 Times: Class 4

Group B - Doodled 5 Times

Class 4

Student Code	Virtual		Student Code	In Person		Student Code	Hybrid	
	Pre	Post		Pre	Post		Pre	Post
B4V.1			B4P.1			B4H.1		
B4V.2			B4P.2			B4H.2		
B4V.3			B4P.3			B4H.3		
B4V.4			B4P.4			B4H.4		
B4V.5			B4P.5			B4H.5		
B4V.6			B4P.6			B4H.6		
B4V.7			B4P.7			B4H.7		
B4V.8			B4P.8			B4H.8		
B4V.9			B4P.9			B4H.9		
etc			etc			etc		

Figure 5

Data Collection Tool: Group C: Doodled 0 Times: Class 5

Group C - Doodled 0 Times

Class 5

Student Code	Virtual		Student Code	In Person		Student Code	Hybrid	
	Pre	Post		Pre	Post		Pre	Post
C5V.1			C5P.1			C5H.1		
C5V.2			C5P.2			C5H.2		
C5V.3			C5P.3			C5H.3		
C5V.4			C5P.4			C5H.4		
C5V.5			C5P.5			C5H.5		
C5V.6			C5P.6			C5H.6		
C5V.7			C5P.7			C5H.7		
C5V.8			C5P.8			C5H.8		
C5V.9			C5P.9			C5H.9		
etc			etc			etc		

Ethical Considerations

In the context of this study, the relationship between the participants and the investigator is structured on a fundamental student-teacher dynamic. The dynamic serves as the cornerstone for a comprehensive understanding of the study's scope and implementation, with a focus on the active involvement of students and the guidance provided by the investigator in the collection of valuable data. The investigator plays a pivotal role in orchestrating the study, ensuring that the student's experiences are accurately represented through meticulous data collection.

To uphold the study's integrity and safeguard the privacy of participating students, a set of robust protocols was devised to maintain anonymity throughout the research process. The assessments conducted by the investigator encompassed the gathering of demographic data and assessment scores, forming the basis for a nuanced analysis of the study's objectives.

The implemented protocols included the assignment of randomized numbers to each participating student, a measure aimed at reinforcing anonymity. Further, the de-identification process involved the allocation of alphanumeric codes based on class, doodling frequency, and the mode of learning (virtual or in-person). To fortify the security of the collected data, the investigator ensured that students' identifying information was kept distinct from the study responses within a securely stored document accessible solely by the investigator through a school-utilized, encrypted, and passcode-protected database.

Access to this data was granted through a district-provided login and passcode, strictly controlled to maintain confidentiality. Once the study concluded, an additional

layer of security was implemented as the investigator locked and encrypted the file, fortifying student anonymity. The investigator, committed to the highest ethical standards, took meticulous measures to separate students' identifying information from their study responses, ensuring that access to the data was restricted to authorized individuals designated by the school. The study's framework prioritizes the protection of participant privacy and data security at every stage of the research process.

Summary

The investigator embarked on a comprehensive research journey, utilizing an archived secondary data collection from a suburban, midwestern, private seventh-grade science classroom. The carefully selected setting provided a rich context for exploring the potential impact of Mindful Doodling on student achievement within the specific confines of middle school science education. The unique characteristics of this suburban private school, located in the heart of the Midwest, added a nuanced layer to the study, acknowledging the potential influence of regional educational dynamics on the outcomes.

The data collection process focused on pre- and post-assessment data, encompassing a diverse group of seventh-grade students who exhibited variations in the frequency of their participation in Mindful Doodling activities. The intentional diversity in doodling engagement ensured a comprehensive exploration of the potential effects across a spectrum of student experiences and preferences. Additionally, the variation in learning environments—hybrid, virtual, or in-person—added another dimension to the study, recognizing the evolving landscape of education, especially in the wake of global events impacting traditional classroom structures.

The primary objective of this meticulously designed data collection was to decipher the effect of doodling on student achievement. By examining the outcomes of students with differing levels of engagement in Mindful Doodling activities and considering the varied learning modes, the study aimed to provide a nuanced understanding of the potential benefits or limitations that Mindful Doodling may present in enhancing student achievement within the middle school science domain.

The subsequent chapter in the research unfolds as an analytical exploration, delving into the collected data to unveil the intricate dynamics at play. The analysis serves as a critical juncture in the study, where the investigator scrutinizes the pre- and post-assessment results, employing robust statistical methods such as the t-test of two dependent means, Tukey's Honest Significant Difference Test, and the Scheffe Test. Through these analytical lenses, the investigator aims to discern any statistically significant variations in student achievement related to the frequency of Mindful Doodling and the diverse learning environments in which students are situated.

The study's location, participants, and the specific methodologies employed are clearly delineated, ensuring clarity and adherence to scholarly standards. The research design, with its deliberate consideration of various factors influencing student achievement, underscores the study's commitment to a thorough and comprehensive investigation into the potential impact of Mindful Doodling in middle school science education. The resulting analysis promises to contribute valuable insights to the broader educational discourse, offering educators a nuanced understanding of how Mindful Doodling may be leveraged to enhance student engagement and elevate academic performance.

Chapter Four: Analysis

The outbreak of SARS-CoV-2 made a significant impact on society, and one of the areas affected the greatest was education. The ramifications of this unprecedented event reverberated significantly among students and teachers alike, casting a shadow over the educational landscape. Despite the resumption of in-person classes during the 2020-2021 school year, a noticeable research gap loomed, particularly in the exploration of the Social Emotional Learning (SEL) strategy known as Mindful Doodling within the middle school science classroom.

This study sought to unravel the impact of Mindful Doodling on student achievement, a facet yet to be rigorously examined, especially in the context of varying learning delivery methods. Delving into this uncharted territory, the overarching goal was to illuminate the role of Mindful Doodling in shaping academic outcomes for middle school students.

In the pages that follow, a meticulous dissection of the findings unfolds, meticulously crafted through a battery of statistical tests. The tests utilized include the right-tailed t-test of independent means, the ANOVA test, Tukey's Honest Significant Difference Test, Scheffe Test, and Linear Regression. The analytical tools serve as a tool to evaluate the intricate relationship between Mindful Doodling and student achievement within the middle school science classroom.

The statistical evaluations not only validate the significance of Mindful Doodling but also offer significant insights into the dynamic interplay between the SEL strategy and the academic achievement of middle school students. Through this scholarly exploration, the aim is not only to bridge the existing research gap but to provide a solid

foundation for future educational strategies, emphasizing the crucial role of Mindful Doodling in fostering holistic student development.

Research Question

Overarching RQ1: How does Mindful Doodling impact student achievement?

Sub-question 1: How do differences in frequency of Mindful Doodling increase student achievement within the middle school science classroom?

Sub-question 2: What are the differences in achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom?

Sub-question 3: What is the relationship between achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school classroom and the frequency of students practicing Mindful Doodling?

The comprehensive investigation unfolded within the confines of a suburban private school nestled in the heart of the Midwest, where a distinctive social-emotional learning (SEL) curriculum, enriched with mindfulness as a potent tool, has a foundation. The focus of this study centered on seventh-grade science courses, wherein the innovative incorporation of Mindful Doodling was seamlessly woven into the SEL curriculum.

