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USING KNOWLEDGE OF THE ADOLESCENT BRAIN TO INCREASE MOTIVATION
AND BUILD RELATIONSHIPS

by

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A capstone submitted in partial fulfillment of the
requirements for the degree of Master of Arts in Education.

Hamline University

Saint Paul, MN

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Content Reviewer: Jill Kind

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“Well, no,” you have to say, “your brain is sometimes an explanation; it’s never an excuse.”
- (Jensen & Nutt, 2015)

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Dedication Page

To my husband, who supported and encouraged me throughout this journey. To the students who challenged me every day and made me a better teacher, I might not have written this capstone if not for you. To Holly, I can't imagine a better friend, mentor, and colleague. And to my mom, who taught me to never stop learning.

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CHAPTER ONE

Introduction

Background

This capstone has grown from a desire to understand how the development of the adolescent brain impacts student motivation and relationships. I hope to create a toolbox of brain-based strategies created around the development of the adolescent brain and how it can help increase motivation and build relationships within a school setting. These strategies could then be integrated into a curriculum. While many of our day-to-day lessons include opportunities for differentiation, they are not necessarily planned with the adolescent brain in mind. I believe that creating a toolbox of strategies with the brain in mind will not only give educators insight into the inner workings of the adolescent brain, but it will also help them become better teachers. This led me to explore my research question: *How can we use knowledge of the adolescent brain to increase motivation and relationships?*

I remember becoming a pre-teen and thinking about all the drama that girls experienced with trying to fit in, finding their places in this world, balancing the lines between wanting independence and needing support, and a whole other mix of emotions. I recall a specific conversation with my mother where I said, “I will never be a hormonal teenager.” Clearly I did not actually know what that meant. We had more than our fair share of fights, walk outs, and disagreements. I had all the answers, and my parents knew nothing.

For me, seventh grade was the start of middle school. Looking back it was the hardest year of my secondary education. I was a tornado of emotions that destroyed almost everything in its path, including myself. I displayed self-centered tendencies, erratic behavior, and

inexplicable choices. Emotions ruled over logic, and my brain constantly felt like it was in a game of Rush Hour. While I managed to prioritize academics, life took over in ways that today I am still not entirely sure I understand. Questions about my self-worth, abilities, friendships, relationships, and who I was and who I was going to be circulated through my mind regularly. It never occurred to me that my brain was still developing and that it might explain several of my actions and feelings. During that time, I am thankful to have had a science teacher who guided me through this turbulent period of my life.

As I progressed through high school, I knew I wanted to be a teacher. I wanted to give back to students in the ways that my seventh grade teacher did for me. In school, it is never only about the academics. It's about the relationships we build, the choices we make, the emotions we experience, and the discovery of one's self. What I never imagined when I became a teacher was the extreme complexity of the adolescent brain and how it affects the way adolescents function throughout the day.

In college, I majored in English Education with a minor in psychology. I thought it would give me better insight into the inner workings of how my students tick. Three of the best courses I took were educational psychology, personality psychology, and human development. Through educational psychology, I learned how students intake and retain knowledge. This also included emotional, social, and cognitive learning processes. My favorite course was personality psychology, where we studied patterns of thoughts, feelings, social interactions, and behaviors that influence a person's self-expectations, perceptions, beliefs, and values. It also explored how individuals react to other people, problems, and stress. All of this is relevant when dealing with 120 different sets of personalities and learning

processes. Finally, I took human development, which explored how humans develop from infancy into adolescence and into adulthood. It analyzed how the brain changes and develops over the years and the influences and implications of this. All of these courses gave me some insight into my adolescent self back in seventh grade and eventually triggered a greater curiosity for how I could understand the development of the adolescent brain and use it as a tool to teach students.

A Curiosity for the Adolescent Brain

I have only taught seventh graders, and in four years, I have seen a plethora of students. I distinctly remember one student whom I acquired one year after he purposely sabotaged his grade in Advanced English. I had heard nothing but negative things about John (not his real name); he would not read, refused to bring a pencil to class, didn't do homework, and would purposely take all hour to do a test, if he would take it at all. When John first started with me at the beginning of second quarter, I found the perceptions I had heard previously about him and my initial experiences with him to cause me frustration towards him. I had never met a student who enjoyed staring at lined paper for fifty three minutes. My frustration turned into exhaustion as I tried to understand John. Eventually, I found our situation comical, comparable to the unfiltered happiness I feel after running on very little sleep. I began teaching my classes in a chair right next to him and forcing him to take notes. I started reading to him out loud. Looking back, I am sure public humiliation in seventh grade is not the best route to go, but I was running out of options. I was not willing to let him get away with not doing his work and learning the content. Eventually, and somehow, I managed to find a series of books he actually read without me needing to read out loud or sit next to

him. Keeping up on taking notes was not always successful, but I did my best not to let him get out of anything. I did learn that sometimes you have to pick your battles. My mindset towards this student became more of a challenge, as I wasn't going to let him be without interacting and understanding the content. I made sure he knew this too. He tried stubbornly to avoid all his work and take his time on tests or not even complete them. I did not let him get out of doing the work and spent many homerooms and lunches sitting with him and holding him accountable. He was not a behaviorally disruptive kid. He was the quiet, defiant kind who flew under the radar, and when I say quiet and defiant, I mean it was like pulling teeth or watching paint dry to get him to talk or do work—painful. I tried to pry information out of him: friends, family, other classes, hobbies, and most frequently, what are you going to do with your life? I tried countless different approaches to get him to open up and think about how his current actions and choices would follow him and catch up to him later in life. He was a student who was the complete opposite of me when I was his age, but somewhere, I still saw so much of me inside of him: stubborn, determined, and angry (without being able to identify *why*).

Early on after John entered eighth grade, I would check in on him. When I realized his behaviors and attitude had not changed, I offered to work with him one-on-one in a study hall. Watching him continue to sit there and stare at paper for an entire class period, even during a test, baffled me. I could not fathom how and why he would purposely sabotage his success or learning in middle school. As I sat with him day after day for an entire quarter, I could not understand what made him act the way he did. Some days I got a little laugh out of him or a brief conversation. Sometimes he would tell me a little bit about his life and why he didn't do

his homework, but we are coming up on two years together, and I did not understand how to get through to him. However, I refused to believe it was not possible.

John became one of the primary reasons I became curious in understanding how the adolescent brain develops and functions. If I can find research-based strategies that help me use how the adolescent brain functions to build relationships with students and motivate them, then maybe I could get through to another John and help him see success. Phelps (2007) wrote about the necessity in understanding that the adolescent brain is incapable of consistency, which contributes to the turbulent mood swings that are often seen in teenagers. He also addressed that, with the amount of profound changes going on in the adolescent brain, it is more often than we realize that students have completely different interpretations of what they hear as well as a potential lack of understanding for their actions. Understanding the continual development of the adolescent brain helped me gain a little better insight into my former student, John. One way that I chose to explore the development of the adolescent brain and the use of brain-based strategies was through the Understanding by Design Curriculum Model (Wiggins & McTighe, 2011).

The Understanding by Design Curriculum Model

When I started my first year of teaching seventh grade, I took a color test from Ritberger's (2009) book *What Color is Your Personality*, to identify my personality traits. This is an activity that every teacher participates in when they begin teaching at our school. Our colors help us understand our personality and how we tend to think and work, as well as how to use our strengths and areas of improvement to work in groups. Colleagues will joke about who is red, orange, yellow, or green simply by the way they organize a desk, share

ideas, work on a task, or talk with other colleagues. As a staff community it has made us stronger in working with each other and playing off of each other's strengths. When I took the color test, my highest score was green, with my second highest as orange. In terms of being "green" I am considered a person who wants to "experience it all". Greens are considered idealists, imaginative, creative, intuitive, and dreamers. Greens see the whole picture they are creating and like to look at the way things could be, rather than what they should be. Greens' imaginations are endless, and they are constantly formulating new ideas and exploring different possibilities.

Oranges are the "let's all get along" people and are caretakers by nature. They focus on building relationships and caring for the emotional needs of others. Oranges frequently struggle to find balance in their lives, crave stability, and feel like there never seems to be enough time in the day to get things done. They believe in a strong sense of community and are natural leaders and supporters when working in a team.