Table 1 illustrates the descriptive statistics encapsulating the significant shifts between pre- and post-assessment data gleaned from the participation of 51 students. These students assisted in the pursuit of an answer to the overarching research question. The statistical analysis from the assessment scores of these 51 students are as follows:

mean scores reveal a central tendency with an average of $M=6.2$ and an accompanying standard deviation (SD) of 3.5.

The constraints of a relatively modest sample size, comprising 51 students, imposed limitations on the data. Consequently, the efficacy of addressing Null Hypothesis 4, which states that there is no relationship between the increase in achievement among virtual learners, hybrid learners, and in-person learners engaged in Mindful Doodling zero times, approximately 1-4 times, and approximately 5-10 times.

Table 1

Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data

Statistics	Seventh Grade Assessment
N	51
Mean	6.2
Median	6
Sample Variance (s^2):	12.4
Sample Standard Deviation (s):	3.5
Population Variance (σ^2):	12.2
Population Standard Deviation(σ):	3.5

Tables 2-4 present the descriptive statistics for the difference in pre-assessment data concerning Sub-question 1, which investigates the impact of Mindful Doodling frequency on student achievement within the middle school science classroom. In Table 2, the focus is on students who did not engage in doodling (0 times) during classroom activities. This subset of students comprised 10 students randomly selected from the overall seventh-grade population of 51. The mean score for this group's pre-assessment was calculated at $M=5.8$, accompanied by a standard deviation (SD) of 3.7.

Table 3 analyzes students who doodled 1-4 times in the middle school science classroom. The data is derived from a sub-population of 21 students, also selected from

the total seventh-grade cohort of 51. The mean pre-assessment score for this group is reported as $M=6.4$, with a standard deviation of 2.9.

Finally, Table 4 analyzes the differences in scores for students who engaged in Mindful Doodling 5-10 times within the same educational setting. The analysis in Table 4 involves 20 students randomly selected from the seventh-grade population of 51. The mean pre-assessment score for this subgroup is $M=6.2$, with a standard deviation (SD) of 4.1. The detailed statistics in Tables 2-4 provide a specific understanding of the relationship between Mindful Doodling frequency and pre-assessment performance in the middle school science classroom.

Table 2

Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data: 0 Times Doodled

Statistics	Seventh Grade Assessment
N	10
Mean	5.8
Median	4.5
Sample Variance (s^2):	14
Sample Standard Deviation (s):	3.7
Population Variance (σ^2):	12.6
Population Standard Deviation(σ):	3.5

Table 3

Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data: 1-4 Times Doodled

Statistics	Seventh Grade Assessment
N	21
Mean	6.4
Median	6
Sample Variance (s^2):	8.6
Sample Standard Deviation (s):	2.9
Population Variance (σ^2):	8.2
Population Standard Deviation(σ):	2.9

Table 4

Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data: 5-10 Times Doodled

Statistics	Seventh Grade Assessment
N	20
Mean	6.2
Median	6
Sample Variance (s^2):	16.8
Sample Standard Deviation (s):	4.1
Population Variance (σ^2):	15.9
Population Standard Deviation(σ):	4

The tables (5-7) provide a comprehensive overview of the descriptive statistics related to the differences in pre-assessment data for Sub-question 2, which investigates the variations in achievement among virtual learners, hybrid learners, and in-person learners practicing Mindful Doodling in the middle school science classroom. The tables examine the differences in scores between pre and post assessment data for each group, shedding light on the impact of learning environments on the efficacy of Mindful Doodling.

Table 5 examines the scores for students who engaged in doodling while learning virtually within the middle school science classroom. The data, collected from a sub-population of 5 students out of the total seventh-grade population of 51, reveals a mean score of $M=6.2$, with a standard deviation (SD) of 2.6. The data provides insights into the effectiveness of Mindful Doodling in a virtual learning setting, offering a significant perspective on the potential benefits for this specific subgroup.

Moving on to Table 6, the focus shifts to students who practiced Mindful Doodling within hybrid learning. The sub-population comprises 16 students selected from the same seventh-grade cohort of 51. The mean score for this group's assessment is $M=7.4$, with a standard deviation (SD) of 3.9. The data within Table 7 contributes

valuable information on the impact of hybrid learning on the effectiveness of Mindful Doodling in enhancing academic performance.

Table 7 extends the analysis to in-person learners within the middle school science classroom who also engaged in Mindful Doodling. The sub-population, consisting of 20 students out of the total seventh-grade population of 51, yielded a mean score of $M=5.4$, with a standard deviation (SD) of 3.2. This table illuminates the dynamics of in-person learning and its potential influence on the outcomes of Mindful Doodling.

The detailed breakdown of descriptive statistics in Tables 5-7 serves as a resource for understanding the variations in achievement among virtual learners, hybrid learners, and in-person learners practicing Mindful Doodling in the middle school science classroom. The significant insights provided by these tables offer a foundation for further analysis and interpretation, guiding future research and educational practices.

Table 5
Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data: Virtual Learners

Statistics	Seventh Grade Assessment
N	5
Mean	6.2
Median	6
Sample Variance (s^2):	8.7
Sample Standard Deviation (s):	3.0
Population Variance (σ^2):	7.0
Population Standard Deviation(σ):	2.6

Table 6

*Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data:
Hybrid Learners*

Statistics	Seventh Grade Assessment
N	16
Mean	7.4
Median	7
Sample Variance (s^2):	15.3
Sample Standard Deviation (s):	3.9
Population Variance (σ^2):	14.4
Population Standard Deviation(σ):	3.8

Table 7

*Descriptive Statistics for Seventh Grade Difference in Pre and Post Assessment Data:
In-Person Learners*

Statistics	Seventh Grade Assessment
N	20
Mean	5.4
Median	5.5
Sample Variance (s^2):	10.2
Sample Standard Deviation (s):	3.2
Population Variance (σ^2):	9.6
Population Standard Deviation(σ):	3.1

Sub research question one explored the doodling frequency of students, a subject addressed in null hypotheses one and two. Data tables two through four were utilized to analyze pre- and post-assessment data. Sub research question two centered on the methods through which students received doodling instruction, as addressed in null hypothesis three. The data tables, spanning from five to seven, facilitated an examination of pre- and post-assessment data, revealing no statistical significance. In addressing sub research question three, an analysis was conducted to explore the relationship between doodling frequency and the delivery of doodling instruction, as outlined in null hypothesis four. Tables two through seven were cross-referenced to discern any potential

correlations. However, the patterns observed in the data failed to indicate any quantitative connections, suggesting an absence of a clear relationship between doodling frequency and the way instruction was delivered.

Null Hypotheses

Null Hypothesis 1: There is no growth in student achievement when students utilize Mindful Doodling within a middle school science classroom.

Null Hypothesis 2: There is not a significant difference in growth in student achievement when Mindful Doodling frequencies increase in the middle school science classroom.

Null Hypothesis 3: There is no difference between the increase in achievement of virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom.

Null Hypothesis 4: There is not a relationship between the increase in achievement of virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling zero times, approximately 1-4 times, and approximately 5-10 times.

Results

Null Hypothesis 1:

The investigation into the impact of Mindful Doodling on student achievement in the middle school science classroom yielded results that challenge the notion of a positive correlation. Utilizing a right-tailed t-test of independent means to compare the growth in achievement between students who engaged in Mindful Doodling and those who did not, the preliminary analysis detected unequal variances. Despite initial expectations, the assessment scores for seventh-grade science students who did not doodle did not

significantly differ from those of their doodling counterparts ($M = 5.8$, $SD = 3.7$) versus ($M = 6.3$, $SD = 3.5$); $t = -0.39$, $p = 0.646$.

These findings, leading to the failure to reject the null hypothesis, suggest that there is no discernible growth in student achievement associated with the practice of Mindful Doodling in the middle school science classroom. These findings challenge the assumed benefits of integrating such activities into the curriculum, prompting a reevaluation of the perceived positive impacts of Mindful Doodling on academic outcomes in this educational context.

Null Hypothesis 2:

To discern any statistically significant differences, an Analysis of Variance (ANOVA) was conducted, comparing three distinct groups based on doodling frequency: 0 times, 1-4 times, and 5-10 times. The ANOVA results yielded no discernible distinctions among the means of these groups. The statistical outcome indicates that, contrary to initial expectations, augmenting Mindful Doodling frequencies did not translate into a noteworthy growth in student achievement. Consequently, the investigator was compelled to uphold the null hypothesis, signifying that there is no substantial disparity in student achievement when varying frequencies of Mindful Doodling are introduced in the middle school science classroom. This insightful analysis contributes valuable data to the ongoing discourse on innovative teaching methods and their tangible impact on academic outcomes.

Table 8

ANOVA Table Comparing Assessment Scores of Students with Different Doodling Frequencies

Source of Variation	SS	df	MS	F	p-value	F crit
Between Groups	2.31	2	1.15	0.09	0.914	3.19
Within Groups	617.10	48	12.85			
Total	619.41	50				

Null Hypothesis 3:

Students who practice Mindful Doodling do not have a difference in achievement when varying delivery methods are utilized (virtual learning, hybrid learning or in-person learning) as collected through pre and post assessment data, particularly within the middle school science classroom. The statistical tool of choice, Analysis of Variance (ANOVA), was utilized to evaluate the potential variations among the means in the three distinct groups: virtual, in-person, and hybrid.

The ANOVA results unveiled no statistically significant differences between the groups, indicating that the learning environment, whether virtual, in-person, or hybrid, did not yield divergent outcomes in student achievement for those engaged in Mindful Doodling. Consequently, the investigator chose not to reject the null hypothesis, asserting that the changes in the learning environment did not exert a substantial impact on the growth of student achievement. This outcome underscores the resilience and consistency of the benefits associated with Mindful Doodling across diverse educational settings.

Table 9

ANOVA Table Comparing Assessment Scores of Students with Different Learning Environments

Source of Variation	SS	df	MS	F	p-value	F crit
Between Groups	34.70	2	17.35	1.44	0.249	3.25
Within Groups	457.35	38	12.03			
Total	492.05	40				

Null Hypothesis 4:

A relationship does not exist between doodling frequency and delivery method on increase of student achievement through an analysis of pre and post assessment data. Utilizing the Analysis of Variance (ANOVA), the investigation sought to ascertain whether variations in the learning environment and doodling frequency—categorized as zero times, approximately 1-4 times, and approximately 5-10 times—had a discernible impact on student achievement within the middle school science classroom. The analysis assessed the means across six distinct groups, encompassing virtual, in-person, and hybrid settings for each doodling frequency category.

The results of the analysis indicated no statistically significant differences among the means in the specified groups. The results led to the retention of the null hypothesis, suggesting that altering the learning environment, coupled with varying frequencies of Mindful Doodling, did not yield a substantial variance in the growth of student achievement. The findings underscore the importance of critically evaluating the assumed influence of doodling frequency and delivery method on academic outcomes, offering valuable insights for educators and investigators alike.

Table 10

ANOVA Table Comparing Assessment Scores of Students with Different Learning Environments and Different Doodling Frequencies

Source of Variation	SS	df	MS	F	p-value	F crit
Between Groups	37.2	5	7.44	0.60	0.703	2.32
Within Groups	1074.45	86	12.49			
Total	1111.65	91				

Summary

The study focused on the relationship between Mindful Doodling, learning modality, and student achievement by examining pre- and post-assessment scores. Employing statistical tools such as right-tailed t-tests of independent means and Analysis of Variation (ANOVA), the data analysis yielded results that failed to refute the null hypotheses, signaling a lack of statistical significance in the observed impact. While the findings may not exhibit a direct correlation between Mindful Doodling and enhanced student achievement, they underscore the scarcity of comprehensive research in this domain, urging the need for further investigation.

Chapter Five of the study will explore the data further and interpret these results, providing valuable insights for educational leaders. The interpretation of the data will highlight potential areas for improvement in the current educational landscape and will present recommendations to guide future research endeavors. Through identifying limitations and details of the study, educators and investigators will gain a significant understanding of the intricacies involved in integrating Mindful Doodling into middle school science classrooms.

Furthermore, the study holds the potential to inspire educators and investigators to persist in exploring the benefits of Mindful Doodling as a Social Emotional Learning (SEL) strategy. The encouragement to explore alternative methods for fostering student achievement signifies the study's broader implications for educational practices. As educators seek innovative approaches to engage students and enhance their learning experiences, the study provides a foundation for ongoing discussions and explorations in the realm of SEL strategies and their impact on academic success. In essence, the research acts as a catalyst, prompting a call for continued investigation into the multifaceted dynamics of Mindful Doodling in educational settings.

Chapter Five: Discussion, Implications, and Recommendations

Overview

Educational practices are ever changing and adapting, as the world continually changes and adapts it is vital to explore innovative teaching methods and practices that enhance student learning and achievement. This study evaluates innovative teaching practices by specifically examining the influence of Mindful Doodling on student achievement in middle school science classrooms. The research seeks to establish a correlation between the incorporation of Mindful Doodling techniques and enhanced student learning outcomes. As the chapter unfolds, it systematically evaluates the major findings derived from the quantitative study, evaluating the relationship between Mindful Doodling and academic achievement. A comprehensive discussion ensues, drawing connections between the research outcomes and existing literature on mindfulness and doodling. The implications of these findings on the middle school science classroom are explored, providing educators with insights into potential strategies for improving student engagement and performance. The chapter concludes by presenting recommendations for further research, encouraging the continuous exploration of innovative teaching practices, and offering a concise summary of the pivotal findings that emerged from the study.

Chapter Five includes a discussion of the findings as well as further research options to assist in answering the following research questions:

Overarching RQ: How does Mindful Doodling impact student achievement?

Sub-question 1: How do differences in the frequency of Mindful Doodling increase student achievement within the middle school science classroom?

Sub-question 2: What are the differences in achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school science classroom?

Sub-question 3: What is the relationship between achievement between virtual learners, hybrid learners, and in-person learners who practice Mindful Doodling in the middle school classroom, and the frequency of students practicing Mindful Doodling?

Each of these research questions are further analyzed through the data collection based pre and post assessment data as aligned to the following null hypotheses.

Discussion

Null Hypothesis 1. In the comprehensive evaluation of the pre- and post-assessment, outlined in Appendix A, an examination was conducted of the data to evaluate the impact of Mindful Doodling on student growth. The assessment, crafted by the instructor, served as a benchmark for measuring the variance in scores before and after the incorporation of Mindful Doodling. The study group was divided into two segments: one exposed to the opportunity for Mindful Doodling and the other group did not participate in Mindful Doodling. The specific Mindful Doodling format provided to the students is outlined in detail in Appendix B.