Over the past four years, I believe understanding my personality (colors) and areas of strengths and improvements have not only made me a better teacher, but also a better colleague and individual. It has also played a part in the curiosity that developed into my research question. When I interviewed for my first teaching position, I compared creating curriculum units to a forest. I like to see the big picture or the end goal before I start working on all the little details. I want to see the forest before all the individual trees. When I began my Masters at Hamline, I took a course that taught me about the Understanding by Design Curriculum Model (McTighe & Wiggins, 2011). The first goal of the model is to identify the desired results - what do I want my students to know, understand, and be able to do? The next

part of the model is developing assessment evidence in the form of project tasks, authentic assessments, and other evidence. These two steps are what I consider to be the forest. The last stage is to create the daily learning plans that will help students perform on their assessments and reach the desired results. This stage represents the individual trees. I was drawn to the Understanding by Design Curriculum Model because it fits my top personality color, green. It is starting with the big picture and then breaking it down into smaller parts.

Being orange is what inspired the desire to create a unit using research-based strategies in adolescent brain functions. Oranges want to focus on building relationships and believe in a strong sense of community. They care about the emotional needs of others. As my second highest color, I can see myself in these qualities and find myself wanting to build better relationships in my classroom with my students, between my students, and with their families. One way to do this is to understand how their brains function, process, and understand all that is going on with them physically, emotionally, mentally, intellectually, and socially. By learning about myself, I realized what I want for my students. I want to further explore how to use the development of the adolescent brain as a launching point for increasing motivation and relationships to give students the best chance of success.

Research Question

From my own experiences as an adolescent as well as my four years of teaching, I have witnessed the many challenges that my students face in developing physically, emotionally, mentally, intellectually, and socially. Understanding the development of their brain and how they acquire information, make decisions, and communicate is an underused tool in understanding how to teach our adolescents. As I furthered my teaching career and

pursued my Master of Arts in Education, I learned of a curriculum model that fits with my personality style—the Understanding By Design Curriculum Model. As a seventh grade teacher, I would like to create a toolbox of strategies that can be integrated into a unit that uses the Understanding by Design Curriculum Model and incorporates how the adolescent brain functions to increase motivation and relationships. To accomplish this goal and create a unit conducive to how students learn best, I am investigating the question, *How can we use knowledge of the adolescent brain to increase motivation and relationships?*

Chapter Summary

When students enter my classroom, there are a plethora of things going on physically, emotionally, mentally, intellectually, and socially, many that I am completely unaware of. With 120 different students coming into my classroom every day, I believe it is necessary to understand how their brain works in order to give them the best chance at learning and success. Oftentimes, I find myself teaching lessons in a way that makes sense to me, and I forget that the way my students intake, process, and interpret information is still underdeveloped compared to mine. Finding research-based strategies for supporting adolescent brain function can help me better understand my students. I believe using the Understanding by Design Curriculum Model is a systematic approach to help students process information in a structured, consistent way and that by combining both the Understanding by Design Curriculum Model and research-based strategies in adolescent brain function, I can create a unit that caters to the exact needs and learning processes that adolescents need. In Chapter Two, I examine literature that explores the development of the adolescent brain,

motivation, relationships, and research based strategies that support adolescent brain functions.

CHAPTER TWO

Literature Review

Introduction

During my undergraduate studies at the University of Wisconsin - Eau Claire, I learned that adolescents are frequently experiencing physical, intellectual, emotional, and social changes that are constantly impacting their learning during the school day. However, the one aspect of the adolescent that I did not learn or consider as I became an educator was how the development of the adolescent brain also impacts student learning. During my time taking courses for my Masters of Arts in Education, I took a course called Advancing Secondary Readers. This course piqued my curiosity on just how much influence the development of the adolescent brain has on student learning and maturity. Now in my fourth year of teaching, I am trying to figure out how to best meet the needs of all my students, and I believe understanding how they intake information and make decisions, as well as the reasons for their decisions, will help me better meet their needs.

In this chapter, I explain adolescent brain development and its relationship to an adolescent's ability to intake information and make decisions, why teenagers are impulsive, and what educators should know about teaching with the brain in mind. I also discuss research based strategies for teaching with the adolescent brain in mind, as well as how this influences adolescents' motivation and relationships. Researching these topics will help answer my question: *How can we use knowledge of the adolescent brain to increase motivation and relationships?*

Adolescent Brain Development

Before the 21st century, it was thought that intellectual functioning could be contributed to larger brain sizes. However, the brain actually reaches its adult size by age ten, dispelling the previous idea (Jensen, 2005). The idea was that once the brain reached maturity, it would remain more or less stable over several years (Jensen & Nutt, 2015). It turns out that the view of a “static” brain is out of date and that “human beings have the capacity and the choice to be able to change [their] own brains” (Jensen, 2005, p. 3). Researchers of environmental events and social influence on both genetic constitution (Reik, Dean, & Walter, 2001; Wilson & Grim, 1991 as cited in Jensen, 2005) and genetic expression (Suomi, 1999 as cited in Jensen, 2005) suggested that these experiences can lead to changes in the brain, which lead to changes in adolescents (Jensen, 2005). White (2005) discussed the range of skills that are crucial to survival, but they come with a price. Children are born dependent on others for approximately the first decade of their lives. After that, they need to venture off and begin to create families of their own. As White (2005) said, “That clearly cannot happen overnight” (p. 3). This is where the role of adolescents sets in as biological and behavioral changes bridge the gap between dependence and independence.

Researchers have discovered that contributions to the development in adolescents can be reflected in changes in brain structure, brain function, and interconnectedness between different regions of the brain (Steinberg, 2011). Learning may also take a backseat for adolescents when presented with opportunities to impress or fit in with their peers. Neuroscientist, Casey (as cited in Turner, 2015), attributed this desire to connect with their peers as a result of the brain being flooded in gonadal hormones (responsible for the growth,

development, maintenance, and regulation of the reproductive system) and the prefrontal cortex still developing (p. 3). These attributes contribute to teenagers' ability to make decisions, and, therefore, they are not always capable of recognizing future consequences or stopping themselves from doing something they may later regret.

Impulsivity in adolescents. In the adolescent brain, the limbic system, which involves emotion and reward processing, is much more hypersensitive compared with adults, whereas the prefrontal cortex is much more developed in adults than it is compared to adolescents (Blakemore, 2012). There is a natural insulation in the brain called myelin - insulation that allow nerve signals to flow freely - which build around cells from the back of the brain to the front. The prefrontal cortex is responsible for executive functions such as weighing risks and rewards, impulse control, planning, thinking ahead, insight, and empathy (Gross, 2015; Steinberg, 2011). Since their prefrontal cortex is not fully developed, their executive functioning skills are not fully intact, making adolescents more prone to impulsive actions.

Individuals may also see teenagers as selfish individuals because their prefrontal cortex is not fully connected, and they are not at a stage where they are capable of thinking about the effects of their behavior on other people (Knox, 2010). As the brain continues to mature, the brain is experiencing a rapid increase of the chemical substance dopamine - which gives off the feeling of pleasure. This is why teenagers tend to go out their way to seek rewarding experiences and why intelligent teenagers can be found doing foolish things (Steinberg, 2011). Teenagers do not have the ability to access their frontal lobe as easily as adults, and therefore do not think about the consequences as readily. Steinberg (2011)

compared adolescent decision making to “starting a car without having a skilled driver behind the wheel” (p. 46).

Another component that adds to the impulsivity of adolescents is the presence of peers. Steinberg (as cited in Turner, 2015) stated peers double “the number of chances that adolescents take, but has no effect on the number of chances that adults take” (p. 2). The prefrontal cortex cannot keep up with the limbic system, which seeks out positive emotions and rewards, and ends up in overdrive with other kids around (Turner, 2015). What Gross (2015) described as “hot cognition” influences the aspects of the adolescent that seek out peers in order to develop skills that will give them autonomy and eventually allow them to leave their parents and take care of themselves.

Teenagers are also more prone to addiction. Since addiction is a form of learning, it can experience repeated exposures. When addiction experiences repeated exposures, the synapses that create pathways for neurons become strengthened. This changes a synapsis from a learning pathway to a substance pathway. Addiction ends up being more efficient in the adolescent brain, and adolescents can get addicted faster (Gross, 2015; Knox, 2010). As an implication for learning, alcohol and marijuana can impede an adolescent's ability to learn or retain information for several days after ingestion (Gross, 2015).