Employing a right-tailed t-test of independent means, the research aimed to determine if there was a significant difference in the growth of student achievement between those who engaged in Mindful Doodling and those who did not. The statistical analysis failed to reveal any noteworthy growth among students who practiced Mindful Doodling when compared to their counterparts who did not partake in this activity. The

assessment criteria focused exclusively on a single evaluation, omitting an examination of the instructional delivery method received by the students.

The analysis of the data outlines the need for a more detailed investigation into the potential influences of instructional methodologies on student performance, recognizing that the impact of Mindful Doodling may be intertwined with broader pedagogical approaches. As education continues to evolve, further exploration is warranted to uncover the multifaceted dynamics that contribute to student growth and achievement.

Mindful Doodling vs. No Mindful Doodling. The cognitive processes involved in information recall pose significant challenges for students. In this context, the role of doodling emerges as a noteworthy facilitator in enhancing recall, as indicated by Brown's research (2015, pp. 19-27). Brown's findings extend beyond mere recall; doodling is identified as a valuable tool for fostering student engagement and retention. Notably, the study explores the multifaceted aspects of engagement, recognizing that it goes beyond a quantitative measure, contrasting with the quantitative assessment employed for doodling practices. The study participants, as highlighted by Andrade, experienced heightened auditory and visual engagement through Mindful Doodling. The dual engagement dynamic not only contributed to increased retention but also played a pivotal role in information assimilation. The failure to reject the null hypothesis in this study indicates that there was no statistically significant difference in student achievement between those who practiced Mindful Doodling and those who did not. The implications of this research highlight the potential of doodling not only as a recall aid but also as a holistic strategy for fostering student engagement and information retention.

Null Hypothesis 2. In evaluating pre- and post-assessment outcomes outlined in Appendix A, an analysis was undertaken to evaluate the influence of Mindful Doodling on student progress. These assessments, crafted by the instructor, were employed as benchmarks, and the difference in assessment scores pre- and post-Mindful Doodling sessions was examined. Students were afforded the opportunity to engage in Mindful Doodling, with frequencies categorized as 0 times, 1-4 times, and 5-10 times, as detailed in Appendix B. A comprehensive comparison of these diverse frequencies of Mindful Doodling was conducted using Analysis of Variance (ANOVA). The objective was to determine whether an increase in the frequency of Mindful Doodling correlated with improved student achievement.

This investigation involved an examination of three distinct groups based on doodling frequencies, aiming to identify any potential patterns of heightened student growth. Despite these efforts, the ANOVA results failed to yield a statistically significant difference in growth. Consequently, the null hypothesis, suggesting no significant variance in achievement growth with increased Mindful Doodling frequencies, was retained. This outcome suggests that, based on the given analysis, altering the frequency of Mindful Doodling did not have a significant impact on student achievement growth, as evidenced by the instructor's assessments.

Mindful Doodling Frequencies. Mindful Doodling, is within the framework of Social Emotional Learning (SEL) or a mindfulness curriculum, draws inspiration from the core principles of mindfulness. Watt (2012) highlights the essence of mindfulness as being fully present and engaged in the current moment, a philosophy that lays the foundation for Mindful Doodling. The creative practice of doodling, often dismissed as

mere idle drawing, proves to be a potent tool for sustaining mental activity. According to Pillay (2016), doodling can extend the duration of mental alertness, promoting heightened focus and prolonged engagement.

The combination of mindfulness and doodling, when incorporated into educational settings, yields notable benefits. Students, through regular Mindful Doodling sessions, exhibit an increased ability to sustain attention and involvement in academic tasks. The combined approach aligns with the objectives of SEL, fostering an environment conducive to enhanced learning experiences. However, insights gained from ANOVA data analysis challenge the notion of a linear correlation between increased Mindful Doodling frequency and academic achievement. The investigator, confronted with non-significant differences in growth, refrains from rejecting the null hypothesis, emphasizing the need for a detailed understanding of the relationship between Mindful Doodling frequency and academic progress.

Null Hypothesis 3. In examining the pre and post assessment detailed in Appendix A, the investigator conducted a comprehensive analysis to gauge student growth. The focus of this investigation was on the impact of Mindful Doodling, a technique delivered through virtual learning, in-person learning, and hybrid learning modalities, as outlined in Appendix B. The study sought to determine if the modality of presenting Mindful Doodling influenced student achievement, using an Analysis of Variance (ANOVA) to compare the results across the three different delivery methods.

The results of the ANOVA, however, did not yield a statistically significant difference in student growth among the diverse modalities—virtual learning, in-person learning, or hybrid learning. This led the investigator to fail to reject the null hypothesis,

indicating that there is no substantial variance in achievement growth when the modality of Mindful Doodling differs. Despite the lack of statistical significance, the study provides valuable insights into the potential uniformity of student outcomes in achievement, regardless of the mode through which Mindful Doodling is administered.

Mindful Doodling Delivery Modality. The transition during adolescence, marked by the development of formal operational thought, is a crucial phase in cognitive growth (Muth & Alvermann, 1999). The transition is effectively facilitated by the educational environment being structured to fully support the evolving thought processes of adolescents, necessitating a carefully designed curriculum (Bishop & Harrison, 2021). However, the recent SARS-CoV-2 outbreak prompted a significant shift in the learning modalities for adolescent students.

The abrupt transition from traditional in-person learning to virtual and hybrid learning options reshaped education. In-person learning involves both students and educators physically present in the same location, fostering a sense of support and immediate interaction (Suleri & Suleri, 2018). Virtual learning, on the other hand, occurs entirely on a computer through various online platforms, while hybrid learning combines elements of both in-person and virtual modalities, providing students with flexibility in their learning environment.

The impact of these modalities on student achievement was assessed using ANOVA, revealing no statistically significant differences. The data implies that the chosen learning modality did not correlate with variations in student achievement. Despite the upheaval caused by the pandemic, understanding the nuanced effects of

different learning environments remains essential for fostering optimal adolescent learning experiences.

Null Hypothesis 4. The analysis of the results from an instructor pre- and post-assessment in Appendix A enabled a comprehensive examination of student growth, with the focus on the impact of Mindful Doodling. The students were categorized based on their learning modalities—virtual, in-person, or hybrid—and their respective frequencies of Mindful Doodling: 0 times, 1-4 times, and 5-10 times, as illustrated in Appendix B. The approach aimed to distinguish whether the combination of learning modality and doodling frequency influenced student achievement on instructor-created assessments. The grouping for comparison involved classifying the data into various subsets, such as virtual learning with 0, 1-4, and 5-10 times doodling frequency; in-person learning with 0-, 1-4-, and 5-10-times doodling frequency; and hybrid learning with 0, 1-4, and 5-10-times doodling frequency. The utilization of an Analysis of Variance (ANOVA) was instrumental in determining statistical differences among these groups.

The ANOVA results yielded no statistically significant differences in growth in achievement. The investigator's failure to reject the null hypothesis suggests that, within the parameters studied, there is no conclusive evidence to support the notion that pairing specific learning modalities with different doodling frequencies significantly influences student growth in achievement.