Intaking information and decision making. The brain is comprised of two categories of cells, neurons and glial. The role of neurons is to process information, make decisions, and control behaviors (White, 2005). The development of the brain relies on the connections that are built between neurons - also known as synapses. Some synapses are genetically programmed, while others are formed from experiences. They continue to develop

as adolescents “learn new skills, build memories, acquire knowledge, and adapt to changing circumstances” (Steinberg, 2011, p. 23). As children grow into adolescence, their brain continues to develop more synapses. Adolescents have more synapses than adults, allowing them to learn much more and with less effort (Perkins-Gough, 2015). Eventually, the brain begins to do something called “systematic pruning” (Perkins-Gough, 2015, p. 3). Systematic pruning helps brain functioning by getting rid of the synapses that are no longer used. As the brain continues to develop, it begins to learn which paths lead to more direct results, eliminating the paths that no longer need to be used (Steinberg, 2011). Steinberg (2011) and Perkins-Gough (2015) both suggested that brain functioning is also strengthened by the experiences individuals have, the information they learn, and the skills they work on, which strengthen those particular synapses. Glial cells support neurons by facilitating communication between neurons and helping hold the brain together. They are also responsible for limiting the passage of chemicals into the brain (White, 2005).

As the brain matures, adolescent thought processes can be distinguished in two different ways. “Cold cognition” is when teenagers do not need to think about things involving emotional content, such as solving a math problem. “Hot cognition” involves thinking about things that make teenagers elated, irate, and frustrated, as well as other emotions (Steinberg, 2011). However, Jensen (2005) argued that our ability to recall information such as words, names, equations, or facts is actually much more challenging in adolescents in comparison to memories that are crucial to what Jensen called “Survival-Based Memories” (p. 126). These memories include how to get home, names of parents, birthdays, and information crucial to survival. According to Steinberg (2011), when it comes to “cold

cognition” the adolescent’s brain is as mature as an average adult. However, when it comes to “hot cognition” their ability to think ahead, plan, or consider consequences is still developing.

A critical component of understanding how students process information is understanding how students retain and remember information. Information to the brain generally comes in the form of the five senses or through imagination or reflection. Bailey and Pransky (2014) pointed out that memories are located in multiple areas, and a single event can activate multiple pathways to store information in different areas. This is done through neurons as they link to other neurons through axons and dendrites. As neurons process all of this information, they must decide whether the information goes to the neural web or whether to inhibit the information (Bailey & Pransky, 2014). They also wrote that part of learning is deciphering which information is important enough to keep and which information is okay to let go. Jensen (2005) compared learning to falling in love. At first there is that initial attraction, followed by the effort to maintain that relationship. If all goes well, the relationship continues to mature, and it requires less effort to continue to evolve together. If the initial attraction or effort fails, the relationship goes its separate ways. The same can be said for learning. If the information is continual and if there is effort put into it, the learning can be retained. If the learning is not carefully practiced, it will not be stored (Jensen, 2005).

Jensen (2005) also explained that what someone saw might be stored in one area of the brain, while what someone heard would be stored in a different area of the brain. Similarly, Willis (as cited in Bailey & Pransky, 2014) stated that “By stimulating several senses with the information, more brain connections are available when students need to recall that memory later on. This means that the memory can be retrieved by more than one type of cue” (p. 10).

As neurons process learning, the axons are covered in a goopy matter known as the myelin sheath. The myelin sheath is responsible for accessing information quicker, and transferring and protecting those connections and information. Bailey and Pransky (2014) emphasized that the phrase “practice makes perfect” is actually relevant in strengthening pathways involving what we learn. Finally, it is important to consider the role the limbic system plays in learning and developing memory. The limbic system is the area of emotional control. If students experience an unsafe or negative learning environment, poor sleep and diet, and a lack of exercise, it will affect their ability to learn and store information (Bailey & Pransky, 2014).

What educators should know about teaching with the brain in mind. Educators, in order to improve “hot cognition” in adolescents, need to give students the opportunity to practice autonomy. Assignments that involve thinking ahead, making a plan, and carrying it out are ways to help the brain mature at a quicker rate (Steinberg, 2011). Another benefit for adolescents is that due to synaptic plasticity - the ability to strengthen or weaken synapses - teenagers are able to learn faster, absorb more information, and retain it for a longer amount of time (Gross, 2015). This is crucial as adolescents begin to decipher which information to store and which information to inhibit. It is also important that educators factor in the limbic system and the emotional control it has over a student’s ability to store information (Bailey & Pransky, 2014). Educators should also be aware that in the event of a brain injury, teenagers could be significantly impaired in their ability to recall information, making learning more difficult (Jensen, 2005).

Additionally, educators should consider that mental illnesses, such as depression or bipolar disorder, as well as other related disorders, are more likely to occur in mid to late teens

and early 20s. This can cause abnormal functioning in the brain and affect an adolescent's ability to learn (Perkins-Gough, 2015). Teachers often spend more time with teenagers than their parents do, and it is imperative that they are vigilant in recognizing some of these issues (Hileman, 2006).

Another implication for learning comes from stress on the brain. Stress is another stimulus that can change brain chemistry and easily lead to depression in teens because of their synapses' plasticity and how they are being shaped by the environment (Gross, 2015). Students are also on overdrive with social media and an overload of after-school activities and organizations. Adolescents also do not get an adequate amount of sleep. The combination of these factors can lead to stress which has lasting effects as adolescents do not have the necessary skills to deal with it. This leads teenagers to make poor decisions that affect their brain long term and their ability to learn (Perkins-Gough, 2015).

Understanding how the adolescent brain develops can help educators better understand why adolescents can be seen making smart decisions one minute and then making foolish decisions the next. It helps educators understand how adolescents process information and make decisions, as well as how their brain intakes information and sorts it into different parts of the brain. Research uncovering the inner workings of the brain have informed my research question by giving me a foundation for how the adolescent brain develops and how this impacts how they behave and learn in my classroom. By understanding how the adolescent brain develops, we can better understand how adolescents are motivated.

Motivation

This section focuses on the research behind motivation and the importance of understanding the need for motivation. Steinberg (2011) stated that as the brain develops, adolescents experience an increase of the chemical dopamine - which stimulates pleasure. Dopamine can add to adolescents' motivation as they experience pleasure in their accomplishments. On the other hand, the brain's production of cortisol can impact a student's motivation negatively. This section will explore how children view intelligence, intrinsic and extrinsic motivation, and the potential positive and negative implications of both kinds of motivation. It will also discuss how the brain processes rewards and the connection between rewards and motivation.

How children view intelligence. According to Dweck (1990), the way children view learning and intelligence fall between two different theories: entities and incremental. "Children with entity theories believe that intelligence is a fixed property of individuals; children with incremental theories believe that intelligence is malleable" (Nelson-LeGall & Resnick, 1998, p. 102). Children with a fixed mindset aim to perform well and avoid anything that could make them look bad or cause failure. They want positive affirmations of their abilities and tend not to put effort into work that they can not perform well in (Jensen, 2005). Children with a growth mindset believe that, with effort, they can see growth in their learning. They seek out challenges and opportunities to improve. These mindsets tend to reflect how students learn and how they think about learning (Jensen, 2005). Jensen also suggested that a child's reaction towards effort, persistence, failure, and learning goals are all related to a child's motivations.

Intrinsic motivation. Adolescents who put themselves in learning situations where there are no rewards or external pressure attached to the learning display “achievement or competence motivation” (White, 2005, p. 3). They have the desire to be naturally curious and self-motivated (Jensen, 2005). According to Piaget (1978), adolescents naturally want to solve problems without the implication of an external reward. It is important that educators nurture that aspect of adolescents and continue to motivate them to be curious, explore, succeed, and understand.

Deci and Ryan (1985) and Deci, Koestner and Ryan (2001) developed the concept of self-determination theory. In their research, they discussed the benefits and power of intrinsically motivated people. These types of people have the desire to be naturally curious and self-motivated (Jensen, 2005). Intrinsically motivated people also experience a satisfaction that produces enjoyment, contributes to their well-being, and creates a sense of excitement to learn (Deci et al., 2001). Choice is also another contributing factor in increasing satisfaction and helping students feel autonomous because they thrive on the opportunity to make their own choices (Patall, Cooper, & Robinson, 2008). Eisenberger and Shanock (2003) stated that extrinsic motivation can be constricting to adolescents’ ability to develop autonomy and that adolescents perceive themselves as self-determined when experiencing the opportunity to make choices. Finally, Willis (2014) suggested that self-motivated students tend to achieve greater success on tasks as well as attain higher academic achievement. However, Deci (1975) pointed out that if students receive rewards for completing activities and those rewards are then taken away, students are less likely to continue to engage in that activity and express a feeling of boredom.