The study provided valuable insights into the relationship between doodling and learning modalities, the absence of significant findings emphasizes the need for further exploration and consideration of additional factors that may contribute to student achievement. Future research may explore individual variations, teaching methods, or

alternative forms of engagement to provide a more nuanced understanding of the dynamics at play in the learning environment.

Doodling Frequency and Delivery Modality. Educators play a pivotal role in the learning environment for adolescent learners, especially during a period of significant change. Adolescence is a transformative phase, marked by profound shifts, making the educator's influence crucial in determining suitable learning modalities, content, and the integration of Social Emotional Learning (SEL). As highlighted by Muth and Alvermann (1999, p. 20), adolescence is a time of unparalleled change, emphasizing the importance of adapting educational approaches to meet the evolving needs of students.

The emergence of the SARS-CoV-2 pandemic further intensified the need for adaptable learning modalities. The transition to in-person, virtual, and hybrid learning modes prompted educators to reassess their strategies. In response to these changes, a notable shift towards incorporating SEL components into the learning process occurred. One specific SEL practice, mindfulness, gained prominence. Mindfulness, as described by Watt (2012, Ch.1, para. 2), involves individuals being consciously aware and present in the moment.

In the study, a unique element of mindfulness, Mindful Doodling, was introduced in conjunction with different learning modalities. The innovative approach aimed to explore the potential benefits of combining Mindful Doodling with diverse learning modes. However, the data analysis, conducted using ANOVA, did not yield evidence supporting a correlation between learning modality and the frequency of Mindful Doodling. Consequently, the investigator failed to reject the null hypothesis, suggesting that there may not be a significant relationship between learning modality and the

frequency of Mindful Doodling in this context. The study highlights the complexity of understanding the interplay between learning modalities and SEL practices, urging further exploration within education.

Reflection on Implementation

The implementation of the Mindful Doodling practice in October 2020 marked an innovative approach to education, seeking to enhance student engagement and achievement. The study involved a cohort of approximately 51 students and one instructor who integrated Mindful Doodling into the curriculum at the study school. To assess the impact of this practice, both pre- and post-assessments were conducted, focusing on topics related to unicellular organisms, multicellular organisms, and microscopes.

Despite the positive experiences reported by students during the Mindful Doodling sessions, the investigator concluded the implementation a failure in terms of achieving the intended growth in student achievement. The data analysis revealed no statistically significant improvement in academic performance. However, an intriguing observation emerged as students, over the course of the lesson, expressed a growing interest in continuing the Mindful Doodling practice beyond its initial incorporation into the curriculum. The shift in student attitude raised questions about the potential long-term benefits of the practice that extended beyond the immediate academic context.

The environment in which this study unfolded added a layer of complexity to the interpretation of results. October 2020 was a period of transition, as schools were gradually shifting from fully virtual learning environments, necessitated by the SARS-CoV-2 outbreak, to a hybrid model of in-person and remote instruction. The challenges

posed by the pandemic were evident in the precautions taken within the physical classroom. Students were required to maintain a minimum distance of six feet from their peers, wear masks, and sanitize their spaces between classes, creating an environment that was far from the traditional in-person setting.

The impact of these restrictions extended beyond the physical aspects of the learning environment to the realm of Social Emotional Learning (SEL). Collaboration, a cornerstone of traditional in-person education, was severely constrained. The spatial limitations meant that students could not engage in the usual group work or interactive discussions that characterize a typical middle school classroom setting. Facing the same direction and communicating through masks created significant hurdles, leaving students with a sense of isolation, despite being physically present in a room full of their peers.

The SEL concerns raised by this study shed light on the profound effects of the pandemic-related restrictions on the overall learning experience. The classroom, although technically in person, underwent a transformation that hindered the fostering of collaboration and effective communication, key components of social and emotional development. As educators grappled with these challenges, the failure of the Mindful Doodling practice to yield measurable academic improvements highlighted the multifaceted nature of the obstacles faced by both students and instructors during this period of educational upheaval.

The implementation of Mindful Doodling within the studied curriculum did not result in the anticipated growth in student achievement, as measured by traditional assessments. However, the students' expressed desire to continue the practice beyond the designated lesson suggests potential benefits that may not be immediately apparent

through conventional metrics. The study also highlights the profound impact of the pandemic on the social and emotional aspects of education, prompting a reevaluation of teaching methods and the broader learning environment in the face of ongoing challenges.

Recommendations for Mindful Doodling Practices

The current practices of mindfulness implemented within the Social Emotional Learning (SEL) curriculum in the existing Advisory curriculum at the study school represent only a small fraction of the overall curriculum. The advisory curriculum at the school is multifaceted, encompassing ethical conduct, mindfulness, cultural competence, leadership, citizenship, and scholarship as the primary components of the curriculum. However, the inclusion of mindfulness as just one of the six components limits students' full understanding and experience with the practice.

Specifically, in the middle school advisory curriculum, mindfulness is approached differently, leading to a varied perspective among middle school students regarding the practice. The mindfulness practices incorporated at this level include activities such as body scans, coloring, meditation, and doodling. Despite these efforts, the current implementation of mindful practices remains minimal. Consequently, the investigator recommends a more robust integration of mindfulness throughout the middle school curriculum, expanding beyond a single course or the confines of the advisory curriculum.

The investigator suggests enhancing the exposure of middle school students to mindful practices by incorporating Mindful Doodling as a cross-curricular mindfulness practice. The approach aims to provide students with broader and more consistent exposure to mindfulness throughout various subject areas. The extension of mindfulness

practices beyond the advisory curriculum, students can develop a more holistic understanding of mindfulness and its potential benefits.

The study puts forth several recommendations to enhance Mindful Doodling practices in middle school classrooms. One primary suggestion is to expand the incorporation of mindfulness practices, including Mindful Doodling, across different subject areas. Although the current study focused on middle school science, the potential benefits of Mindful Doodling can be extrapolated to other subjects, contributing to a more comprehensive understanding of its impact on student achievement.

Furthermore, the study advocates for a more comprehensive integration of mindfulness practices throughout the entire middle school curriculum. Rather than confining mindfulness to a single course or the advisory curriculum, the proposal is to integrate it seamlessly across various content areas. This broader approach is designed to offer students increased exposure to mindful practices, fostering a deeper and more nuanced understanding of mindfulness and its potential positive effects on their academic and personal development.

The current implementation of mindfulness practices within the middle school curriculum at the study school is limited, particularly in terms of the advisory curriculum. The investigator recommends a more expansive and inclusive approach, suggesting the incorporation of Mindful Doodling across different subject areas to enhance students' exposure to mindfulness practices. The holistic integration of mindfulness throughout the entire middle school curriculum is proposed to provide students with a more comprehensive understanding of mindfulness and its potential benefits, both academically and personally.

Recommendations for Future Research

As the prospects of Mindful Doodling in middle school classrooms are explored, it becomes evident that the groundwork laid by the current study provides a solid foundation but requires further refinement and expansion to unlock its full potential. Addressing the limitations highlighted in the study opens up avenues for a more comprehensive examination of Mindful Doodling's impact on student achievement.

Expanding the study population represents a critical step in ensuring the applicability of findings across diverse demographics. While the initial study focused on a specific subset of middle school science students, future research should strive for a more extensive and diverse participant pool. The future research could involve including students from various socio-economic backgrounds, ethnicities, and learning styles. Understanding how Mindful Doodling resonates with different groups can reveal detailed insights, allowing educators to tailor implementation strategies to meet the unique needs of various student populations.