Willis (2014) discussed that the most common reason students drop out of school is because they are bored. When schools focus on material that is uninteresting or irrelevant to their lives, they lose their desire to learn. Boredom stems from adolescents wanting to learn but being unable to because there is no external stimulation to engage them (Willis, 2014). Boredom has a negative effect on the brain when teenagers begin to feel a sense of hopelessness and emotional detachment from what they should be learning (Macklem, 2015). This impacts students' motivation. In this situation, a student's lack of motivation can be "interpreted as cognitive limitations, intentional lack of effort, or willful opposition when in fact their brains reactive responses are involuntary and not willful" (Willis, 2014 p. 3). One way to help students understand that boredom can be a natural feeling is to explain that experiencing boredom can motivate students to try new things, develop new interests, foster curiosity, and encourage innovation (Hidi, 2016).

One challenge that adolescents face when dealing with boredom is that the stimulation provided by dopamine often dwindles over time because the expectations for achievement and reward do not change (Macklem, 2015). When students experience feelings of failure, an inability to succeed, and low self-esteem, cortisol is produced. The production of cortisol inhibits comprehension, which leads to low achievement (Jackson, 2011). Jackson also pointed out that stress can impact motivation as it rewires cognitive functioning and pushes adolescents to do the same thing over and over again. Stress impacts adolescents' executive functioning and contributes to the manifestation of negative habits. One way to avoid this is to build the networks in the executive functions of the brain. "Executive functions override the

brain's innate compulsion to seek immediate gratification in order to achieve more long-term goals" (Willis, 2014, p. 3).

Executive functioning is not as developed in adolescents; therefore, they struggle to manage their emotional responses to boredom (Willis, 2014). If students learn to build self-directed strategies to manage their emotions and change their feelings towards boredom into an opportunity for success, they are more likely to regain their sense of intrinsic motivation (Deci & Ryan, 1985). One way they can do this is by using metacognition - actively thinking and reflecting on the process of their learning - strategies to recognize when they are in a bored or stressed state and work to set achievable goals, attainable challenges, and make connections to things that are relevant to them (Willis, 2014). Feuerstein (1978) supported the development of interests and connections to personal experiences as a means of stimulating motivation. Jackson (2011) wrote, "Like understanding, our engagement is affected by our brain's recognition of relevance and meaningfulness" (as cited in Feuerstein, 1978, 1980, p. 75). Engagement becomes the catalyst for motivation.

The continuum between extrinsic and intrinsic motivation. Lepper (1998) suggested that intrinsic and extrinsic motivation is not necessarily on opposite sides of a continuum, but rather fluctuates given the circumstances and that they can both be mutually beneficial to each other. Lepper discussed that in some instances, rewards can produce a negative effect on adolescents, but they can also produce success in students when they are given feedback and reinforcements to continue their behaviors and performance goals.

One concern between extrinsic and intrinsic motivation that Hidi (2016) addressed is that extrinsic motivation, which involves rewarding students for their efforts, good behavior,

and excellent performance, often undermines intrinsic motivation, which is the self-satisfaction that students get from doing an activity. Another concern is that, while external rewards are good motivators, it affects students' internal abilities to explore their curiosity for learning, self-regulate positive and negative behaviors, and be innovators of their learning (Ryan & Deci, 2000, 2009). Finally, Steinberg (2011) pointed out that during adolescence, teenagers are much more motivated by their peers and therefore are more susceptible to taking risks when they are with their friends. They tend to focus more on the rewards of their risky behavior than the potential consequences.

In contrast to those who view extrinsic rewards as a potential negative effect on adolescents, Steinberg (2011) believed that rewards are “primary motivators of behavior and key components in the control of actions, decisions, goal-directed behavior, and learning” (as cited in Martin-Soelch et al., 2001 p. 53). Schutz (2007) believed that rewards can be motivating for students to continue positive behaviors, seek out the positive feelings that come from learning, are crucial to adolescent survival, and improve how the brain processes information. Extrinsic motivation can also increase motivation and performance on tasks that hold low interest or not a lot of relevance for students (Cameron, Banko, & Pierce, 2001).

How the brain processes rewards. The brain has the capability to respond to rewards and how they are delivered as well as when they are taken away (Macklem, 2015). Macklem pointed out that adolescent's ability to process rewards is vital to their decision to continue to participate in activities and seek out other rewards. He also said that when the brain processes rewards, it determines the benefits of those rewards and influences how adolescents make decisions regarding choices and how they learn. Researchers tend to agree that extrinsic

rewards are beneficial when students are faced with an uninteresting or unmotivated task (Cameron et al., 2001). When the brain experiences withdrawals in rewards, such as when students are motivated in their actions and no longer need rewards, the way the brain is wired can change (Macklem, 2015). Understanding the effects of intrinsic and extrinsic motivation are vital in using them appropriately with adolescents in the classroom.

Educational implications in increasing motivation. Glynn and Koballa (2006) discussed the six important constructs of motivation. These include “intrinsic and extrinsic motivation, relevance to personal goals, self-determination, self-efficacy, and assessment anxiety” (p. 4). One way to increase motivation is to teach material that is relevant, interesting, and helps adolescents achieve their goals (Willis, 2014). This can be done by using pre-assessments to gain an understanding of what students already know (Macklem, 2015). It is also useful to begin units with essential questions that allow students to approach answering those questions in a way that is relevant to them (Willis, 2014). Willis found that motivation and engagement increase when students take the information they learn and reflect on it, adjust their previous notions, and share their insights. This helps the brain acquire the information and store it in long-term memory (Jensen, 2005) and continue students’ desire for knowledge acquisition.

Just as students’ feelings of hopelessness and emotional detachment can affect the brain negatively, positive emotions and experiences tied with interests can motivate students in their desire to learn (Willis, 2014). One way to motivate students is through differentiation. Differentiation is when students have a variety of opportunities to learn in a way that is conducive to them (McTighe & Wiggins, 2011). It also teaches students at their level and

provides challenges that are within their reach, helps them find success, and encourages them to continue to seek that self-rewarding feeling (Willis, 2014). Differentiation and a student's desire to learn help them experience intrinsic motivation, in which the brain releases dopamine, the pleasure response (Willis, 2014). Due to this, students experience a self-rewarding feeling as they complete a challenge or task that applies to their interests and current understanding (Macklem, 2015). Because of this self-reward, the student is more likely to be motivated to repeat the action in order to repeat the feeling (Willis, 2014).

Both intrinsic and extrinsic motivation are necessary in motivating adolescents. When adolescents are unmotivated or uninterested in a task, rewards (extrinsic) are helpful in motivating students to complete activities. However, the self-determination and satisfaction that comes from doing things on their own and continuing to pursue their understanding of things is the ultimate goal of developing motivation in adolescents. Steinberg (2011) said adolescents are much more motivated by their peers and are more susceptible to seek out activities and rewards that gain them favor with their peers. Exploring how the brain is connected to adolescent motivation informs the current research question by providing insight into how to find a balance in motivating students intrinsically and extrinsically based on how their brain responds to rewards. The cognitive development of the adolescent brain also helps educators understand what happens to the brain when adolescents experience negative emotions, environments, or situations and how that differs from how the brain is wired when students are engaged in their learning. In the next section, I discuss how the development of the adolescent brain influences adolescents' relationships with peers and adults.

Relationships

This section focuses on how the brain influences adolescents' relationships with peers and adults. Specifically this section explores how the brain is social and how relationships help build and create the brain. This section also explores the adolescent's relationship between peers and adults. Finally, educational implications for developing relationships within the classroom is discussed.

The social brain. Just as humans are social beings, so are their brains (Jensen, 2005). Siegel (2012) pointed out that the brain “is relational, not a product created in isolation” (p. 5). Siegel (2012) also suggested that the brain is not independent, but rather that it is dependent on other individuals to help the mind function. Research has found that the brain reacts differently if a person is in a social setting or on their own (Jensen, 2005). This means the brain is literally changing based on its social environment and the relationships it forms (Siegel, 2012). This research suggests that relationships with family members, peers, coaches, teachers, etc., all contribute to how the mind is shaped.

How the brain supports relationships with adults. By understanding how human relationships alter the connections between neurons, researchers have been able to understand how these experiences shape the way adolescents process the circuits in their brain responsible for memory, emotion, and self awareness (Siegel, 2012). Memory is not only about the experiences that influence what an individual remembers, but also how they remember it. As this occurs, the individual begins to create an awareness of themselves and their self in relationship to others (Siegel, 2012).

Similar to creating and retaining memories, what and how an adult recalls memories influence how an adult relates to a child. This develops a form of attachment between the adult and child (Jaffe & Segal, 2017). This attachment is responsible for the success of future relationships, maintaining emotional balance, enjoying themselves and their time with other people, and having the ability to rebound from negative feelings and experiences (Jaffe & Segal, 2017).

“Emotional communication” plays the primary role in connecting the “internal and interpersonal worlds of the human mind” by establishing what kind of relationship an adult will have with a child (Jaffe & Segal, 2017, p. 12). Some neurons have “mirror” properties that allow children to imitate what behaviors or feelings they see in other people as their own. This “mirror” property could also be applied to their adolescent peers. As Turnish (2015) pointed out, adolescents are more prone to the pressures of their peers and are more likely to take risks or make foolish decisions. Adolescents may “sponge up” behaviors in peers or adults and assimilate them into their own behaviors and feelings, which shapes who they become (Siegel, 2012).

Clark (2014) suggested that “While brain architecture — foundations, walls, and building blocks — explains *what* is built in the brain, *how* your child’s brain is built is dependent on relationships” (p. 1). The relationship a child develops with an adult and peer helps to strengthen synapses in the brain. As those interactions with adults and peers continue and build, those synapses strengthen (Jaffe & Segal, 2017). The important part of relationships and developing the brain is that it is a give and take. Clark (2014) pointed out that adolescents need to be active participants in their relationships in order to develop

themselves. They also need a variety of skill sets in order to build their brains, so developing safe relationships with children while teaching different skills will help them develop a sense of self (Clark, 2014).

How the adolescent brain impacts relationships with peers. Socio-emotional change is a significant part of an adolescent's development, particularly regarding self-awareness and self-concept (Sebastian, Burnett, & Blakemore, 2008). In large, this is due to the emotions adolescents are able to feel such as embarrassment, guilt, fear, elation, etc. (Blakemore, 2011) as well as their developing self-concept (Brown, 2004). As children get older (from ages 5 to 11) they gain a better understanding of mixed emotions and begin to identify that they can simultaneously experience two different emotions, such as anger and disappointment (Blakemore, 2011). During adolescence, the teenage brain experiences a much more intense range of emotions which can cause a more confusing relationship with themselves (Siegel, 2014). This can impact how an adolescent might interpret the emotions of their peers incorrectly. As adolescents are experiencing these complex emotions, they become more easily irritated, moody, and annoyed, making relationships with peers more complicated (Siegel, 2014). Blakemore (2011) distinguished between social emotions and basic emotions. Social emotions require the complex perspectives and feelings of other people in contrast to basic emotions which do not require the relationship with another person. The complexity of social emotions influence how adolescents might behave in certain scenarios as well as in relationships with peers (Blakemore, 2011).

Another development occurring in the adolescent brain is the changing of their attachments. It is common for adolescents to begin to change their attachments from adults to

their peers (Siegel, 2014). As Jensen (2005) discussed in the section on adolescent brain development, he mentioned memories that are called “Survival-Based Strategies” which include remembering details that are crucial to survival. Similarly, adolescents switch their attachments from adults to peers as a form of survival, since these are the people who will be with them after they leave home (Siegel, 2014). Siegel also pointed out that one downside of peer relationships is that their brain is still evolving, and they are more susceptible to peer pressure. Because of this, some situations can become a matter of “life and death” to them, such as the number of friends they have, not being invited to a party, or not having a certain pair of shoes (Siegel, 2014).

Adolescent relationships between adults and peers are crucial to the development of the adolescent brain. In earlier years, the development of the adolescent brain relies mostly on the relationship with adults. What and how adults share their memories with children, as well as the emotional connection they develop are all contributing factors to the development of the brain and how it will impact the adolescent in the future. As the brain develops into adolescence, they are more susceptible to peer pressure. This can impact their decision-making skills as well as their motivation in the school setting. The relationships that adolescents develop with adults and peers help clarify how adolescents relate and think when it comes to their relationship with themselves and each other. This connects with the research question by giving insight into how to develop individual relationships with students, as well as how to use the social aspect of the brain to offer learning strategies that build peer relationships. In the next section, I discuss an assortment of brain-based strategies that support adolescent learning as well as improving adolescent motivation and adolescent relationships.

Brain-Based Strategies

This section focuses on the research behind brain-based strategies. Specifically this section explores how brain based-strategies can help adolescents in increasing motivation as well as developing relationships. Finally, this section discusses how brain based-strategies can improve student learning.

Strategies that support the development of the adolescent brain. Adolescents' awareness of the "emotional complexity of social situations" may impede their ability to learn in the classroom (Siegel, 2014, p. 8). Adolescents' ability to manage their emotions is more difficult than it is in the early and later stages of development (Siegel, 2014). Adolescents are more prone to the implications of social inclusion and exclusion, making it wise for educational programs to focus on topics like empathy, peer support, the effects of bullying, and how to behave in a team setting (Blakemore, 2011). Blakemore also suggested that during adolescence, it is valuable to teach them about the changes going on in their brain that might impact executive functioning abilities such as internal control, multi-tasking and planning, self-awareness, social cognitive skills, and complex social emotions.

When thinking about classroom management, it is important to keep the adolescent brain in mind as many of their responses to emotional situations such as confrontation result in the "fight or flight" method which can lead students to respond with denial of responsibility, argument, or placing the blame on someone else. Since adults have more developed pre-frontal cortexes, when it comes to emotional situations, they are able to generate an appropriate response without acting irrationally (Mears, 2012). Mears suggested one way to deal with adolescents through classroom management. "The teacher must separate

the ‘emotion’ from the ‘management’ and engage ‘detached interactions’” (p. 34). To do this, the teacher must not engage in the emotional behavior of argument, denial, or misplaced blame, and instead focus on the management of those situations (Mears, 2012).

According to Hileman (2006), students’ brains work on a time clock in terms of a student’s strengths and areas of improvements in learning. It is important that teachers consider switching up activities every 12-15 minutes to keep students engaged in learning. Students also learn better through repetition (Hileman, 2006). This connects with what Jackson (2011) said about strengthening synapses through sheath myelin, which develops when information is repeatedly practiced. However, the teacher must be cautious in varying how students are exposed to repetition so as not to bore them (Willis, 2014). Hileman (2006) also suggested using active learning as a tool to help improve adolescents’ learning, improve memory, and build self-confidence. By encouraging adolescents to stand and move around the room, educators are increasing blood flow and heart rate, and waking up the neurons responsible for learning.

As previously explored in the section on the development of the adolescent brain, it is important to teach in a way that helps students store information in multiple regions of the brain. Willis (2006) pointed out that by teaching students using multiple senses as well as across contents, adolescents would be able to store information in multiple regions of their brain and access the information more readily. The ability to make connections between different regions of the brain and associate current knowledge with previous knowledge allows adolescents to recall and use information in a more efficient and quick manner (Willis, 2006). Willis stated, “Engaging in the process of learning actually increases one’s capacity to

learn” (p. 312). She recommends avoiding rote memorization in favor of active learning that allows synapses to strengthen, connect old memories to new, and help the brain retrieve information more readily.

The use of graphic organizers is also a powerful tool for building relationships between what students already know and what they are learning. It helps students cluster information and recognize relationships and patterns that allow them to sort new information into memory storage (Willis, 2006). Graphic organizers encapsulate on the brain’s natural tendency to construct patterns in information (Willis, 2006).

Strategies to improve motivation. As mentioned in the section on motivation, one reason students are not motivated to learn is because they are bored. One way to remedy this is by helping adolescents develop thinking skills that are used in real world and authentic situations. By doing so, educators are facilitating skills that the adolescent brain needs to continue to develop, such as decision-making, creativity, and processing skills (Hileman, 2006).

Another way to motivate students is to “surprise” them to spark attention and curiosity (Willis, 2006). By doing this, students will be more engaged in the learning that is to follow. To expand upon their engagement, consider giving students the opportunity to interact with the information and explore the topic in a meaningful way (Willis, 2006).

Willis (2006) suggested that the more ways something can be learned, the more pathways that will be created to the brain, and more bridges between synapses will emerge. As the pathways that are created around a particular topic or skill are used more often, they get stronger, and avoid being lost. This goes back to Feuerstein (1978) and his statement that

learning is increased through motivation. If students are motivated to learn, they are creating positive habits that will be strengthened and continue to help them retain information.

Brain-based strategies are tools that can be used to increase learning, relationships, and motivation among adolescents. These strategies were developed based on the research done on how the adolescent brain learns best. Learning a variety of brain-based strategies has provided insight into how to help adolescents develop their brain, improve relationships, and increase motivation. Brain-based strategies have supported the research question by providing options for ways to create a unit that caters to how the adolescent brain develops.