In parallel, a cross-subject analysis is paramount for a holistic understanding of the implications of Mindful Doodling. While the current study honed in on science classrooms, extending research across various subjects can provide a comprehensive perspective. Different subjects may elicit distinct responses to Mindful Doodling, influenced by subject-specific demands and learning styles. By conducting research across subject areas, we can discern whether Mindful Doodling offers universally applicable benefits or if its impact is subject-dependent.

The recommendation to isolate Mindful Doodling as a variable is integral to distinguishing its effects from other instructional elements. The current study was

embedded within multifaceted lessons, making it challenging to attribute observed changes in student achievement solely to Mindful Doodling. A future research approach that isolates Mindful Doodling allows for a more granular examination of its impact, facilitating a clearer understanding of its direct influence on student outcomes.

In conjunction with this, a separate analysis of learning modalities addresses the dynamic nature of contemporary education. As education evolves, especially in the wake of technological advancements, understanding how Mindful Doodling aligns with different learning modalities becomes crucial. The approach of evaluating learning modalities can offer insights into the adaptability of Mindful Doodling across in-person, virtual, and hybrid learning environments, providing educators with practical guidance on implementation strategies tailored to specific instructional formats.

Finally, the inclusion of longitudinal studies is vital for comprehending the enduring effects of Mindful Doodling. While the immediate impact is insightful, observing the trajectory of student achievement over an extended period provides a more thorough understanding. Longitudinal studies can explore whether the benefits of Mindful Doodling persist, decrease, or evolve over time, shedding light on its sustained efficacy.

In essence, the future of Mindful Doodling in middle school classrooms is full of potential, contingent on a multifaceted research approach. Researchers can contribute significantly to the evolution of Mindful Doodling as a valuable educational practice by expanding the study population, embracing cross-subject analyses, isolating Mindful Doodling as a variable, analyzing learning modalities separately, and incorporating longitudinal studies. The comprehensive research approach ensures that educators receive

evidence-based insights that transcend the limitations of the initial study, fostering a deeper appreciation for the role of Mindful Doodling in enhancing middle school student achievement.

Conclusion

The changing understanding of education consistently results in adjustments to the method of instructional delivery as well as Social Emotional Learning (SEL) curriculum. During the SARS-CoV-2 pandemic, these adjustments became essential to avoid losses in learning. The development of different learning delivery methods, including virtual learning, hybrid learning, and in-person learning, became a necessity during the SARS-CoV-2 pandemic. Additionally, considerations had to be made for the impact the pandemic had on student social emotional learning. The impact of isolation resulted in schools adjusting their social emotional curriculum to include more focus on mindfulness practices. The implementation of mindful practices included Mindful Doodling, which allowed for students to be present with the content in the moment in a different manner.

The study examined various aspects of Mindful Doodling, including the frequency of doodling and different learning modalities. The data exhibited that neither increased frequency of doodling nor changes in learning modalities significantly influenced student achievement. The findings challenge some of the initial hypotheses regarding the effectiveness of Mindful Doodling in enhancing student learning.

The role of educators in creating effective learning environments is crucial, especially in the context of adolescents' cognitive development. However, the study highlights that even as the learning modalities shifted from in-person to virtual and

hybrid learning, the impact on student achievement remained negligible. Educators play a pivotal role in shaping the learning experience, and understanding how instructional methods, including mindful practices, affect student outcomes is crucial for their effectiveness.

The findings of this study suggest that further research is needed to explore more in depth into the relationship between Mindful Doodling and student achievement. Future research should consider expanding the study population, conducting cross-subject analyses, isolating Mindful Doodling as a variable, and assessing the long-term effects of this practice. The expansion of the study will contribute to a more comprehensive understanding of the potential benefits of Mindful Doodling and how it can be effectively integrated into middle school curricula to enhance student achievement.

The potential benefits of Mindful Doodling are explored, it is essential to recognize the broader implications for education. The study's inconclusive results prompt a reevaluation of current practices and a reimagining of instructional strategies. The dynamic nature of education requires a continual reassessment of teaching methods, especially in the face of unprecedented challenges like the SARS-CoV-2 pandemic.

Furthermore, the study highlights the need for a holistic approach to student well-being. While Mindful Doodling may not have shown a direct correlation with improved academic outcomes in this study, the focus on Social Emotional Learning and mindfulness practices signals a recognition of the interconnectedness between mental well-being and academic success. Educators and policymakers should consider incorporating a variety of strategies that cater to the diverse needs of students.

The ever-changing atmosphere of education demands a proactive and flexible approach to instructional methods. The study on Mindful Doodling serves as a benchmark for further exploration, emphasizing the importance of ongoing research to refine and enhance educational practices. Future researchers can embrace a multidimensional perspective on student achievement and well-being, educators can better navigate the challenges of the modern educational environment and foster a more enriching learning experience for all.

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Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

Pre-Assessment: Cells & Microscopes

* Required

1. Email address *

2. Select your class section from the dropdown *

Mark only one oval.

- Section 1
 Section 2
 Section 3
 Section 4
 Section 5

3. What is a Cell? *

Mark only one oval.

- A tiny, microscopic structure
 Found in all living things
 The basic unit of life
 All of the answer choices

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

4. What happens inside a cell? *

Mark only one oval.

- New organisms are made inside cells
- New cells are made inside cells
- Processes and and functions that keep an organism alive
- None of the other answer choices

5. Which of the following is NOT made of many cells? *

Mark only one oval.

- Bacteria
- Plants
- Animals
- Humans

6. Which of the following are NOT part of the tenets of the cell theory? *

Mark only one oval.

- All living things are made of cells
- Cells are the basic unit of life
- Cells arise from pre-existing cells
- Cells spontaneously arise from the air around them

7. Why do cells divide? *

Mark only one oval.

- Cells divide in order to make new organisms. Cells also divide in order to grow an organism or to repair/replace damaged cells in an organism
- Cells divide in order to more effectively communicate with other cells.

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

8. Which of the following is a unicellular organism? *

Mark only one oval.

- Amoeba
 Fern
 Tardigrade
 Betta fish

9. What type of organism is made of many cells? *

Mark only one oval.

- A unicellular organism
 A multicellular organism

10. What do unicellular organisms use to perform life functions? *

Mark only one oval.

- Organelles
 Tissues
 Organs
 Organ Systems

11. Which statement best describes how life functions are carried out in multicellular organisms? *

Mark only one oval.

- Organelles form tissues that carry out life functions
 Organs form tissues which work together to perform life functions
 Cells form tissues, which form organs and organ systems that carry out life functions
 Cells contain organs which carry out life functions

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

12. How do multicellular organisms obtain and process nutrients? *

Mark only one oval.

- using the digestive system
- using the respiratory system
- using the excretory system
- using the circulatory system

13. How do multicellular organisms obtain oxygen? *

Mark only one oval.

- using the digestive system
- using the respiratory system
- using the excretory system
- using the circulatory system

14. How do unicellular organisms obtain and process nutrients? *

Mark only one oval.

- using the cell membrane and food vacuole
- using the cell membrane only
- using lysosomes
- using mitochondria

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

15. How do unicellular organisms obtain oxygen? *

Mark only one oval.