Strategies to improve relationships. As mentioned in the section on relationships, the brain is social. Social learning can increase adolescent learning and relationships, as well as hold them accountable for their learning (Hileman, 2006). Wilson, Conyers, and Rose (2015) suggested personalizing classroom instruction since each brain is like a “fingerprint” and requires its own level of guidance (p. 1). They proposed this through using the three “C’s” - caring, choice, and challenge. When students are in a caring environment, provided choice for how they learn, and are challenged in their thinking, students are more apt to be motivated and engaged because it lets them be in charge of their learning (Wilson et al., 2015).

Cornelius-White (2007) summarized (as cited in Hattie, 2009) “To improve teacher-student relationships and reap their benefits, teachers should learn to facilitate students’ development, see their perspective, and communicate it back to them so that they have valuable feedback to self-assess, feel safe, and learn to understand others and the content with the same interest and concern” (p. 4). Saplosky (2005) pointed out that negative relationships with adults can lead to increased stress levels, memory retention, lower level thinking over higher level thinking,

poor social decision making, and a lower desire to learn. Lemov (2010) suggested seven ways to improve relationships with adolescents including set expectations, build trust, care about them, and establish a joy factor in the room.

Jensen (2005) discussed the brain as a social entity. It is not comprised of an independent person, but is dependent on the people around it. The brain learns and develops based on its social environment and social experiences. Hileman (2006) recommended giving adolescents the opportunity to talk to each other and learn from each other. In turn, this builds confidence, learning, and relationships between peers.

Conclusion

In my introduction to this chapter, I mentioned that in my undergraduate experience we spent a lot of time focusing on the changes in adolescents physically, intellectually, emotionally, and socially. During my time there, I felt that I was ill-equipped to understand how the development of the adolescent brain factored into adolescent learning. The research on the development of the adolescent brain is the umbrella for the changes that adolescents are experiencing physically, intellectually, emotionally, and socially. Throughout this chapter, I discussed the impulsivity of teenagers and how that can influence some negative behaviors, as well as that adolescents are only typically engaged for 12-15 minutes and need physical movement to wake up their brains. I pointed out that motivation can fall on a spectrum between intrinsic and extrinsic motivation and that it is important to figure out which kind will work for each student. I also addressed the many complex emotions that adolescents are dealing with and how that can influence their ability to learn as well as their relationships with

peers. Lastly, I also explored the brain as a social entity and how it needs the relationships with other people as a means of learning and developing.

The research methods outlined in Chapter Three aim to identify how strategies learned through the understanding of adolescent brain development can be used to increase motivation and foster positive relationships during the creation of a unit. Using knowledge of how the adolescent brain develops, the goal of this research is to create a unit that supports the development of the adolescent brain using brain-based strategies to increase student motivation and relationships to improve learning.

CHAPTER THREE

Project Description

Introduction

In teaching middle school, I have come to realize that adolescents have far more going on in their brain than I realized. They are balancing the need for autonomy, yet still depend on the assistance and support from adults (Jensen, 2005). They are shifting from their attachment to their parents to their attachment to friends. As a result of this, they are more susceptible to peer pressure, risk taking, and impulsive decisions (White, 2005). They are processing intense emotions, experiencing physical changes, and learning how to process information in an effective and efficient way. As I researched the development of the adolescent brain, I began to understand that adolescents are far more complex than most educators probably give them credit for and that we need to consider how to meet the needs of their brain.

This gave me the idea to create a toolbox of brain-based strategies to incorporate into a curriculum to help the adolescent brain develop and help students be motivated to learn and build positive relationships that will benefit them throughout the rest of their lives. I wanted to create a toolbox for educators that offered relevant materials that encouraged curiosity, innovation, and application; strategies that used peers and adults as a tool to encourage communication, trust, and understanding. Finally, I wanted a toolbox of strategies that continued to support the growth of the adolescent brain to lead adolescents to positive decision making, metacognition, and higher level thinking inside and outside of school. This led me to my research question: *How can we use knowledge of the adolescent brain to increase motivation and relationships?* I chose to use the Backwards Design model (Wiggins

& McTighe, 2011) and Differentiated Instruction (Tomlinson, 1999) as the foundation for creating this toolbox.

This chapter explains my research, process, and the methods of the curriculum development. This chapter also gives some context on the students whom this curriculum is intended for, as well as information on the school district and community that influence these students. Lastly, I discuss the intended audience for this capstone. All of these components provide a better understanding for the curriculum supplemental toolbox that is created in Chapter Four.

Rationale

I chose to create a toolbox of brain-based strategies that can support any curriculum. In my experience, curriculums tend to focus heavily on meeting state standards and are not necessarily written with the adolescent brain in mind. Educators may implement differentiation in their classrooms, but it may not be designed to increase motivation or build relationships. Currently, our district uses the Understanding by Design model (Wiggins & McTighe, 2011) (UbD) to develop curriculum. The brain-based strategies toolbox can supplement any curriculum and support the structure of the UbD model.

As White (2005) pointed out, children are typically dependent on others for the first decade of their life. After that, they venture off to become independent and create their own families and/or self identities. In the section on relationships, Siegel (2014) wrote about the shift in attachments from their parents to their peers as a result of survival based needs. By providing educators with a toolbox of brain-based strategies that support their curriculum and strengthen the development of the adolescent brain, I am preparing students for the autonomy

they need in adulthood as well as nurturing the relationships they need to have as they progress through life.

When considering motivation, Jensen (2005) suggested that it plays a factor in a child's reaction towards effort, persistence, failure, and learning goals. Students' motivation is a balancing act of understanding how to use intrinsic and extrinsic rewards to leverage student engagement, growth mindset, and learning. By providing educators with a toolbox of brain-based strategies to increase motivation, I am helping students make learning relevant and meaningful. Ultimately, the goal in using these strategies would help students become more intrinsically motivated when they see the satisfaction that comes from doing things on their own and exploring their own learning.

Participants and Audience

I teach at a middle school that serves 6-8 graders. Our district has another middle school across the street, and we share students between both buildings. Both middle schools have approximately 1,000 students each; several students cross the street for different classes. The middle school that I teach at is comprised of 1% American Indian, 6% Asian, 4% Hispanic, 4% Black/African American, and 85% White. We also have eight ELL students (Minnesota Department of Education, 2017). Approximately 12% of students qualify for free and reduced lunch. In my current classroom, I have six students with ADHD, one student diagnosed as EBD, and one student diagnosed as LD in a classroom of approximately 35 students. Our district has a seven day period (classes) for both middle schools. I see students for a fifty-three minute period. Some of my students see me twice a day for additional reading support. When students are not in class with me, they are transitioning in the school and

across the street to their other core classes as well as electives. As a result, it is important to consider the suggestion by Wilson, Conyers, and Rose (2015) to personalize classroom learning because each brain can be seen as a “fingerprint” that requires its own guidance for learning (p. 1). Adolescents are not suited for a factory one-size-fits-all model. They are complex individuals whose brains are all developing at different speeds.

The intended audience for this curriculum supplement is teachers of adolescents (secondary educators). While this toolbox caters towards 7th grade students in their core classes (math, science, social studies, English), the brain-based strategies that are suggested within the lessons are still applicable to all grade levels and all content areas.

Backward Design

Wiggins and McTighe (2011) proposed a model known as Understanding by Design (UbD) which is a curriculum model that focuses on the “what and how of teaching” and the assessments needed to determine if students have learned the content (p. 6). The belief behind the model is that learning is most effective when instruction and learning activities are tied to clear objectives and serve a strategic purpose. Lemov (2010) stated the flaws behind thinking about an activity for a class the following day instead of creating objectives first. By focusing on the objective first and what I want students to learn, I transferred my criteria for the day from “What will my students do today?” to “What will my students understand today?” (p. 57). Lemov pointed out that the latter is measurable, whereas the former is not. UbD works with this thinking by starting with the end in mind and working backwards. Wiggins and McTighe (2011) proposed determining what they want students to accomplish, what evidence

they deem acceptable to show understanding, and what instruction is needed to help students reach the intended learning.

In the first stage, teachers prioritize learning outcomes, including what they want students to know, be able to do, and understand as a result of the teaching. They plan essential questions and tie them to overarching goals. Then teachers identify assessments that will assess student learning. This includes formative assessments, project-based assessments, and real world applications. These assessments should align with their objectives, essential questions, and what they want students to be able to do and understand. The last stage requires teachers to plan purposeful instruction to help students achieve the desired results. They use their essential question and assessments to direct their planning and differentiate instruction. Through the use of differentiated instruction, I can use brain-based strategies and the understanding of motivation and relationships to create purposeful learning experiences that support adolescent brain development. See Appendix A for the UbD unit template (Wiggins & McTighe, 2011).