- using the cell membrane and food vacuole
- using the cell membrane only
- using lysosomes
- using mitochondria

16. What is a microscope? *

Mark only one oval.

- A very tiny organism
- A tool that slices tissues into very thin slices
- A tool that magnifies cells or microorganisms
- A type of hand lens

17. Which type of microscope does NOT use light to produce an image of a specimen? *

Mark only one oval.

- A dissecting microscope
- A light microscope
- An electron microscope

10/7/2020

Pre-Assessment: Cells & Microscopes

18. What microscope is used to produce low-magnified images of a 3D living specimen? *

Mark only one oval.

- A dissecting microscope
- A light microscope
- a transmission electron microscope
- a scanning electron microscope

19. What part of the microscope do you look through to view a specimen? *

Mark only one oval.

- Eyepiece
- Nosepiece
- Stage
- Diaphragm

20. What part of the microscope adjusts the light passing through the specimen? *

Mark only one oval.

- Eyepiece
- Nosepiece
- Stage
- Diaphragm

10/7/2020

Pre-Assessment: Cells & Microscopes

21. What is the function of the objectives? *

Mark only one oval.

- Produce light
- Helps focus the specimen
- Supports the parts of the microscope
- Magnify the specimen

22. What is the function of the coarse adjustment and fine adjustment? *

Mark only one oval.

- Produce light
- Helps focus the specimen
- Supports the parts of the microscope
- Magnify the specimen

23. What is the function of the arm? *

Mark only one oval.

- Produce light
- Helps focus the specimen
- Supports the parts of the microscope
- Magnify the specimen

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

24. What part(s) should you hold when carrying the microscope? *

Mark only one oval.

- The arm and base
- The stage and nosepiece
- The arm and stage
- The base and coarse adjustment

25. What should you NOT use when using a high-power objective? *

Mark only one oval.

- The diaphragm
- The light source
- The coarse adjustment
- The fine adjustment

26. What should you use to clean lenses? *

Mark only one oval.

- Paper towels
- Cleaning spray & napkins
- Damp towels
- Lens cleaning cloth

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

27. What type of specimen can you view with a light microscope? *

Mark only one oval.

- A thick piece of tissue
- A glob of cells
- A one-cell thick tissue or cell sample
- All of the other answer choices

28. Why do you place a coverslip down slowly over the specimen? *

Mark only one oval.

- To prevent the slide from breaking
- To prevent the coverslip from breaking
- To prevent bubbles from forming under the coverslip
- Both prevent the slide and coverslip from breaking

29. How does a specimen appear when viewed under a microscope? *

Mark only one oval.

- Smaller
- Just as it appears on the slide
- Upside down and backwards
- Sideways

Appendix A: Instructor Created Assessment

10/7/2020

Pre-Assessment: Cells & Microscopes

30. Where is the specimen magnified in a light microscope? *

Mark only one oval.

- In the eyepiece
 In the objective
 In the nosepiece
 In the eyepiece & objective

31. What adjustments should you NEVER use when viewing a specimen through the high power objective? *

Mark only one oval.

- Coarse adjustment
 Fine adjustment
 Diaphragm
 Nosepiece

32. What do you open and close to adjust the lighting of a microscope? *

Mark only one oval.

- Coarse adjustment
 Fine adjustment
 Diaphragm
 Nosepiece

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Google Forms

Appendix B: Instructor Modeled Doodle Notebook Example

36

STRUCTURE, FUNCTION & INFORMATION PROCESSING STANDARDS

36

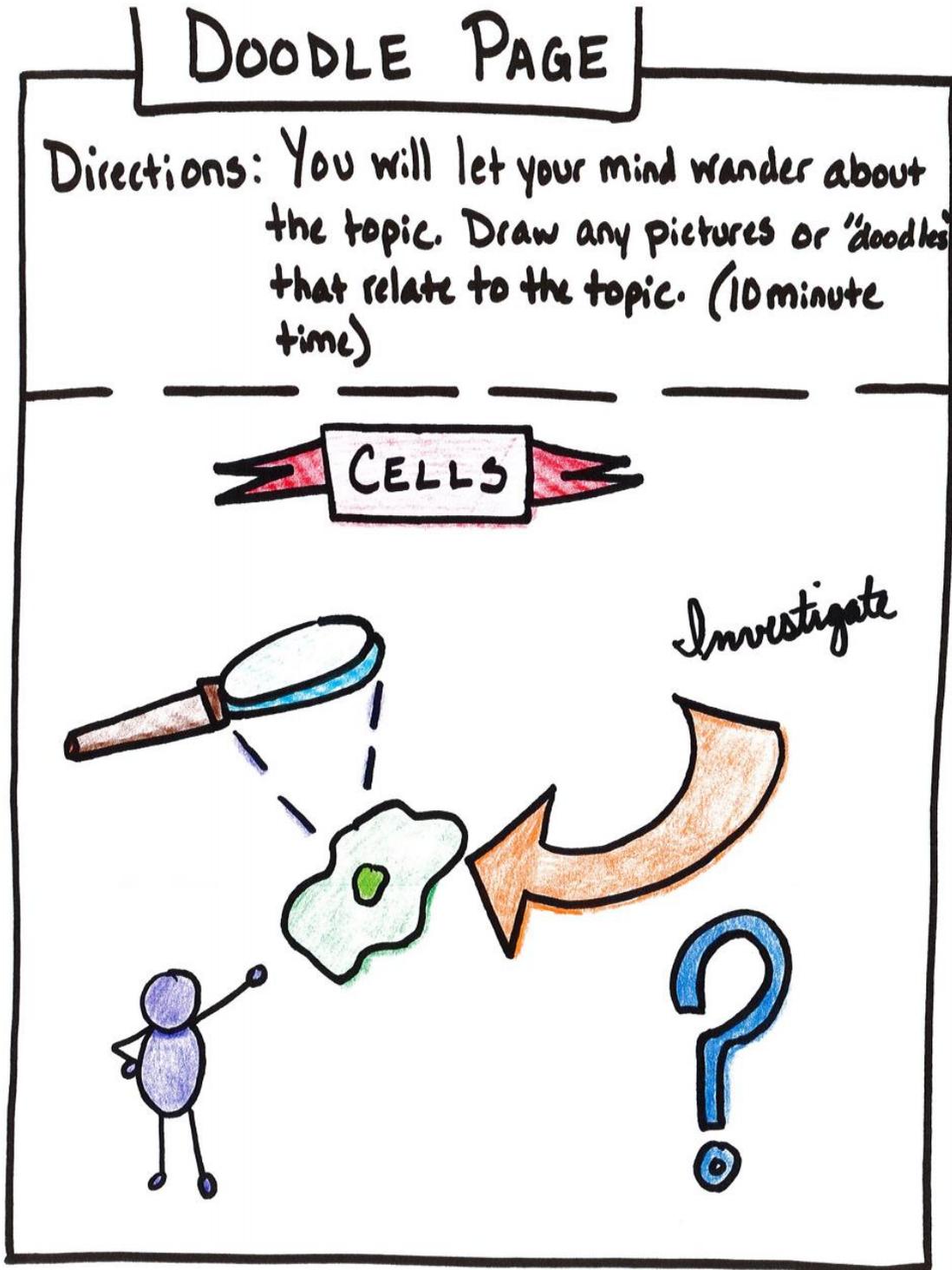
- MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.
- MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