Differentiated Instruction

Tomlinson and McTighe (2006) suggested that Differentiated Instruction is an essential partnership to UbD. Just as UbD focuses on the “what and how of teaching”, Differentiated Instruction focuses on the “whom, where, and how we teach” (Tomlinson & McTighe, 2006, p. 7). Whereas UbD is a curriculum model, Differentiated Instruction is an instructional model. The instructional model supports learning experiences that vary for each student. Tomlinson and McTighe (2006) suggested developing differentiated instruction by identifying patterns that can be used across categories to serve multiple needs. Many of these

patterns are similar to the brain-based strategies listed in Chapter Two. These include purposefully getting to know students as individuals, incorporating small group teaching, offering multiple ways to express learning, teaching in multiple ways, and giving students the opportunity to work independently and in groups (Tomlinson & McTighe, 2006, pp. 21-22).

Another way Differentiated Instruction supports the development of the adolescent brain is by creating multiple lessons that help build synapses. In Chapter Two, Willis (2006) pointed out that learning in various ways can strengthen synapses. As the pathways that are created around a particular topic or skill are used more often, they strengthen and avoid being lost. Differentiated Instruction is valuable because it involves teaching in ways that help students store information in multiple regions of the brain. Willis (2006) suggested using the five senses and teaching across multiple subjects so that students have the ability to store information in multiple regions and access it more readily. The ability to make connections between different regions of the brain and associate current knowledge with previous knowledge allows adolescents to recall and use information in a more efficient and quick manner (Willis, 2006). By implementing brain-based strategies that support the development of the adolescent brain, educators can increase student motivation and ability to build positive relationships with themselves and others.

Evidence of Effectiveness

It is an integral part of teaching to be a reflective practitioner. It is the role of the teacher to continually evaluate the effectiveness of their lessons, including learning activities, assessments, and whether the outcome of the desired results have been met. Frequent reflection and formative assessments help educators make adjustments within the current unit,

such as reteaching, and making changes for future lessons. To collect evidence on the effectiveness of the curriculum supplement in connection with the development of the adolescent brain, I analyze the use of brain-based strategies to increase student motivation and build relationships through formative assessments, surveys, informal observations, common assessments, MAP and MCA data, as well as the district's student engagement survey.

Timeline

The curriculum supplement is applicable for the entire year, with sample lessons using brain-based strategies in each of the four core subjects. The toolbox of strategies co-align with the UbD model as designed by (Wiggins & McTighe, 2011). The project was completed over the summer of 2017. During back to school workshop week, the toolbox of strategies was shared with educators in a google drive to use in alignment with their curriculum.

Conclusion

In this chapter, I have discussed the rationale and model for the curriculum supplement I created to answer the research question, *How can we use knowledge of the adolescent brain to increase motivation and relationships?* The toolbox was written for any curriculum used at the 7th grade level. It includes differentiated instruction that implements brain-based strategies to increase motivation and build relationships, ultimately improving learning. Chapter Four includes the curriculum project for a toolbox of brain-based strategies to be used alongside a curriculum. The three themes that the toolbox are designed around is catering to the adolescent brain, building relationships, and leveraging intrinsic and extrinsic motivation.

CHAPTER FOUR

Reflection

Introduction

When I chose to study in the field of education, I strongly debated whether to become a teacher in mathematics or English. I ultimately chose English because I thoroughly enjoyed the complexity of it, the fact that most things aren't simply black or white, but rather fall somewhere on a grayscale. You can not argue that $2+2=4$, but you can debate Charlotte Bronte's use of the angel/monster dichotomy in both *Jane Eyre* and *Bertha Mason* in her novel, *Jane Eyre*. Yet, it turns out, that teaching in itself is as complex as whatever subject matter one is teaching.

I came across the following quote by Lola J. May, a notable mathematician and author. She said, "There are three things to remember when teaching: know your stuff; know whom you are stuffing; and then stuff them elegantly" (May, n.d., p. 1). My undergraduate studies helped prepare me for knowing how to teach English. As I began my teaching career, I realized there was more I wanted to know about teaching adolescents. I wanted to better learn their complexities so I could teach in a way that catered to them. This led me to my research question, *How can we use knowledge of the adolescent brain to increase motivation and relationships?* In writing the first three chapters of this capstone, I have a better understanding of "whom I am stuffing". My research question and the literature I reviewed led me to create a toolbox of strategies that teachers can use that lend itself to the development of the adolescent brain, increase motivation, and build relationships. The toolbox is accompanied by a seventh grade short story unit that shows how to use the various strategies within individual lessons.

In completing this project, I believe that I am equipping myself and others to “stuff them elegantly”.

Summary of Literature Review

Research suggests that while the brain may have reached its adult size by age ten, it is far from being a static entity. The brain is still developing well into adolescence, making it crucial for educators to understand what this means for their learning. Teenagers’ executive functions, such as weighing risks and rewards, impulse control, planning, thinking ahead, insight, empathy, as well as thinking about the effects of their behavior on other people are all still developing due to an underdeveloped prefrontal cortex (Gross, 2015; Steinberg, 2011; Knox 2010). In addition to an underdeveloped prefrontal cortex, the brain is experiencing a rapid intake of dopamine as well as a hypersensitive limbic system, both of which seek out pleasure, rewards, and other positive emotions (Turner, 2015).

Despite having a brain that may tend to “live in the moment” more, learning in adolescents takes much less effort due to the abundance of synapses, the connections that are built between neurons, in the brain (Perkins-Gough, 2015). Neurons are responsible for processing information, making decisions, and controlling behaviors (White, 2005). Synapses continue to develop as adolescents “learn new skills, build memories, acquire knowledge, and adapt to changing circumstances” (Steinberg, 2011, p. 23). Eventually, the brain begins a process known as “systematic pruning” which eliminates synapses that are no longer used or no longer lead to more direct results (Steinberg, 2011).

As adolescents are learning, their brain is constantly seeking pleasure from the chemical substance, dopamine. This can be a great contributor to motivation as students

experience pleasure in their academic accomplishments. Many researchers believe there are positive and negatives to offering extrinsic rewards as a motivator for adolescents.

Adolescents are curious by nature and naturally want to solve problems without the implication of an external reward. Educators should consider this aspect of adolescents and continue to motivate them to be curious, explore, succeed, and understand (Piaget, 1978).

However, extrinsic rewards should not be dismissed as they can be motivating for students to continue positive behaviors, improve how the brain processes information, and increase motivation on tasks that hold low interest or not a lot of relevance for students (Cameron, Banko, & Pierce, 2001; Schutz, 2007).

The brain is a social being and “is relational, not a product created in isolation” (Siegel, 2012, p. 21). In the early stages of childhood and adolescence, the relationship between child and parent is responsible for the success of future relationships, maintaining emotional balance, enjoying themselves and their time with other people, and having the ability to rebound from negative feelings and experiences (Jaffe & Segal, 2017). As children move into adolescence, their attachments begin to change from adults to their peers (Siegel, 2014). This is in part because adolescents need to learn to shift from dependence to independence. It is important that educators nurture the relationship they develop with their students as well as help foster relationships with their peers.

Overall, the findings of the research suggest that the development of the adolescent brain has an impact on how students view motivation and how it processes both intrinsic and extrinsic rewards. As the brain is a social entity, findings indicate the importance of the relationships developed with adults and peers in the development of future relationships and

independence. The underdevelopment of the prefrontal cortex and the rapid increase in dopamine and the hypersensitivity of the limbic system suggest that a lot is happening in the adolescent brain. Educators should be aware of these aspects of the brain in order to nurture the development of the adolescent brain, help adolescents build their executive functioning skills, strengthen their synapses, and gain autonomy.

Description of Project

Research has provided a plethora of brain-based strategies that support the development of the adolescent brain and help to increase motivation and build relationships in adolescents. The project consists of a google drive separated into three different themes: developing the adolescent brain, increasing motivation, and building relationships. Each theme provides a bulleted list of brain-based strategies that educators can use in lessons to support adolescents. The development of the adolescent brain folder also offers suggestions for building the emotional development of the brain. In the increasing motivation folder there is an additional document that introduces a Positive Behavioral Intervention System (PBIS). It is an extrinsic rewards program that encourages positive behavior and academic accomplishments as well as eliminates negative and unwanted behaviors. Finally, each folder provides two to three lessons that show how to use those brain-based strategies. The lessons are developed to support a seventh grade English unit on short stories.

Limitations of the Project

Initially I planned to only create a unit using the UbD curriculum. However, I felt that I ran into the issue of providing a rationale for educators to use each brain-based strategy and reconsidered the use of the UbD curriculum. This caused me to change my approach to the

project and led me to create a toolbox of strategies. This allowed me to explain to educators the research behind the strategies and how they benefited adolescents. Once I created the toolbox, I realized I needed to provide examples within lessons of how to use these strategies. This led me back to the UbD curriculum. I used the UbD template to create a unit that implemented the various brain-based strategies within the learning activities.

One challenge I faced in creating this project was how my research would fit into the UbD curriculum. I wanted to fit the research into the first and second stages. For example, “Students will know how to... think ahead to create a plan and carry it out” by the end of the lesson or creating an essential question such as “Why are relationships essential to developing autonomy?” However, I was not creating a unit on how educators could teach the development of the adolescent brain, motivation, and relationships. This caused a slight setback as I was no longer sure if the project I envisioned was going to work. Eventually I realized that my research was meant to impact how I taught my lessons, which led me to create lessons I would typically teach in a unit. As I created each lesson, I consciously implemented the brain-based strategies I discovered in order to support my research question.

One limitation I found when developing my unit is that some strategies cannot explicitly be shown within the lesson. For example, it would be difficult to show how to motivate certain students or how to build relationships between the teacher and student within the learning activities. It is more of a strategy that educators need to be consciously aware of in their teaching. There is not a learning activity that explains the necessity of fostering individual relationships with students, yet it is something that educators must do to support the development of the adolescent brain. In addition to using strategies that may not explicitly be

taught, but rather shown, it is difficult to know how parents, mentors, coaches, the community, and the world are impacting adolescents outside of the classroom. Are they guiding youth in a way that supports their growth as an individual? The strategies created in this project support the development of the adolescent in a positive way, but there is no way to verify or ensure that these strategies continue outside of the classroom.

Another limitation of this project is that the unit offered is tailored to a seventh grade English unit. Therefore the brain-based strategies used also cater to seventh graders. These strategies would need to be altered to suit the appropriate age groups. Other core content or elective teachers could use the English unit as a reference and framework, but they would need to figure out how to incorporate these strategies into their own lessons.

Implications of the Project

My research question developed from my third year teaching when I met a student who challenged me as a teacher beyond teaching content. I approached teaching him in a way that was different than any other student I had taught. It made me reflect on other components that go into teaching and whether I was teaching in a way that supported how my students needed to learn. This sparked my curiosity on the development of the adolescent brain and its impact on student learning. From there I wanted to learn how that development could increase motivation and build relationships, two components of teaching that I believe are invaluable. This led me to my research question, *How can we use knowledge of the adolescent brain to increase motivation and relationships?*

The toolbox of strategies along with the example lessons that show how to implement these strategies, help me and other educators consciously think about how the adolescent brain

develops and how we can use that information to effectively teach in a way that supports the development of the adolescent brain, increases motivation, and builds relationships. Children are born dependent on others for approximately the first decade of their lives (White, 2005). This means that most of the skills adolescents need to bridge the gap between dependent and independent, such as planning, empathy, impulse control, and thinking ahead need to be developed in their adolescent years (Gross, 2015). Adolescents are also experiencing a rapid increase in dopamine which can contribute to their motivation as they experience pleasure in their accomplishments (Steinberg, 2011). However, the production of cortisol can impact a student's motivation negatively. Jensen (2005) points out that children's reactions towards effort, persistence, failure, and learning goals are all related to a child's motivation. Therefore, it is important that we are purposeful in how we teach adolescents. Despite the strategies offered in this project not being explicitly identified and explained to students during a lesson, I believe the outcome of the actions educators take to implement these strategies in how they teach will become apparent as adolescents continue to mature and grow.

Providing example lessons of how to create relevancy and include choice in a classroom can help motivate students, offer differentiation, and continue to build relationships. By offering choice in how or what adolescents learn helps students feel autonomous because they thrive on the opportunity to make their own choices (Patall, Cooper, & Robinson, 2008). Differentiation allows students to learn in a way that is conducive to them (McTighe & Wiggins, 2011). It helps them find success, and encourages them to continue to seek that self-rewarding feeling (Willis, 2014). Hileman (2006) recommended giving adolescents the opportunity to talk to each other and learn from each other. This build

confidence, learning, and relationships between peers. All of the lessons offered in the curriculum unit show how to support the adolescent brain, increase motivation, and build relationships by labeling when a strategy is being used during a learning activity. This can help educators continue to support the development of adolescents as they are experiencing a plethora of changes.

The majority of the literature reviewed offered insight into understanding the significance and impact of the development of the adolescent brain on learning, motivation, and relationships. By consciously using the various strategies suggested in the project, educators are not only teaching beyond the content but are fostering and nurturing the development of the adolescent brain and preparing students for what lies ahead.

I am not sure I would change my research question because of how personal the topic was to me. The research also reinforced my beliefs that it is necessary for educators to teach beyond the content. Adolescents need the room to practice autonomy, foster their desire to be intrinsically motivated, and build positive relationships. I think if I could pursue another research topic (and who knows, maybe I will) I would either pursue how to effectively assess and teach middle school interventions or best practices in supporting struggling students when the rest of the class is ready to move forward. The former interests me because there are not a lot of resources available on assessing or teaching the specific needs of adolescents. The latter interests me because my colleagues and I are frequently trying to figure out how to help the 5% of students who didn't understand the content while continuing to teach the rest of the class.

Author's Reflection

I am sure my former seventh grade student will not read this capstone, but I wish he understood the impact he had on me as a teacher. Without him, I may have chosen a different avenue to explore for my capstone. I may not have gained the knowledge and understanding of the adolescent brain and how it differs from my own brain. This process opened my eyes to the intricacies of the human brain. I believe that teaching is not a one-size-fits-all model, and the research I found reinforced that belief and allowed me to take it one step further. Through this capstone and project I was able to develop a set of brain-based strategies that I can implement within my lessons to support the growth of the adolescent brain and student learning.

This capstone has challenged me as a teacher and a researcher. As a teacher, it challenged me to look at the lessons I currently teach and consider whether my learning activities were actively supporting my students' growth beyond learning the content. It challenged me to incorporate all that I learned from the research and the strategies I discovered into those lessons. As a researcher I came to find the importance of synthesizing information, considering multiple perspectives, and questioning what I read. When I first started writing my literature review, I remember my instructor warning me that, while it appeared intimidating, most people found it to be quite addicting and rewarding. I now see what she meant. As a researcher and a student I found myself curious about the information I read and learned. I became wrapped up in reading the literature and hearing what all the scholars had to say about a topic I felt passionate about.

As I continue in my educational career I know this capstone and project will influence how I approach teaching and approach certain students. My graduate studies will continue to support and guide me as I grow as an educator and an individual. Many of my courses did not just teach me skills that fit into an educational setting, but can also apply in living life outside the classroom. In addition to completing my Masters, I took additional courses to obtain my reading license. This will support me as I work with struggling readers and help to inform my instruction in the classroom. As far as future plans go, I am sure I will find myself taking additional courses over the years to stay current and relevant in the world of teaching.

Conclusion

Lola J. May (n.d.) claimed that there are three parts to teaching. The first is to “know your stuff”. In completing this capstone project, I have gained knowledge to help students grow beyond the content they learn in the classroom. The capstone took me beyond just theory and helped me learn pedagogical knowledge through brain-based strategies that I can implement in my teaching. I have a strong foundational base of the development of the adolescent brain and how to increase motivation and build relationships. It has also given me the opportunity to grow and learn as an educator as well as offer support and research beneficial to my colleagues and my students. It has continued to make me a reflective practitioner, a curious learner, and a better teacher and individual.

The second part to teaching is to know “whom you are stuffing”. Completing this project has reinforced the need for differentiation and an understanding of the complexities of each student. It’s essential to take the time to foster relationships with each student and support them where they are at developmentally, both academically and emotionally. My

students come from all different backgrounds. By learning about how to use the development of the adolescent brain to increase motivation and build relationships, I am able to provide an environment that is conducive to student needs, fosters relationships, and promotes positive self-perceptions.

The final part to teaching is to “stuff them elegantly”. My graduate courses and this capstone and project have led me to gain new practices that can only enhance my current teaching practices. I have the opportunity to take my teaching to a new place by supporting my students as adolescents and not just students. With the knowledge that I gained from this project, I can teach students in new ways that are creative, innovative, individualized, and supportive of their development. In this regard, I am prepared to stuff my students exquisitely.

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Appendix A

Project Link - Toolbox of Strategies

<https://drive.google.com/drive/folders/0B3Kp5uDTYuT2R3J2MV9MSkpzMFk?usp=sharing>