DOODLE PAGE

Directions: You will let your mind wander about the topic. Draw any pictures or 'doodles' that relate to the topic. (10 minute time)



Appendix B: Instructor Modeled Doodle Notebook Example



Appendix C: Permission to use Study Site

WHITFIELD Michelle Brown <michelle.brown@whitfieldschool.org>

Dissertation approval
6 messages

Michelle Brown <michelle.brown@whitfieldschool.org> Fri, Jan 29, 2021 at 12:47 PM
To: John Delautre <john.delautre@whitfieldschool.org>

John,
Previously we had discussed my dissertation and you had initially approved my request. I have made some changes in the direction of my research and now that I am progressing even further, I am in need of a short letter indicating that approval. My study has shifted direction to focus on the following: Using Mindfulness Through Doodling in Interactive Notebooking to Increase Student Achievement. I feel that this shift aligns better with the mission and vision of Whitfield. According to my University, all I would need is a short email indicating your approval. Thank you so much for your time.
Michelle



Michelle Brown (she/her)
Teacher, 7th Grade Science
Science Department
TSA (Technology Student Association) Advisor
314.434.1285 Office
314.324.2130 Cell

Whitfield School cultivates ethical, confident, successful students in a community of innovation, collaboration, and trust.

John Delautre <john.delautre@whitfieldschool.org> Fri, Jan 29, 2021 at 2:44 PM
To: Michelle Brown <michelle.brown@whitfieldschool.org>

Michelle, to save time, would you please compose the text you need and send it to me along with the email address etc? Otherwise I think we'll be consigned to a lot of back-and-forthing about the details ;)



John Delautre
Head of School
314.434.5141 Office
314.724.2594 Cell
[Quoted text hidden]

[Quoted text hidden]

Michelle Brown <michelle.brown@whitfieldschool.org> Fri, Jan 29, 2021 at 2:49 PM
To: John Delautre <john.delautre@whitfieldschool.org>

John,
My University stated all I would need is a reply to this email with your statement saying you approve of me conducting my research for my dissertation. Thank you so much!!!
Michelle



Michelle Brown (she/her)
Teacher, 7th Grade Science
Science Department
TSA (Technology Student Association) Advisor
314.434.1285 Office
314.324.2130 Cell

Whitfield School cultivates ethical, confident, successful students in a community of innovation, collaboration, and trust.

[Quoted text hidden]

Appendix C: Permission to use Study Site

John Delautre <john.delautre@whitfieldschool.org>
To: Michelle Brown <michelle.brown@whitfieldschool.org>

Fri, Jan 29, 2021 at 2:50 PM

P.S. Happy to help! And this topic looks good.



John Delautre
Head of School
314.434.5141 Office
314.724.2594 Cell

Whitfield School cultivates ethical, confident, successful students in a community of innovation, collaboration, and trust.

On Fri, Jan 29, 2021 at 12:47 PM Michelle Brown <michelle.brown@whitfieldschool.org> wrote:
[Quoted text hidden]

John Delautre <john.delautre@whitfieldschool.org>
To: Michelle Brown <michelle.brown@whitfieldschool.org>

Fri, Jan 29, 2021 at 2:51 PM

Oh, okay. That I can do! Stand by.

[Quoted text hidden]

[Quoted text hidden]

John Delautre <john.delautre@whitfieldschool.org>
To: Michelle Brown <michelle.brown@whitfieldschool.org>

Fri, Jan 29, 2021 at 2:52 PM

Michelle, yes, this topic looks reasonable for our circumstances. I approve.

Best, JD



John Delautre
Head of School
314.434.5141 Office
314.724.2594 Cell

Whitfield School cultivates ethical, confident, successful students in a community of innovation, collaboration, and trust.

On Fri, Jan 29, 2021 at 12:47 PM Michelle Brown <michelle.brown@whitfieldschool.org> wrote:
[Quoted text hidden]

Appendix D: CITI Certifications



Completion Date 10-Feb-2019
Expiration Date 09-Feb-2022
Record ID 30450216

This is to certify that:

Michelle Brown

Has completed the following CITI Program course:

Social and Behavioral Responsible Conduct of Research (Curriculum Group)
Social and Behavioral Responsible Conduct of Research (Course Learner Group)
1 - RCR (Stage)

Under requirements set by:

Lindenwood University



Verify at www.citiprogram.org/verify/?w6285adf4-2eba-43ee-a672-c87d19f29010-30450216



Completion Date 10-Feb-2019
Expiration Date 09-Feb-2022
Record ID 30450215

This is to certify that:

Michelle Brown

Has completed the following CITI Program course:

Social & Behavioral Research - Basic/Refresher (Curriculum Group)
Social & Behavioral Research (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Lindenwood University



Verify at www.citiprogram.org/verify/?wfb8b2f16-10ea-497b-a39e-5d5734a088aa-30450215

Appendix D: CITI Certifications



Completion Date 10-Feb-2019
Expiration Date 09-Feb-2022
Record ID 30450218

This is to certify that:

Michelle Brown

Has completed the following CITI Program course:

GCP – Social and Behavioral Research Best Practices for Clinical Research (Curriculum Group)
GCP – Social and Behavioral Research Best Practices for Clinical Research (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Lindenwood University



Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wd849aa57-a87f-4815-a2ab-b635069a4a0a-30450218



Completion Date 08-Feb-2019
Expiration Date 07-Feb-2023
Record ID 30450217

This is to certify that:

Michelle Brown

Has completed the following CITI Program course:

CITI Conflicts of Interest (Curriculum Group)
Conflicts of Interest (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Lindenwood University



Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w5ec4cd2e-28bc-45c7-8500-95b4ac4c69f5-30450217

Vitae

Michelle Brown

Education

Doctorate in Curriculum and Instruction- in Progress

Master of Arts Education- Educational Technology- May 2017

Bachelor of Science in Education- Middle School May 2010 Concentration:

Science Harris-Stowe State University, St. Louis, MO

Middle School Teaching Certificate, State of Missouri

Project Lead The Way: Human Body Systems (HBS) 2014

Educational Employment History

2018-Present Whitfield School: 7th Grade science instructor: 2018-2019 11-12 grade

Physics instructor, 2021-2022 12 Psychology instructor, 2022-2023, Middle School

Technology Coach, 7th Grade- Grade Level Coordinator

2017-2018 Cross Keys Middle School, Ferguson Florissant School District: 8th Grade
science instructor

2015-2107 Montgomery County Middle School, Montgomery County School District: 7th
Grade science instructor

2014-2015 Jennings Junior High School, Jennings School District: 6th & 7th Grade
science instructor

2012-2014 Lift For Life Academy: 7th Grade science instructor

2011-2012 Imagine Academy of Careers Middle School: 7th grade science instructor

2010-2011 Westview Middle School, Riverview Gardens School District: 8th grade
science instructor

Awards

2021 EducateSTL Rebecca Hare Creativity in the Classroom Award for Achievement
and Excellence in Creative Tips & Tricks

2021 Technology Student Association Advisor of the Year for the state of Missouri

2012 VFW Post 3944 Teacher of the Year

2011 VFW Post 3944 Teacher of the Year